MINISTRY OF HUMAN RESOURCES

TalentCorp
GROUP OF COMPANIES

Impact Study of Artificial Intelligence, Digital, and Green Economy on the Malaysian Workforce Volume 2

Sector:
Food Manufacturing and Services

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Preface by the Group Chief Executive Officer of TalentCorp

As Malaysia stands on the threshold of a transformative era, we find ourselves driven by the accelerating forces of Artificial Intelligence (AI), Digital, and Green Economy. These global trends are reshaping industries, redefining the future of work, and challenging us to navigate both the opportunities for job creation and the realities of evolving role redundancies.

With a median age of 31, Malaysia leads a youthful ASEAN region where the median age is just 30. This demographic advantage presents a unique opportunity—a vibrant, dynamic workforce ready to harness the opportunities of a Digital and Green Economy. Yet, it also poses challenges. Youth unemployment and underemployment remain persistent issues across ASEAN, with Malaysia facing a youth unemployment rate of 11% and 36.3% of tertiary-educated employees grappling with skill-related underemployment. These figures demand immediate action. Reskilling and upskilling are not just important—they are imperative as the landscape of jobs continues to evolve.

At TalentCorp, we are honoured to serve as a strategic think tank under the Ministry of Human Resources' (KESUMA) mandate. This critical role allows us to leverage our networks and initiatives, providing data-driven insights that strengthen the government's intelligence capacity and support national policy development, advocacy, and long-term strategic planning.

One of our foremost initiatives in this capacity is the **Impact Study of AI, Digital, and Green Economy on the Malaysian Workforce**. This study is designed to offer key guidance to policymakers and industries, equipping them with the knowledge to prepare the workforce for upcoming shifts. It highlights essential reskilling and upskilling programmes to assist Malaysians affected by job displacement, ensuring they transition smoothly into new roles, fostering sustainable growth, and ensuring no one is left behind.

Through insights gleaned from this study, TalentCorp's MyMAHIR Future Skills Talent Council (FSTC)—an industry-led body dedicated to addressing skills needs—will drive efforts to close critical skills gaps. MyMAHIR's collaboration with industry leaders enables us to identify priority competencies and shape training programmes to meet the evolving demands of their sectors. Aligned with the MADANI Economy framework's focus on lifelong learning and guided by best practices from the International Labour Organization (ILO), TalentCorp will continue working closely with key ministries, agencies, and industry players to develop forward-looking curricula that meet the workforce needs of the future.

As Malaysia navigates this new landscape, the findings from this study will serve as an indispensable resource—providing policymakers, industries, and the workforce with the insights and tools required to stay competitive and resilient in an ever-evolving global economy.

On behalf of TalentCorp, I extend our deepest gratitude to our industry partners, colleagues, and experts for their invaluable contributions to this study. Together, we have crafted a comprehensive and impactful report that will serve as a guide for Malaysia's future of work, ensuring that we are prepared for the challenges and opportunities ahead.

Thomas Mathew
Group Chief Executive Officer
Talent Corporation Malaysia Berhad

“As Malaysia navigates this new landscape, the findings from this study will serve as an indispensable resource— providing policymakers, industries, and the workforce with the insights and tools required to stay competitive and resilient in an ever-evolving global economy.”

Thomas Mathew
Group Chief Executive Officer
Talent Corporation Malaysia Berhad

Executive Summary

The global Food Manufacturing and Services (FMS) sector is rapidly evolving, driven by shifting consumer preferences towards more nourishing and 'health-first' foods, advancements in technology that are enabling greater automation and delivery services, and a growing emphasis on sustainability under the 'Green' agenda. As these trends converge, they are shaping the future of the sector, pushing it towards innovative and sustainable practices.

The global food and beverage sector has experienced substantial growth in recent years, with the market size growing from USD6.6 trillion (RM28.6 trillion) in 2023 to USD7 trillion (RM30.33 trillion) in 2024 at a compound annual growth rate (CAGR) of 6.4%, driven by economic development, increased internet penetration, and rising disposable incomes in emerging markets. This positive trend is expected to persist, with the market projected to continue expanding at a steady rate over the next few years. The market is forecasted to reach USD8.9 trillion (RM38.57 trillion) by 2028, with a CAGR of 5.9%. This growth is anticipated to be fuelled by ongoing technological advancements and shifting consumer behaviours.[1]

The FMS sector plays an essential role in Malaysia's economy, contributing 10.4% of the country's GDP, which amounts to RM78.2 billion. Its growth is driven by population expansion, urbanisation, and lifestyle changes, all of which have led to a growing demand for high-nutrient food products.[2] Malaysia's FMS sector is set for a significant transformation over the next three (3) to five (5) years, driven by changing consumer preferences, technological advancements, and economic considerations. Recent developments around AI, Digital, and Green Economy are also driving changes in the Malaysian FMS players' businesses, impacting the Malaysian workforce's roles and skills to meet the sector's evolving demands.

Artificial Intelligence (AI) technologies are set to revolutionise the FMS sector, mainly in four (4) areas: adoption of robotic technologies; optimisation of food processing and packaging through AI technology; optimisation of maintenance activities; and virtual and augmented reality (VR and AR).

Digital is rapidly transforming the FMS sector, creating opportunities and challenges. This transformation involves integrating digital technologies to streamline operations; improve efficiency; enhance customer experiences; and promote sustainability in key areas, such as digitised documentation, e-commerce, and digitalisation of food ordering and payment.

Green Economy initiatives are gaining traction in the FMS sector, though adoption varies by country and company size. In Food Manufacturing, major players and established companies are leading the way, while small to medium-sized enterprises (SMEs), although facing cost concerns and lower levels of awareness, are making strides in adoption. In Food Services, many leading chains offer plant-based options and promote energy efficiency through energy-efficient appliances. The sector increasingly adopts energy-efficient technologies and practices as consumer environmental consciousness rises.

The impact study for FMS assessed a total of 77 roles across seven (7) key clusters, which are:

1. Production
2. Research and Development (R&D)
3. Quality Assurance and Quality Control
4. Halal Affairs
5. Logistic and Supply Chain
6. F&B Services
7. Kitchen Operations

From the 77 roles, six (6) are identified as emerging roles that will drive future advancement and innovations:

1. Food Biotechnologist
2. Bioprocess Engineer
3. Data Scientist
4. Drone Pilot / Driver
5. System Architect
6. Sustainability Specialist

1. The Business Research Company, *Food and Beverages Global Market Report 2024*, January 2024
2. Ministry of Investment, Trade and Industry (MITI), *New Industrial Master Plan 2030: Food Processing Industry*, 2023; Department of Statistics Malaysia (DOSM)

Highly impacted roles are identified by the integration of AI and Digital, which automates routine tasks like equipment handling, packaging, inventory management, and analysing experimental data in R&D laboratories. These roles are categorised as highly impacted because they are at risk of convergence, displacement, or redundancy due to technological advancements, emphasising the urgent need for upskilling and reskilling. Five (5) highly impacted roles have been identified in the **Food Manufacturing Sector**:

1. Production Operator
2. Process Technician / Maintenance Technician
3. Quality Control Technician / Assistant / Laboratory Technician
4. Laboratory Technician
5. Transportation Assistant

Furthermore, two (2) highly impacted roles have been identified in the **Food Services Sector**:

1. Crew Leader
2. Server / Service Crew

These roles are identified as highly impacted since AI and Digital can recommend menu selections, personalise customer catalogues, manage reservations, and even handle food delivery to tables in restaurants.

The study further identified career pathways for highly impacted roles. For instance, the role of a Production Operator can pivot within the FMS sector to Production Planner and Warehouse Storekeeper roles. Specific skills such as Advanced Processing Technology, Active and Smart Packaging, Budget Management, and Dangerous Goods Management are required for this transition. In the near future, a Production Operator will also be expected to perform basic maintenance, shifting the role towards becoming a Technical Operator.

With the adoption of AI, Digital, and Green Economy, the role of Service Crew / Server at food and beverage service outlets is expected to be highly impacted, as responsibilities such as reservation management, order taking, and payments can now be performed digitally. However, with upskilling and reskilling, this role can pivot to positions such as Kitchen Steward / Kitchen Assistant within the FMS sector, or Retail Coordinator, Online Store Representative, and Customer Experience roles within the Wholesale and Retail Trade sector.

The impact study assessment identified 10 initiatives across the talent ecosystem to adapt to AI, Digital, and Green Economy trends within the FMS sector. These Recommended Initiatives have been grouped into four (4) stakeholder categories: **Government**, **Industry Players**, **Academia**, and **Training Providers**:

GOVERNMENT	**IN1** Provide Funding and Incentives to Encourage Adoption of Emerging Technologies and Practices **IN2** Inclusion of Private Sectors in Regulatory and Policy Reviews **IN3** Collaboration and Engagement with Industry Players **IN4** Creation of Technical Leadership or Advisory Body to Help Individuals or SMEs with Specialised Expertise and Technical Guidance
INDUSTRY PLAYERS	**IN5** Enhance Talent Development Strategy for Long-Term Success
ACADEMIA	**IN6** Collaborate with Industry Experts to Integrate Real-World Practices in Curriculum and Syllabus **IN7** Collaborate with Industry Players to Design Effective Internship Curriculum **IN8** Enhance Quality of Educators with Advanced Sector Training and Resources
TRAINING PROVIDERS	**IN9** Enhance Training Delivery and Effectiveness by Onboarding More Credible and Certified Training Providers **IN10** Accessible and Practical Training Approach to Cater for Larger Group of Workforce

Chapter 1:

Introduction of the Study

Introduction of the Study

Purpose of the Study

The increasing focus and adoption of AI, Digital, and Green Economy call for a transformative shift in global operating models and workforce, supported by the digitally enabled drive beyond Industrial Revolution 4.0. The study aims to help government, industry players, academia, training providers, and the public to prepare for future workforce demands. The output of this study will contribute to the Malaysia National Skills Registry (MyNSR), a skills taxonomy that will be integrated into the MyMAHIR platform. This platform offers comprehensive insights into industry trends, job roles, required skills, career pathways, and available training programmes across all sectors.

These research and studies cover several sectors, namely Information and Communications Technology (ICT); Food Manufacturing and Services; Pharmaceutical Manufacturing; Medical Devices; Aerospace; Electrical and Electronics; Wholesale and Retail Trade; Energy and Power; Chemical; and Global Business Services.

AI will increasingly impact the nature of work and the broader societal progress

Majority of industry players in Malaysia are conscious about AI and the benefits it brings to organisations. While some have leveraged AI to carry out tasks, many organisations have yet to fully embrace AI as it remains difficult for organisations to justify the expense and effort required to implement AI due to the uncertainty of Return on Investment (ROI). Organisations are also wrestling with how to address AI throughout their operations – not just from a technology perspective but also from the human perspective in terms of roles and skills readiness.

This is also consistent with an inaugural Cisco AI Readiness Index in 2023 where 86% of organisations worldwide are not fully ready to integrate AI into their businesses. Malaysia's AI Readiness tracks that of the Global level, standing at 87% with only 13% considered as "pacesetters".

With the rise of AI, the Malaysian government has launched the National AI Talent Roadmap 2024–2033 to cultivate a skilled workforce to unlock the potential of AI across various sectors. Adding to this momentum, tech giant Microsoft Corp announced a significant investment of RM10.5 billion in Malaysia's cloud and AI infrastructure. Additionally, global tech firms Google and ByteDance will invest RM9.4 billion and approximately RM10 billion to establish data centres and transform Malaysia into a regional AI hub.

Malaysia's digital transformation is key to enhance national competitiveness, empower industries and local enterprises to progress towards high-value added activities

Digital transformation has been a strategic imperative across many organisations for many years. By continuing to embrace digital technologies, Malaysia can significantly elevate the capabilities of its industries and local enterprises. This technological advancement is not just about automating existing processes to enhance productivity, but also about enabling a shift towards higher value activities.

Digital economy is one of Malaysia's key economic pillars, contributing 22.6% to the country's gross domestic product (GDP).[3] This number is set to rise to 25.5% by 2025. To remain relevant and resilient, the Malaysia Digital Economy Blueprint overseen by MyDIGITAL outlines the efforts and initiatives taken to transform Malaysia into a high-income nation that is focused on digitalisation and a regional pioneer in the digital economy.

Malaysia is also making significant strides in Green Economy

When it comes to Green Economy, most organisations in Malaysia today are still driven by compliance to regulations. However, there has been growing awareness and willingness to drive the Environmental, Social and Governance (ESG) agenda at the forefront with concerted efforts from the government, private sector, and public. While progress is being made, ongoing commitment and collaboration across all industries are necessary to ensure a sustainable future for the country.

This is in line with the Twelfth Malaysia Plan (2021–2025) that outlines the nation's aspiration to achieve net-zero greenhouse gas (GHG) emissions as early as 2050. Complementing this, the National Energy Policy (2022–2040) sets the foundation for transforming the energy landscape towards sustainability. In line with these objectives, the Malaysian Government has also developed the National Energy Transition Roadmap (NETR) to accelerate the shift from a traditional fossil fuel-based economy to a high-value Green Economy. Malaysia's efforts are reflected in its leading position in the World Economic Forum Energy Transition Index, ranking 1st in ASEAN and 35th globally.[4]

It is imperative to future-proof Malaysia's workforce for the impact of AI, Digital, and Green Economy

This study aims to provide transformative and strategic inputs to complement the rapid growth of these areas. It will examine how these trends as a whole will reshape Malaysia's workforce in the upcoming three (3) to five (5) years and assess the impact of current and future trends of AI, Digital, and Green Economy; its implications for current and future job roles and skills; the nation's capacity to cater to future workforce demands and needs; and lastly, policy recommendations that the policy makers and agencies, industry players, academia and training providers as a whole can do in spurring the industry forward amidst flexible changes ahead.

This report will provide an overview of the FMS sector, including its related sub-segments, the key trends and developments relating to AI, Digital, and Green Economy. More importantly, it will highlight the roles impacted as well as the skills needed to be future-ready for the FMS sector. These findings are based on engagements with industry associations and key players as well as regulators and government agencies.

The report concludes with Recommended Initiatives for four (4) key stakeholder groups, namely: Government, Industry Players, Academia, and Training Providers.

> **"Microsoft's investments in digital infrastructure and skilling will help Malaysian businesses, communities, and developers apply the latest technology to drive inclusive economic growth and innovation across the country."**
>
> ***Satya Nadella, CEO of Microsoft***

3. Vanessa Gomes, *Catalysing Malaysia's Digital Economy*, September 2022, https://mdec.my/esg-mdcap/content-hub/catalysing-malaysia-digital-economy
4. MIDA, *Malaysia ranked first place in S-E Asia in WEF energy transition index*, July 2030, <https://www.mida.gov.my/mida-news/malaysia-ranked-first-place-in-s-e-asia-in-wef-energy-transition-index/>

Chapter 2:

Approach and Methodology

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Approach

A six-pronged approach entailed a blend of qualitative and quantitative research techniques that generated insights and met the objectives desired from this study. The study's outcomes reflect what is happening in each industry today and what is expected of each sector in the next three (3) to five (5) years.

Research Techniques

The qualitative and quantitative research techniques were as follows:

Research Methodology

The study focused on three (3) key trends shaping today's workforce: AI, Digital, and Green Economy. Their definition is outlined below:

01 Artificial Intelligence
Development and use of machine learning models capable of performing tasks that would have required human intelligence (deep learning, computer vision, Natural Language Processing (NLP), reinforcement learning, supervised and unsupervised learning).[5]

02 Digital
Activities and transactions driven by the public and various organisations to produce, adapt and innovate digital technologies and services for enhanced productivity and quality of life (big data analytics, cloud, Internet of Things (IoT), and robotic process automation).[6]

03 Green Economy
Employment growth and income driven by investment in low-carbon, resource-efficient, and socially inclusive economic activities, infrastructure, and assets.[7]

To effectively analyse how the key trends impact existing roles, four (4) key parameters have been defined in the assessment process, as stated below:

AI & Digital

1. **Opportunity to automate data-driven or low-creativity activities that are repetitive or rule-based via AI or other technology tools.**

2. **Human intervention is required despite some or most activities being automated or digitalised, as:**
   - Strategic thinking and problem-solving are vital to making decisions
   - Creative thinking is needed to generate new ideas or ways of working
   - Outcomes need to be communicated or socialised and regulated
   - High importance is placed on human emotions or physical involvement in performing the activity
   - Typically performed by a critical role that holds accountability or a role requiring certification

Green Economy

1. **Impact of the environment on jobs that depend on limited natural resources and produce outputs that are polluting or may pollute the environment.**

2. **Opportunity to diversify, requiring new skills to implement the organisation's Environmental, Social, and Governance (ESG) agenda, which includes:**
   - Environment: Areas for improvement in environmental sustainability
   - Social: Diversity, equity, inclusivity, ethics, and community engagement
   - Governance: Risk management, compliance, reporting, and corporate culture

5. World Economic Forum
6. Malaysia Digital Economy Corporation (MDEC)
7. United Nations Environment Programme (UNEP)

Based on the parameters above, the impact assessment of AI, Digital, and Green Economy on roles will result in one of the following outcomes:

HIGH

Roles at risk of convergence or displacement

Need to pivot to adjacent role and reskill

MEDIUM

Roles still relevant

Need to evolve and upskill to deliver beyond what would traditionally be expected

LOW

Roles not severely impacted

Require ongoing self-improvement to stay relevant

The impact assessment results inform individuals and organisations about the levels of risk faced by job roles in the industry. This information can aid in strategising career development and workforce planning, ensuring relevance amidst advancements in the three (3) key trends.

Key Stakeholders Engaged in the Study

Recognising the importance of on-the-ground perspectives, the impact study gathered insights from key stakeholders across the country, including Government, Associations, Industry Players, and Training Providers. The contributions from these four (4) groups enriched and fine-tuned the study's findings.

Stakeholders and their Contributions to the Study

Stakeholder Groups	Government Entities responsible for enforcing industry regulations and ensuring compliance with standard.	Associations Organisations facilitating networking, advocacy, and knowledge exchange among industry players.	Industry Players Companies actively involved in producing and distributing goods or services within the industry.	Training Providers National and state-specific institutions that offer courses to develop skills and knowledge in various fields.
Key Contributions	• Share inputs on industry trends. • Validate high-level impact assessments. • Recommend initiatives.	• Identify selected industry players. • Share inputs on industry trends. • Validate high-level impact assessments. • Recommend initiatives.	• Validate industry trends. • Validate detailed impact assessments. • Identify future roles and skills requirement. • Provide a view of capacity demand and number of highly impacted workforce. • Recommend initiatives.	• Recommend training providers and suitable programmes mapped to skills. • Suggest new training programmes to close existing and future gaps. • Recommend initiatives.

Stakeholders' Selection Criteria

Selecting the right stakeholders ensures the impact study benefits from diverse perspectives and relevant expertise. The four (4) criteria used to identify stakeholders for engagement are:

01

HOLISTIC SECTOR COVERAGE

Comprehensive coverage of industry players across all sub-sectors and the entire value chain

02

STRONG BRAND PRESENCE

Widespread visibility and influence within the sector

03

SIZEABLE EMPLOYMENT COVERAGE

Comprehensive coverage and employee counts across all roles included in the assessment

04

SIGNIFICANT TURNOVER

Ensure a diverse mix of industry players, including large firms with high turnover

The study was conducted from April to September 2024, consulting **34** experts from **23** organisations during a workshop, followed by **14** separate engagements with industry stakeholders.

Key Facts and Figures of Impact Study Stakeholder Engagements

In-Depth Interviews

Regulators : 1

Validation Workshops

Associations : 4

Industry Players : 18

Chapter 3:

Sector Overview

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This chapter delves into the FMS sector, highlighting the impact of global and Malaysian macro trends. AI technologies will drive the adoption of robotics, optimise food processing, packaging, maintenance, and leverage VR and AR. Digital technologies will streamline operations, improve efficiency, enhance customer experiences, and promote sustainability through digitised documentation, e-commerce, and digitalised food ordering. In the Food Services sector, sustainable practices are growing, with plant-based options and energy-efficient appliances. While these advancements widen the skills gap, they also create new opportunities for those who upskill and adapt.

Overview of the Global Trends in the FMS Sector

The global food sector is a vast and dynamic sector encompassing agriculture, food manufacturing, distribution, retail, and services. It involves the production of a wide range of food products from raw ingredients to finished goods encompassing a complex system that involves various players from farmers, manufacturers, and distributors to service providers.

The global food sector has experienced significant expansion in recent years, with the market size growing from USD6.6 trillion (RM28.6 trillion) in 2023 to USD7 trillion (RM30.33 trillion) in 2024 at a CAGR of 6.4%. This robust growth indicates the increasing demand for food and beverages worldwide.[8]

Technological advancements are pivotal in driving market growth. The increasing adoption of smartphones, rapid urbanisation, and the emergence of new payment methods are creating favourable conditions for market expansion. Additionally, evolving consumer preferences are shaping market dynamics, such as the growing popularity of subscription-based food services, mobile grocery shopping, and the convenience of "buy now, pay later" options.

Substantial growth in this sector has been observed over the past few decades, driven by advancements in food manufacturing technology, improved production practices, and rising global demand. According to the Food and Agriculture Organisation (FAO),[9] significant increases have been observed in the production of processed foods, dairy products, meats, and packaged goods.

The food industry is forecasted to reach an impressive USD8.9 trillion (RM38.57 trillion) by 2028, with a CAGR of 5.9%. This significant growth is anticipated to be fuelled by a combination of ongoing technological advancements and shifting consumer behaviours, providing a promising outlook for the market's future.[10]

The production of primary crops was 9.5 billion tonnes in 2021, 54% more than in 2000.

The production of vegetable oils went up to 125% between 2000 and 2020, driven by a sharp increase in palm oil.

357 million tonnes of meat were produced in 2021, 53% more than in 2000.

8. The Business Research Company, Food and Beverages Global Market Report 2024, January 2024
9. Food and Agriculture Organisation (FAO), World Food and Agriculture Statistical Yearbook 2023, 2023
10. The Business Research Company, Food and Beverages Global Market Report 2024, January 2024, <https://www.thebusinessresearchcompany.com/report/food-and-beverages-global-market-repor>

As food security becomes a global priority, the Food Manufacturing sector has emerged as a key focus area. This particular sector is responsible for transforming raw agricultural products into consumable food items that sustain populations, encompassing a wide range of activities such as milling, refining, canning, packaging, and preserving food products. Zero hunger remains one of the most rigorous of the world's Sustainable Development Goals (SDGs), underscoring that access to safe, nutritious, and sufficient food is a basic human right.

The global Food Manufacturing sector plays an essential role in providing a wide range of food products to the global markets, with the changing demand of consumers and advancements in technology to enhance efficiency, safety, and sustainability.

Five (5) key global trends in the Food Manufacturing sector are driving the sector's growth:

01 Adaptation to Supply Chain Disruptions

- Disruptions in the supply chain have compelled food manufacturers to adapt quickly, manage their risks more effectively and explore new distribution channels. Even before the COVID-19 pandemic, food processors faced challenges due to the increasing number of stock-keeping units (SKUs) driven by consumer demands and a variety of flavours and options.
- Managing a large number of SKUs, often with hundreds of ingredients, exposes manufacturers to significant risks. If an ingredient becomes unavailable, substituting it can impact storage, processing, and compliance with traceability requirements.
- To address these challenges, investments in technology, such as AI-powered algorithms, have enabled more flexible and adaptable systems. These technologies assist by rapidly adjusting to supply constraint, tracking locations in real-time, and finding alternative sources for inputs.

02 Technology-Driven Food Manufacturing

- Digital technologies are being adopted to meet industry standards for transparency and safety. This shift is driven by both compliance and retailer demands for digital supply network participation.
- Investing in digital tools to measure raw materials and finished products can enhance performance. For instance, understanding a product's water content through real-time measurement can help optimise its shelf life.
- Capturing operational data helps standardise processes and reduces dependency on individual expertise. Data-driven decision-making benefits business operations. Utilising big data can also advance food science, including cold-chain management and related research and development.

03 Automation, Robotics and Industry 4.0

- Autonomous systems significantly impact food manufacturing by enhancing sensor performance and analysing complex ingredients and products using data acquisition systems, hence enabling automation and predictive data analysis. Other benefits of automation include; enhanced production efficiency, potential 24/7 operations, reduced labour demands, increased uptime and extended machine lifecycles, and improved product quality.
- This, however, poses a big challenge to smaller manufacturers to adopt automation for it requires substantial capital investment and workforce skills in analytics and programming.

04 Changing Dietary Preferences and Empowered Customers

- Informed consumers are demanding healthier choices, transparent processes, and brands that reduce environmental impact. They seek customisation and personalised nutrition solutions tailored to their unique needs and preferences, which has led to the emergence of functional food and personalised nutrition services.
- Demand for plant-based and alternative protein products has also surged with the increased popularity of plant-based diets and concern over sustainability and animal welfare.
- Successful brands enhance transparency in both products and environmental impact to engage consumers, such as by using QR codes to display water usage in production and providing detailed information on product origins and usage tips.

05 Sustainable Use of Resources

- Food manufacturers are utilising advanced technologies to manage resources more efficiently as the food sector is facing stricter regulations on emissions, resource use, and waste.
- Successful companies conduct resource-use audits to identify cost-effective improvements; for example, understanding the amount of aluminium or water used can highlight opportunities for reduction or reuse.

Case Studies

Adaptation to Supply Chain Disruption:
The conflict in Ukraine and sanctions on Russian grain and fertiliser exports have caused significant disruptions to global food supply chains, severely impacting food security. Grain, particularly wheat, plays a critical role, providing nearly one-fifth of the world's dietary calories and protein. This disruption poses a serious threat to global nutrition and energy needs.[11]

The Food Services sector encompasses all businesses, establishments, and services involved in preparing, serving and selling food for on-premise consumption, takeaway, and delivery. It is diverse and includes various types of operations such as food service retailers, counter and table servers, kitchen operations and food service providers. The sector plays a vital role in the economy, providing employment opportunities, supporting local agricultural and food production, and contributing to cultural and social experiences.

Key global trends in Food Services include the following **four (4):**

01 Accelerating Business through Digitalisation

- Post-COVID-19, the drive to optimise operations and ensure profitability has pushed food service businesses to embrace digitalisation. While this trend began before the pandemic, it gained significant momentum as restaurants sought to remain operational.
- Robotics and AI have gained prominence in the Food Services sector, exemplified by manless cafés in the US and Korea. Cooking robots are being utilised to reduce labour costs and streamline operations. These innovations not only attract customers but also enable businesses to thrive through technology and automation.

11. World Economic Forum, *How is the war in Ukraine impacting the global supply chain?*, 5 July 2022 <https://www.weforum.org/agenda/2022/07/ripple-effects-from-russia-ukraine-war-test-global-economies/>

Case Studies

Technology Enhancing Customer Experience:
The total number of restaurants with self-service kiosks globally increased by 43% over the two (2) years leading up to June 2023, nearing 350,000 installations.[12]

02 Ordering Fulfilment: Delivery and Online Ordering

- Consumers increasingly prefer convenient dining options, leading to a surge of online ordering and delivery services, a trend amplified during the pandemic. This growth is expected to continue, with the online food delivery market projected to grow at a CAGR of 16.24% from 2023 to 2028.
- Cloud kitchens have become popular due to their convenience, fast-paced lifestyles, and widespread internet access, making them attractive investments for restaurants. For instance, REEF Technologies is expanding its cloud kitchen network in the Middle East and North America.[13]

03 Consumer Awareness and Dietary Trends

- Consumers are increasingly aware of how food impacts the environment, their bodies, and their health. This has led to a rise in demand for healthier food options and dietary trends since consumers are more informed about product attributes, with superfoods becoming a popular option amongst consumers.
- Products rich in good fats, antioxidants, protein fibre, and vitamins are gaining market share.

04 Demand for Transparency Driving Shifts in Food Services

- Consumer demand for transparency and growing interest in local and natural products are driving operators to change their menus, which would impact the distributors and suppliers. Operators are pressured to use fresh, natural, and local ingredients, to be able to reflect a connection to the source of the food.
- This need for transparency encourages chefs to simplify menus and focus on showcasing their culture and strengths with cleaner labels and less processed foods.

12. Datos Insights, *Global Demand for Self-Ordering Kiosks Continues to Soar*, 10 January 2024 <https://datos-insights.com/press-release/global-demand-for-self-ordering-kiosks-continues-to-soar/>
13. Louis Parks, *REEF and Americana to run cloud kitchens in the MENA region, Edge Middle East*, 7 January 2022, <https://www.edgemiddleeast.com/innovation/cloud/reef-and-americana-to-open-cloud-kitchens>

Overview of the Malaysian Trends in the FMS Sector

A snapshot of Malaysia's FMS sector[14]

GDP contribution

RM78.2 bil

Import/ Export

Import
RM75.6 bil

Export
RM44.6 bil

Number of Employees

Food Manufacturing
235,000

Food Services
868,000

Nature of sector

Supply Chain Complexity: Involves multiple stages, including raw material production, processing, packaging, distribution, and retail. The complexity of supply chains leads to specialisation, with different companies focusing on specific stages, thus contributing to sector fragmentation.

Low Barrier to Entry: For Food Services, the barriers to entry can be relatively low, allowing for a multitude of small businesses to enter the market. This includes small-scale restaurants, food trucks, catering services, and boutique food shops.

The two (2) main sectors within FMS are:

Food Manufacturing	This sector encompasses a range of activities, from processing agricultural products to producing ready-to-eat food. It is regulated to ensure food safety, quality, and compliance with health standards.
Food Services	This sector includes a variety of establishments that prepare and serve food and beverages to customers, such as restaurants, cafes, food stalls, catering services, and fast-food outlets. It emphasises customer experience, culinary innovation, and the maintenance of high standards of food safety and hygiene.

14. Ministry of Investment, *Trade and Industry (MITI), New Industrial Master Plan 2030: Food Processing Industry*, 2023; Department of Statistics Malaysia (DOSM)

Sub-sectors of Food Manufacturing are:

Sub-sectors	Description
Manufacturing of Grain Mill and Starch Products	Milling flour or meal from grains and vegetables, cleaning and polishing rice, and making flour mixes or dough. It also includes wet milling of corn and vegetables and producing starch and related products.
Manufacturing of Dairy Products	Making fresh milk, cream, butter, yoghurt, cheese, whey, casein, lactose, ice cream, and milk-based drinks. It also covers pasteurisation, sterilisation, homogenisation, and ultra-heat treatment processes, as well as the production of dried or concentrated milk.
Manufacturing of Vegetable and Animal Oils and Fats	Producing crude and refined oils from vegetable and animal materials, like olive and soya beans. It includes refining, processing, and manufacturing products like margarine, compound cooking fats, and extracting non-edible animal oils.
Manufacturing of Beverages	Making non-alcoholic drinks and mineral water, fermenting alcoholic beverages like beer and wine, and distilling alcoholic drinks.
Preparation and Preservation of Meat	Operating slaughterhouses to produce fresh, chilled, or frozen meat in various forms, including cuts and portions. It also includes making dried, salted, or smoked meats and products like sausages and pâtés. Additional activities cover processing animal by-products, hides and skins, and rendering animal fats.
Preparation and Preservation of Seafood	Preparing and preserving fish, crustaceans, and molluscs by freezing, drying, smoking, or canning. It also involves making products like fish fillets and caviar, producing fishmeal, and processing seaweed.
Processing and Preservation of Vegetables	Manufacturing food from fruits and vegetables, preserving them by freezing, drying, or canning, and making products like juices, jams, and potato products. It also includes roasting nuts, making nut-based foods, and producing perishable prepared foods like salads and tofu.
Manufacturing of Animal Feed	Making pet food and farm animal feeds, including concentrated and supplemental feeds. It also involves preparing single feeds for farm animals and processing slaughter waste into animal feed.
Manufacturing of Other Food Products	Producing various food items, such as bakery products, confectionery, pasta, prepared meals, coffee, tea, spices, and specialty foods.

Sub-sectors of Food Services are:

Sub-sectors	Description
Restaurants and Mobile Food Services Activities	Providing food services where customers can dine in, take out, or have meals delivered. It also includes preparing and serving food from motorised vehicles or carts. Preparing and serving drinks for immediate consumption on-site.
Beverage Service Activities	Catering for events and operating food concessions at venues like sports facilities.
Event Catering and Other Food Service Activities	This covers catering for events and operating food concessions at venues like sports facilities.

Impacts of AI, Digital, and Green Economy on the FMS Sector

A Challenges and Opportunities

Challenges

Cost of Implementation:
Implementing AI, Digital, and Green Economy initiatives involves significant upfront costs for equipment, software, infrastructure, and training, particularly for SMEs with limited capital and access to funding. Companies may be hesitant to make substantial investments in these technologies, especially when there is no clear evidence of a quick return on investment. Additionally, cybersecurity can be costly, requiring significant investment in both technology and skilled personnel.

Skills Gaps:
Implementing AI, Digital, and Green Economy requires specialised skills and continuous workforce training (theoretical and practical). Thus, overcoming employee resistance and achieving cultural shifts toward these practices can be challenging and time-consuming.

Technological Integration:
Integrating new technologies with legacy systems presents technical and cost challenges, while a lack of standardisation hinders seamless integration. Additionally, reliance on advanced technologies increases the risk of system failures and demands significant maintenance resources and expertise.

Legacy System:
Many food manufacturers use older, established systems that may not be readily compatible with new AI technologies. This creates integration challenges and can require significant system overhauls.

Data Quality, Security, and Storage:
Storing large volumes of data securely and efficiently requires advanced infrastructure and technologies. This also means investing significant money in storage and data security to prevent cyber attacks, which can ultimately compromise data integrity and disrupt manufacturing.

Opportunities

Beyond the challenges, industry players revealed promising opportunities arising from the adoption of AI, Digital, and Green Economy initiatives.

Increased Efficiency and Productivity through Process Optimisation:

Production Scheduling:
AI can optimise production schedules based on demand forecasts, reducing downtime, and maximising output.

Packaging and Sorting using Robotics:
Digital and robotics can handle packaging and sorting tasks with high precision and perform repetitive or hazardous tasks. This allows our workforce to perform more strategic tasks and reduce the risk of injury and downtime.

Supply Chain Management:
AI can enhance supply chain efficiency by predicting demand, optimising inventory levels, and managing logistics more effectively by minimising transportation costs and ensuring on-time delivery.

Energy Efficiency:
Investing in energy-efficient appliances and practices can substantially lower energy consumption and operational costs. With consumers increasingly prioritising environmental sustainability, this initiative not only attracts eco-conscious patrons but also supports the business's commitment to sustainability.

Enhanced Quality Control and Assurance

Automated Inspection:
AI-powered vision systems can inspect products for defects, ensuring consistent quality and higher safety standards by reducing contamination risks.

Predictive Analytics:
Machine learning algorithms can predict potential quality issues by analysing data from production processes, allowing for proactive adjustments.

Customer Experience

Personalisation and Feedback Analysis:
Digital tools can enhance customer experience and interactions by providing personalised services and recommendations through consumer data analysis. This will also enable tailored marketing and product development through analysis of feedback trends.

Sustainable Sourcing:
Sourcing ingredients from local, organic, and sustainable farms can reduce transportation emissions and empower local economies. This practice aligns with increasing consumer preference for a farm-to-table dining experience and the growing demand for waste reduction, reflecting heightened awareness of environmental impacts.

Sustainable Menu Design:
Significant shifts have occurred towards plant-based diets and sustainable eating habits. Consumers are seeking restaurants offering vegan, vegetarian, and sustainably sourced options. Designing menus that emphasise plant-based and sustainably sourced ingredients can reduce environmental impact and cater to health-conscious consumers.

B Impacts of AI, Digital, and Green Economy

AI, Digital, and Green Economy are transforming the Food Manufacturing sector, driving efficiency, innovation, and sustainability while creating a need for a skilled workforce in these areas.

Large companies and key players in the Food Manufacturing sector are actively integrating advanced technologies and sustainable practices by using AI, Digital, and Green initiatives to improve production, quality control, and environmental sustainability. Although SMEs encounter challenges, they are beginning to see the advantages and are adopting these innovations.

AI Impact and Trends

Globally, in the Food Services sector, top chains are pioneering the use of advanced technologies and sustainable practices. They utilise AI, digitalisation, and green initiatives to enhance customer experiences, streamline operations, and minimise environmental impact. Due to this trend, SMEs are increasingly incorporating these innovative practices into their business models.

In Malaysia, both the Food Manufacturing and Food Services sectors are shifting towards incorporating advanced technologies and sustainable practices. Larger companies and leading chains in these sectors are at the forefront of this movement. They are integrating AI, digital solutions, and green technologies to optimise production processes, enhance quality control, improve customer experience, streamline operations, and reduce environmental impact.

Moreover, larger organisations and SMEs in these sectors increasingly recognise the benefits of these innovative practices and are progressively adopting them into their operations. This shift towards advanced technologies and sustainable practices is becoming a common theme across the FMS sector in Malaysia, reflecting a broader trend towards greater efficiency and environmental responsibility.

AI is transforming the FMS sector by automating processes, enhancing quality, and supporting sustainability. It boosts production efficiency, enables continuous operations, and drives innovation in customer personalisation.

The Malaysian Government is facilitating this transformation by introducing the Industry4WRD policy and the Malaysia Digital Economy Blueprint. These initiatives provide incentives, funding, and training programmes to spur AI adoption, cultivate skilled professionals, and encourage sustainable practices. The goal is to maintain competitiveness of the FMS sector and ensure its alignment with international trends.

Digital Impact and Trends

Digitalisation is revolutionising the FMS sector by boosting efficiency, enhancing the supply chain, and elevating customer experiences. Digital tools in Food Manufacturing streamline supply chains, strengthen quality control, and bolster sustainability efforts. In the Food Services sector, AI-driven technologies facilitate personalised interactions, optimise operations, and improve food safety. To support this digital transformation, the Malaysian Government, through the Malaysian Investment Development Authority (MIDA), has introduced initiatives aimed at technology adoption, R&D funding, and fostering public-private partnerships. These efforts are designed to accelerate digital innovation and ensure the sector remains competitive and sustainable.

Green Economy Impact and Trends

The Green Economy drives resource efficiency and sustainable practices in the FMS sector, leading to cost savings and reduced environmental impacts. The sector is adopting renewable energy, eco-friendly materials, and better waste management, including recycling and composting. Food Services are also sourcing sustainably to decrease their carbon footprint.

The Malaysian Government is facilitating this transition by offering financial incentives for green technology through several key initiatives. The National Green Technology Policy supports businesses that adopt green technologies and sustainable practices. The Green Technology Master Plan focuses on integrating green practices, while the Green Investment Tax Allowance (GITA) provides tax benefits for green investments. Additionally, the Green Income Tax Exemption (GITE) encourages a circular economy. These measures collectively enhance environmental responsibility and promote advanced technologies within FMS companies.

While larger chains lead the way in integrating AI, Digital, and Green Economy practices, SMEs are making notable progress. With increasing awareness and support from industry initiatives, SMEs are well-positioned to overcome initial challenges and enhance their adoption of these transformative practices. This collective shift towards innovation and sustainability is driving a more dynamic and eco-friendly food services sector in Malaysia.

> **“Promoting a Green Economy takes time and requires educating the customers as to the reason they are paying a premium and a lot more awareness is needed for this part”**
>
> ***Patrick Sim, Managing Director of Secret Recipe Cakes and Cafe Sdn. Bhd.***

State of Trends Adoption

Artificial Intelligence

AI Adoption in Food Manufacturing

- **Production Optimisation:**
  Larger players leverage AI to analyse data and optimise production processes, resulting in significant reductions in waste and enhanced efficiency. SMEs are starting to explore AI solutions, which can provide substantial long-term benefits even with smaller-scale.

Case Study

Farm Fresh has implemented an AI system to monitor product expiry dates. With an investment of approximately RM14,000, the system has led to a 20% - 30% reduction in customer complaints. This technology improves accuracy in expiry date tracking, boosting overall customer satisfaction and product reliability.

- **Predictive Maintenance**
  AI helps predict equipment failures, minimising downtime, and ensuring consistent production. SMEs can start with affordable AI-based maintenance solutions, reducing operational disruptions and enhancing productivity.

AI Adoption in Food Services

- **Self-Ordering Kiosks:**
  Tablets and kiosks for self-ordering are becoming common among significant chains, reducing wait times, and labour costs. SMEs are increasingly adopting self-ordering solutions to enhance customer convenience and streamline service. For example, Marrybrown self-checkout kiosks have significantly improved operational efficiency by reducing wait times and streamlining transactions. These kiosks allow customers to place and customise orders quickly, minimising human errors and expediting payment. As a result, the overall customer experience is enhanced, and staff can focus more on food preparation and customer service rather than routine transactions.[15]

15. QSR Media Asia, *How this home-grown fast-food brand is tackling the cost of living woes in Malaysia*, <https://qsrmedia.asia/executive-insights/exclusive/how-home-grown-fast-food-brand-tackling-cost-living-woes-in-malaysia>

Digital

Digital Adoption in Food Manufacturing

- **Supply Chain Management System:**
  Enhanced visibility into the supply chain allows larger companies to better coordinate with suppliers and distributors, improving overall efficiency. SMEs are adopting digital supply chain systems to streamline their operations, which can lead to improved coordination and cost savings.

Case Study

Coca-Cola's introduction of the Automated Storage and Retrieval System (ASRS) has led to a substantial boost in supply chain productivity. A dedicated maintenance team was established to manage the system internally, reduce reliance on external vendors and ensure operation efficiency. As a result of this adoption, traditional job roles have been adapted to support the ASRS, rather than being replaced.[16]

- **Data Analytics:**
  Analysing production data helps identify potential quality issues before they occur, a practice increasingly adopted by larger companies. SMEs are beginning to utilise data analytics to gain insights into their operations, leading to improved decision-making and efficiency. For example, the DMO system, developed by Nestlé, enhances manufacturing processes by replacing non-compliant systems and providing a cost-effective alternative to SMEs. It globally collects stoppage data with local customisation, captures daily operations, and sends Purchase Order (PO) data directly to SAP. The system enables engineering teams to raise support tickets, automates data capture to reduce errors and provides real-time insights for decision-making.

Case Study

The Digital Manufacturing Operations (DMO) system, designed by Nestlé, is a powerful tool for streamlining manufacturing processes, ensuring compliance, and reducing costs. Its integration with SAP systems through Manufacturing Integration and Intelligence (MII) allows for efficient data flow without redundant data entry. With features tailored to global and local needs, it supports day-to-day operations, performance monitoring, and quality control, making it an essential component in modern manufacturing management.

16. Karla Paris, *Coca-Cola Finds Efficiency And Energy Savings Through Automation, Food Online*, 22 April 2014, <https://www.foodonline.com/doc/coca-cola-finds-efficiency-and-energy-savings-through-automation-0001>

Digital Adoption in Food Services

- **Virtual Shops and Restaurants:**
  Some chains establish virtual shops that handle only digital orders and prepare food for delivery or takeout without a dine-in option. SMEs are exploring similar models to adapt to changing consumer preferences and reduce overhead costs. For example, KitchenCo, a leading cloud kitchen platform in Malaysia, offers a distinctive business model that benefits both aspiring food entrepreneurs and consumers. The cloud kitchen model provides significant advantages, including lower startup costs for entrepreneurs, enhanced operational efficiency through shared resources, and a broader customer reach. Meanwhile, customers benefit from a diverse range of food options available through a single virtual platform.[17]

- **Virtual Shops and Restaurants:**
  Implementing QR codes and mobile payment solutions for cashless transactions is a growing trend. SMEs are adopting these technologies to enhance payment convenience and speed up service. For example, Tealive Malaysia offers a range of payment options to accommodate customer preferences. In-store, customers can pay using cash, major debit and credit cards, and popular e-wallets such as Touch 'n Go, GrabPay, and Boost. For online and app-based transactions, Tealive accepts credit and debit cards, integrates various e-wallet options, and facilitates the use of Tealive Credits for purchases. This variety ensures a convenient and flexible payment experience for all customers.[18]

Green Economy

Green Economy Adoption in Food Manufacturing

- **Eco-friendly and Sustainable Packaging:**
  Larger companies lead the trend of transitioning from traditional plastic to biodegradable, recycled, or recyclable packaging. SMEs are increasingly moving towards sustainable packaging solutions, enhancing their environmental credentials, and appealing to eco-conscious consumers. Alarmingly, Malaysia contributes 0.7% of the world's plastic pollution and is among the top five (5) global pollutants. Currently, the market does not utilise non-virgin plastics, presenting an opportunity to significantly reduce plastic pollution. By incorporating non-virgin plastics, we could substantially decrease the environmental impact of plastic waste.

- **Sustainable Sourcing:**
  Partnering with certified sustainable farmers and suppliers helps reduce environmental footprints and comply with sustainability requirements. SMEs are building relationships with sustainable suppliers, aligning their operations with ecological standards and market demands. For example, one of Arnott Group's brands, Kimball, utilises locally sourced raw ingredients to create dishes that are finely tuned to local tastes. This approach meets market demands and mitigates the environmental impact associated with importing ingredients from abroad, thus supporting sustainability efforts. Similarly, F&N has established its dairy farm, F&N AgriValley, in Gemas, Negeri Sembilan, with a strong focus on ESG principles. The farm aims to decrease reliance on imported milk, lowering the overall carbon footprint associated with international transportation. Additionally, F&N AgriValley aims to incorporate sustainable farming practices and green technology throughout its operations.

17. KitchenCo - Cloud Kitchen, <https://www.kitchenco.asia/>
18. Tealive, <https://www.tealive.com.my/support>

Case Study

Nestlé's Chembong Factory utilises a fully automated biomass-fired boiler that harnesses oil palm Empty Fruit Bunches (EFB) and palm kernel shells as renewable energy sources for its manufacturing operations. Operational since late 2023, this carbon-neutral system replaces fossil fuels to generate steam for manufacturing, reducing the factory's GHG emissions by 14,000 tonnes of CO2e annually. This initiative aligns with environmental stewardship and responsible economic growth, reinforcing Nestlé's commitment to achieving net zero emissions by 2050.[19]

Farm Fresh stands at the forefront of eco-friendly practices, having effectively repurposed 336.7 million litres of Farm Dairy Effluent (FDE) and 88.3 million kilograms of solid waste. The company's dedication to the environment is further reflected in its packaging choices, with 35.5% of its revenue generated from goods packaged in completely recyclable and sustainably obtained materials. These achievements underscore Farm Fresh's commitment to minimising its ecological footprint and establishing a benchmark for sustainability within the sector.[20]

Green Economy Adoption in Food Services

- **Compostable/Biodegradable Packaging:**
  Many leading chains are replacing traditional plastic packaging with compostable or biodegradable alternatives. SMEs are following suit, gradually adopting sustainable packaging to reduce their environmental footprint and appeal to eco-conscious consumers. For instance, Coffee Bean and Tea Leaf Malaysia, among other brands, has advanced its environmental sustainability efforts by introducing edible rice straws as an alternative to plastic. These biodegradable straws are environmentally friendly, tasteless, and do not alter the flavour of your drink. They become soft and jelly-like when soaked, providing a comfortable drinking experience while supporting eco-friendly practices.

- **Reducing Food Waste:**
  Designing menus to utilise all parts of ingredients and implementing composting programmes for food scraps are practices being adopted by top chains. SMEs are also incorporating these strategies to minimise waste and contribute to a circular economy. As an example, the ZUS project transforms coffee grounds into biofuel, substantially cutting GHG emissions. By upcycling 21 tonnes of coffee waste, this initiative underscores ZUS's commitment to innovative waste management solutions.

19. Nestlé Malaysia, *Accelerates its Sustainability Journey Through a New Biomass Boiler for its Industrial Complex in Chembong*, 3 March 2024, <https://www.nestle.com.my/media/pressreleases/chembong-biomass-boiler>
20. Farm Fresh Malaysia, *Sustainability Report 2023*

Chapter 4:
Key Findings

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- Medium and Low Impacted Roles 67
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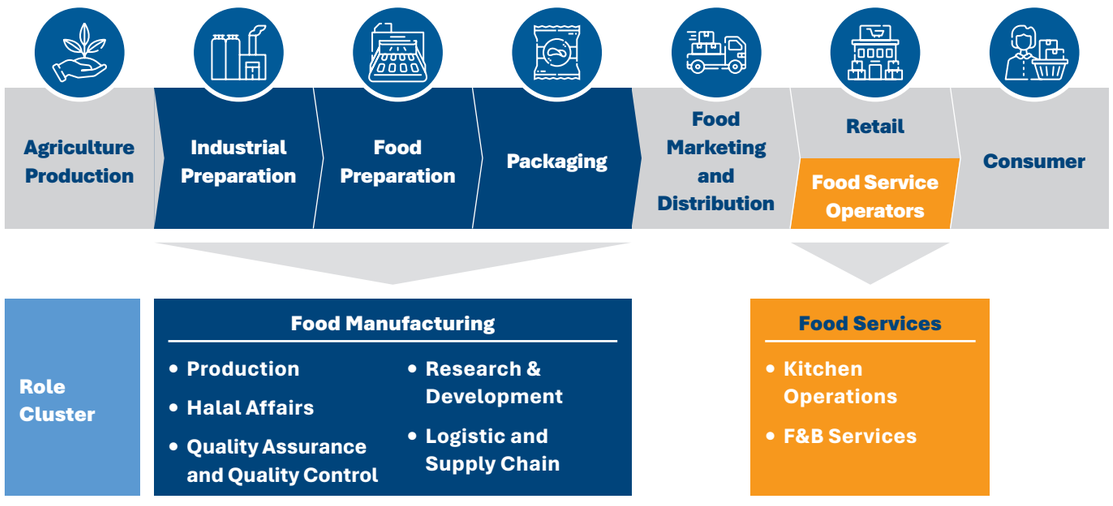
Overview of Roles and Skills

The impact study encompasses an in-depth analysis of all the key roles and components within the FMS value chain.

Value Chain of the FMS Sector[21]



21. Ministry of Investment, *Trade and Industry (MITI), New Industrial Master Plan 2030: Food Processing Industry*, 2023

Consolidated Job Clusters, Roles, and Skills in FMS

7 Job Clusters

Food Manufacturing

- **Production** (8 job roles)
- **Halal Affairs** (2 job roles)
- **Quality Assurance and Quality Control** (6 job roles)
- **Research & Development** (9 job roles)
- **Logistic and Supply Chain** (9 job roles)

Food Services

- **Kitchen Operations** (20 job roles)
- **F&B Services** (17 job roles)

71 Job Roles

22 Skills Clusters

(Categorised into 20 specific skill clusters and and two (2) basic skill clusters)

Specific Skills

- **Agile and Continuous Improvement** (1 skill)
- **Automation and Robotics** (5 skills)
- **Branding, Sales and Marketing** (3 skills)
- **Business Development and Strategy** (3 skills)
- **Business Operation Management** (1 skill)
- **Customer, Vendor, and Stakeholder Management** (6 skills)
- **Data Development and Implementation** (1 skill)
- **Food and Beverages Management** (21 skills)
- **General Business Management** (4 skills)
- **Health, Safety, and Environment (HSE)** (18 skills)
- **Manufacturing and Production** (5 skills)
- **Products and Services** (1 skill)
- **Project and Process Management** (1 skill)
- **Quality Management** (13 skills)
- **Research and Development** (5 skills)
- **Risk Management, Compliance, and Governance** (8 skills)
- **Supply Chain and Logistics Management** (1 skill)
- **Technical Design and Architecture** (1 skill)
- **Technology Management** (2 skills)
- **Warehouse and Inventory Management** (12 skills)

Basic Skills

- **Innovation and Delivery** (9 skills)
- **Social Intelligence** (7 skills)

128 Skills

Which comprises 112 Specific Skills and 16 Basic Skills

Job Clusters and Roles

Given the increasing impact of AI, Digital, and Green Economy in the FMS sector, it is important to understand the effects of these changes on job roles and categories within the sector. Moreover, exploring how job responsibilities are changing and new positions are emerging in response to these developments is essential.

While specific roles may change or be replaced, there will be new opportunities, emphasising the importance of adaptability and ongoing education. Government and industry leaders must prioritise investment in educational and support programmes to navigate this evolving landscape effectively.

The increasing impact of AI, Digital, and Green Economy is bringing about significant changes in Malaysia's FMS sector. Five (5) job clusters, identified in Food Manufacturing sector, and two (2) job clusters identified for the Food Services sector.

There are five (5) job clusters identified for the Food Manufacturing sector:

Job Clusters	Roles	
Production	1. Head of Production 2. Production Manager 3. Production Executive 4. Production Supervisor / Production Planner 5. Production Operator	6. Engineering Manager / Maintenance Manager 7. Process Engineer / Maintenance Engineer 8. Process Technician / Maintenance Technician
Halal Affairs	1. Halal Manager / Head of Halal Affairs	2. Halal Executive / Technician
Quality Assurance and Quality Control	1. Head of Quality Assurance and Quality Control 2. Quality Assurance and Quality Control Manager 3. Quality Assurance and Quality Control Specialist / Laboratory Manager	4. Quality Assurance and Quality Control Supervisor / Executive / Laboratory Supervisor 5. Quality Control Technician / Assistant / Laboratory Technician 6. Food Safety / Food Quality Executive
Research & Development (R&D)	1. Head of R&D / R&D Manager 2. R&D Executive 3. R&D Assistant 4. Product Technologist / Innovation Manager 5. Food Technologist	6. Assistant Food Technologist 7. Food Analyst 8. Laboratory Technician 9. R&D Chef
Logistic and Supply Chain	1. Demand Planner 2. Supply Planner 3. Warehouse / Inventory Manager 4. Warehouse / Inventory Executive 5. Warehouse Storekeeper / Inventory Coordinator	6. Forklift Operator 7. Transportation Manager 8. Transportation Executive 9. Transportation Assistant

In addition, there are two (2) job clusters identified for the Food Services sector:

Job Clusters	Roles	
Kitchen Operations	1. Executive Chef 2. Head Chef 3. Chef de Cuisine 4. Executive Sous Chef 5. Sous Chef 6. Assistant Head Chef 7. Junior Sous Chef 8. Demi Chef 9. Senior Cook / Station Chef / Chef de Partie 10. Commis Chef	11. Chief Steward 12. Assistant Chief Steward 13. Kitchen Steward / Kitchen Assistant 14. Executive Pastry Chef 15. Pastry Chef 16. Assistant Pastry Chef 17. Pastry Cook 18. Head Baker 19. Baker 20. Assistant Pastry Cook / Assistant
F&B Services	1. Operations Director / Operations Manager 2. Multi-Outlet Manager 3. Outlet Manager 4. Assistant Outlet Manager 5. F&B Executive 6. Service Supervisor / Executive 7. Service & Kitchen Supervisor 8. Crew Leader	9. Server / Service Crew 10. Group Beverage Manager 11. Head Barista 12. Barista Supervisor / Senior Barista 13. Barista 14. Head Bartender 15. Bartender Supervisor 16. Bartender 17. Wine Specialist / Demi Sommelier

Skills Clusters and Skills

Skills Category	Skills Clusters	
BASIC SKILLS Essential skills required for a person to be fit for a job	**Innovation and Delivery** • Adaptability and Resiliency • Business Acumen • Change Management • Cognitive Skills • Critical Thinking	• Digital and AI Fluency • Innovative Thinking • Learning Agility • Sustainability Awareness
	Social Intelligence • Coaching and Mentoring • Communication • Conflict Management • Empathy	• Influencing and Negotiation • Planning and Organising • Teamwork and Collaboration

Skills Clusters and Skills (Continue)

Skills Category	Skills Clusters
SPECIFIC SKILLS Skills relating to a specific task or situation. It involves both understanding and proficiency in such specific activity that involves methods, processes, procedures, or techniques	**Agile and Continuous Improvement** • Continuous Improvement
	Automation and Robotics • Automated Manufacturing Maintenance • Automated Operation Monitoring • Automated System Design • Automation Design • Automation Process Control
	Branding, Sales, and Marketing • Brand Management • E-Commerce Campaign Management • Sales Target Management
	Business Development and Strategy • Business Opportunities Development • Business Performance Management • Systems Thinking
	Business Operation Management • Food and Beverage Recipe Formulation
	Customer, Vendor, and Stakeholder Management • Customer Acquisition and Retention Management • Customer Management • Customer Relationship Management • Partnership Management • Stakeholder Management • Vendor Management
	Data Development and Implementation • Big Data Analytics
	General Business Management • Budget Management • Business Networking • Cost Management • Resource Management

Skills Category	Skills Clusters
SPECIFIC SKILLS Skills relating to a specific task or situation. It involves both understanding and proficiency in such specific activity that involves methods, processes, procedures, or techniques	**Food and Beverages Management** • Alcoholic Beverage Preparation • Asian Cuisine Preparation and Cooking • Bread Preparation • Cold Dish and Dessert Preparation • Dry-Heat Dish Preparation and Cooking • Food and Beverage Equipment Maintenance • Food and Beverage Production Management • Food and Beverage Service • Food and Beverage Visual Merchandising Presentation • Food Science Application • Halal Administration • Halal Compliance and Requirements • Halal Related Guidelines • Meat Storage and Fabrication • Moist-Heat Dish Preparation and Cooking • Non-Alcoholic Beverage Preparation • Non-Halal Contamination • Pastry Preparation • Seafood Storage and Fabrication • Specialty Cuisine Preparation and Cooking • Wine Service
	Health, Safety, and Environment (HSE) • Dangerous Goods Management • Eco-Design Principles • Emergency Response • Environment, Health and Safety • Environmental Awareness • Environmental Protection Management • Environmental Remediation • Food Safety and Hygiene • Food Waste Disposal and Reduction • Hazardous Materials Identification • Hazards and Risk Identification and Management • Renewable Energy • Sustainable Business Practices • Sustainable Manufacturing • Sustainable Utilities Management • Warehousing / Cargo-related Occupational Health and Safety Management • Waste Management • Workplace Safety and Health
	Manufacturing and Production • Food Manufacturing Facility Maintenance • Food Manufacturing Process Design • Green Manufacturing Design and Implementation • Production Management • Sustainable Food Production Design

Skills Clusters and Skills (Continue)

Skills Category	Skills Clusters	
SPECIFIC SKILLS Skills relating to a specific task or situation. It involves both understanding and proficiency in such specific activity that involves methods, processes, procedures, or techniques	**Products and Services**	
	• Marketing	
	Project and Process Management	
	• Project Management	
	Quality Management	
	• Cleanliness Testing • Document Control • F&B Audit and Compliance • Food Safety Assessment • Food Safety Practices • Halal Assurance System (HAS) Audit and Compliance	• Laboratory Management • Packaging Testing • Process Validation • Product Testing • Quality Assurance Management • Quality Control Management • Quality System Management
	Research and Development	
	• Active and Smart Packaging • Advanced Processing Technology • Food Product Development	• Product Improvement • Recipe Formulation
	Risk Management, Compliance, and Governance	
	• Business Continuity Management • Business Continuity Planning • Cargo Issuance Compliance • Crisis and Disaster Recovery Management	• Export Market Compliance • Loss and Risk Prevention Management • Regulatory Compliance • Risk Management
	Supply Chain and Logistics Management	
	• Order Fulfilment Administration	
	Technology Management	
	• Emerging Technology Synthesis	• Technology Strategy Design

Skills Category	Skills Clusters	
SPECIFIC SKILLS Skills relating to a specific task or situation. It involves both understanding and proficiency in such specific activity that involves methods, processes, procedures, or techniques	**Technical Design and Architecture**	
	• Embedded Systems Integration	
	Warehouse and Inventory Management	
	• Cross Docking • Inventory Control Management • Inventory Management • Warehouse Administration • Warehouse Automation Application • Warehouse Facility Management • Warehouse Facility Security Control	• Warehouse Layout Design • Warehouse Maintenance and Housekeeping • Warehouse Management System Administration • Warehouse Performance Measurement • Warehouse Space Utilisation

In-Demand Skills

In-demand skills in the FMS sector include:

Skills Category	Skills Clusters	
Top Basic Skills	**Innovation and Delivery**	
	1. Adaptability and Resiliency 2. Change Management 3. Critical Thinking 4. Digital and AI Fluency	5. Innovative Thinking
	Social Intelligence	
	6. Learning Agility 7. Coaching and Mentoring 8. Collaboration 9. Communication	10. Empathy 11. Influencing and Negotiation

Skills Category	Skills Clusters
Top Specific Skills	**Customer, Vendor, and Stakeholder Management**
	1. Stakeholder Management
	Data Develpment and Implementation
	2. Big Data Analytics
	General Business Management
	3. Cost Management
	Health, Safety and Environment
	4. Emergency Response 5. Environmental Awareness 6. Food Safety and Hygiene 7. Food Waste Disposal and Reduction 8. Sustainable Business Practice 9. Sustainable Manufacturing 10. Waste Management
	Quality Management
	11. F&B Audit and Compliance 12. Food Safety Practices 13. Quality Assurance Management
	Risk Management, Compliance, and Governance
	14. Business Continuity Planning 15. Regulatory Compliance
	Technology Management
	16. Emerging Technology Synthesis
	Warehouse and Inventory Management
	17. Inventory Control Management

Role and Skills Analysis by Impact Level

The impact study for the FMS sector identified 77 critical roles: 71 established roles essential for maintaining the sector's standards and operational efficiency, and six (6) emerging roles that are set to drive future advancements and innovations.

Impact Assessment on 71 Existing Roles in the FMS Sector

	High	Medium	Low	Emerging
AI/Digital	• **High opportunity** to **automate** • **Low human intervention**	• **High opportunity** to **automate** • **High human intervention**	• **Low opportunity** to **automate** • **High or Low human intervention**	
Green Economy	• **Job no longer required** due to impact to environment • **May or may not** have **opportunity to diversify**	• **Job still required** despite impact to environment • **Opportunity to diversify exist**	• **Job still required** despite impact to environment • **No opportunity to diversify**	New job positions created due to technological advancements, sector trends, and societal changes help organisations drive innovation, adopt sustainable practices, and stay competitive and compliant with evolving regulations and market demands.
Outcome	**Roles facing convergence or displacement** Need to pivot to adjacent role and reskill	**Roles are evolving** Need to upskill to deliver beyond what would traditionally be expected	**Roles not severely impacted** Need to continue improving to keep self relevant	
	7 Roles	41 Roles	23 Roles	6 Roles
Proportion of Roles	10%	58%	32%	

The findings have identified 34 critical roles within the Food Manufacturing sector. Furthermore, the analysis identified five (5) emerging roles that will drive future advancements and innovations within the sector.

An Overview of the Impact Assessment on 34 Existing Roles across the Food Manufacturing Sector

HIGH

5 Roles

1. Process Technician / Maintenance Technician
2. Production Operator
3. Quality Control Technician / Assistant / Laboratory Technician
4. Laboratory Technician
5. Transportation Assistant

MEDIUM

22 Roles

1. Halal Executive
2. Engineering Manager / Maintenance Manager
3. Process Engineer / Maintenance Engineer
4. Production Executive
5. Production Supervisor / Production Planner
6. Head of Quality Assurance and Quality Control
7. Quality Assurance and Quality Control Manager
8. Food Safety / Food Quality Executive
9. Quality Assurance and Quality Control Specialist / Laboratory Manager
10. Quality Assurance and Quality Control Supervisor / Executive / Laboratory Supervisor

LOW

7 Roles

1. Halal Manager / Head of Halal Affairs
2. Production Manager
3. Head of Production
4. Product Technologist / Innovation Manager
5. Head of R&D / R&D Manager
6. Transportation Manager

11. Assistant Food Technologist
12. Food Technologist
13. Food Analyst
14. R&D Executive
15. R&D Chef
16. R&D Assistant
17. Forklift Operator
18. Warehouse Storekeeper / Inventory Coordinator

EMERGING

5 Roles

1. Food Biotechnologist
2. Bioprocess Engineer
3. Data Scientist
4. Drone Pilot / Driver
5. System Architect

7. Warehouse / Inventory Manager

19. Transportation Executive
20. Warehouse / Inventory Executive
21. Demand Planner
22. Supply Planner

Meanwhile, there are 37 critical roles in the Food Services sector, with one (1) emerging role that will lead the future progress and developments in the FMS sector.

An Overview of the Impact Assessment on 37 Existing Roles across the Food Services Sector

HIGH

2 Roles

1. Crew Leader
2. Server / Service Crew

MEDIUM

19 Roles

1. Barista
2. Barista Supervisor / Senior Barista
3. Bartender
4. Bartender Supervisor
5. Wine Specialist / Demi Sommelier
6. Assistant Outlet Manager
7. Service Supervisor / Executive
8. F&B Executive
9. Service & Kitchen Supervisor
10. Assistant Head Chef
11. Chef De Cuisine
12. Executive Chef
13. Executive Sous Chef
14. Head Chef

LOW

16 Roles

1. Group Beverage Manager
2. Head Barista
3. Head Bartender
4. Multi-Outlet Manager / Area Manager
5. Operations Director / Operations Manager
6. Outlet Manager
7. Commis Chef
8. Demi Chef
9. Senior Cook / Station Chef / Chef De Partie

15. Junior Sous Chef
16. Sous Chef
17. Assistant Chief Steward

EMERGING

1 Role

1. Sustainability Specialist

10. Kitchen Steward / Kitchen Assistant
11. Assistant Pastry Chef
12. Executive Pastry Chef
13. Pastry Chef
14. Assistant Pastry Cook / Assistant Baker / Kitchen Assistant
15. Baker
16. Pastry Cook

18. Chief Steward
19. Head Baker

Highly Impacted Roles and Career Pathways

The study highlights the impact of shifting consumption patterns and automation on highly impacted roles in the FMS sector, emphasising the need for employees to transition into other in-demand roles. With the integration of AI into food manufacturing processes, human intervention is reduced, and employees must quickly grasp AI algorithms to predict demand, manage inventory, and optimise logistics, ultimately reducing waste and ensuring timely food delivery.

In addition to AI, digital literacy is increasingly essential across all workforce levels. Digital technology and big data provide valuable insights that enhance production, improve consumer understanding, and streamline supply chain efficiency, guiding strategic decisions, and optimising operations.

Furthermore, the development and implementation of green technologies, such as renewable energy sources and biodegradable materials, require innovation and technical skills. R&D focused on creating sustainable alternatives to traditional manufacturing processes will be critical for the future job market, underscoring the growing importance of sustainability skills.

Case Studies for Highly Impacted Roles in the Food Manufacturing Sector

Roles	Impact and Case Studies
Process Technician / Maintenance Technician	Technology will augment current ways of working for the Process Technician / Maintenance Technician role in the short-to mid-term time frame. This change will potentially reduce manual tasks, freeing up time for higher-value-added work such as performance management, driving improvements, and increasing the scope of machines and lines. • **Nestlé:** Using AI to predict demand, personalise nutrition, and improve manufacturing processes. They have also partnered with companies like IBM to use AI for product development and with Microsoft for AI-driven digital transformation.[22] • **PepsiCo:** Employs AI and machine learning to optimise manufacturing processes, forecast demand, and manage inventory. They also use AI to analyse consumer data for insights into purchasing behaviours and preferences.[23]

22. Veeral Shah, *Unlocking New Opportunities with Gen AI, Nestle*, June 2024 <https://www.nestleusa.com/stories/unlocking-new-opportunities-gen-ai>
23. Bernad Marr, *The Fascinating Ways PepsiCo Uses Artificial Intelligence And Machine Learning To Deliver Success, Forbes*, 8 April 2019,

Roles	Impact and Case Studies
Production Operator	For the role of Production Operator, the central weighing system technology allows order data to be captured and sent directly to computers. This technology minimises working time, allowing a Production Operator to now focus their free time on weighing products. On the other hand, the Production Operator responsible at the end of the production line can perform basic Quality Control (QC) checks on finished products. In addition, the automatic conveyor system replaces the manual transport of meat across stations, allowing the Production Operator to focus on tasks that are more difficult to automate, such as meat trimming. • Food and Beverage Manufacturers: **Large-scale food producers, such as Nestlé, PepsiCo, and Tyson Foods**, use central weighing systems to ensure accurate ingredient measurements for batch processing and to comply with packaging regulations.[24]
Quality Control Technician / Assistant / Laboratory Technician	The rise of manufacturing analytics requires the job holder to develop basic data analytics skills to generate insights from test results and propose corrective actions to mitigate food safety and quality issues. • **Nestlé:** uses AI vision systems to automate product inspections on the production line. These systems can detect defects such as incorrect packaging, product damage, and labelling errors in real-time. The AI systems ensure consistent quality checks much faster than human inspectors, reducing the chance of defective products reaching consumers.[25]
Laboratory Technician	AI and Digital solutions such as Internet of Things (IoT) sensors and smart cameras could be used to substitute QC inspections at production lines, reducing the reliance on manual effort from the Laboratory Technician to conduct these inspections. • **Danone** has embraced the future with the adoption of digital technologies to enhance the efficiency of its laboratory operations. This includes the use of advanced data analytics to monitor and control quality parameters in real-time.[26]

24. <https://www.forbes.com/sites/bernardmarr/2019/04/05/the-fascinating-ways-pepsico-uses-artificial-intelligence-and-machine-learning-to-deliver-success/>
25. SICK Sensor Intelligence, *Artificial intelligence at Nestlé: Innovative process control with deep learning*, 16 March 2022, <https://www.sick.com/gb/en/sick-sensor-blog/artificial-intelligence-at-nestle-innovative-process-control-with-deep-learning/w/blog-artificial-intelligence-nestle/>
26. Danone, *Danone Collaborates with Microsoft to Accelerate Artificial Intelligence (AI)*, 24 July 2024 <https://www.danone.com/media/press-releases-list/danone-collaborates-with-microsoft-to-accelerate-ai.html>

Roles	Impact and Case Studies
Transportation Assistant	AI optimises the efficiency of Logistic Operations and may reduce the need for human intervention. This advancement will diminish the role of Transportation Assistants. • **PepsiCo:** uses AI to optimise delivery routes and predictive analytics for vehicle maintenance. These systems handle tasks traditionally managed by transportation assistants, such as planning routes and scheduling maintenance.[27]

Case Studies for Highly Impacted Roles in the Food Services Sector

Roles	Impact and Case Studies
Crew Leader	Intelligent Inventory Management and e-procurement systems track and record inventory replenishment at service stations, allowing the Crew Leader to prioritise tasks such as customer interactions and ensuring ingredients are prepped accordingly. • **Fast Food Chains** are using a digital ordering system that provides real-time data on customer preferences and order patterns. Crew Leaders can now leverage data to optimise staffing levels during peak hours and ensure proper ingredient preparation. This digital shift also enables Crew Leaders to transition to roles such as Restaurant Managers and Regional Leaders.[28]
Server / Service Crew	The role is highly impacted as some restaurants use AI chatbots to handle reservations, inquiries, and even initial order-taking, which can streamline operations and reduce the need for a sizable front-of-house staff. • Many restaurants have implemented AI-driven kiosks and tablet devices at tables to enhance ordering. These devices allow customers to browse the menu, place orders, and make payments without a server's assistance. Servers spend less time taking orders and processing payments, allowing them to focus more on customer interaction, upselling, and ensuring overall customer satisfaction.[29] • **A high-end restaurant in Napa Valley** specialising in Californian wines uses an AI-powered sommelier system integrated into the tablet wine list. The wine server can utilise this system to make personalised recommendations based on customers' preferences (grape varietal, region, price point).[30]

27. AIM Research, *How PepsiCo Utilises Generative AI to Drive Innovation and Efficiency*, 21 June 2024 <https://aimresearch.co/generative-ai/how-pepsico-utilizes-generative-ai-to-drive-innovation-and-efficiency>
28. Neil Sahota, *AI In The Fast Lane: Revolutionising Fast Food Through Technology, Forbes*, 5 March 2024 <https://www.forbes.com/sites/neilsahota/2024/03/05/ai-in-the-fast-lane-revolutionizing-fast-food-through-technology/>
29. Medium, *The Rise of Contactless Dining: Self-Order Kiosks and the Post-Pandemic Restaurant Experience*, 9 August 2023, <https://medium.com/@touchsuite/the-rise-of-contactless-dining-self-order-kiosks-and-the-post-pandemic-restaurant-experience-fb41d1a64a50>
30. Neil Sahota, *The AI Sommelier: AI Has Revolutionized the Wine Industry and How Your Industry Benefit, Forbes*, <https://www.forbes.com/sites/neilsahota/2023/12/21/the-ai-sommelier-ai-has-revolutionized-the-wine-industry-and-how-your-industry-benefit/>

Highly Impacted Roles Career Pathways

Roles

PRODUCTION OPERATOR

Key Responsibilities:
Contributes to food production operations by preparing ingredients, food products, and packaging, setting up workstations, and operating equipment within the plant.

Examples of Additional Skills Required and Analysis

AI / DIGITAL SKILLS

1. **Advanced Technology Integration:**
   Mastering AI-driven and automated technologies is necessary for production operators to transition into other roles where they can understand complex technologies and handle modern equipment effectively.
2. **System Thinking:**
   This skill prepares the operators with a holistic understanding of production and other system-related processes, leading to a better understanding of the system and the ability to handle it accordingly.
3. **Data Mining:**
   Proficiency in data mining allows operators to assume more analytical roles within an organisation. It helps them understand how data is used and how to extract actionable insights from production/business data in the best possible way.

GREEN SKILLS

1. **Environmental Awareness:**
   This skill prepares the operators to be aware of environmental regulations and sustainability goals, which is essential for transitioning into roles focusing on sustainability.
2. **Sustainable Business Practices:**
   Integrating sustainability into daily operations is vital to ensuring compliance with environmental regulations. This skill helps operators apply theoretical knowledge to actionable practices.
3. **Environmental Protection Management:**
   Mastery of this skill is not just about compliance but about actively reducing the impact of business operations on the environment. It is an important skill for all levels of the workforce.

Possible Roles for Transition Within the Sector

Production Supervisor / Production Planner

Warehouse Storekeeper / Inventory Coordinator

Possible Roles for Transition into Other Sectors

Plant Operator
Sector:
Energy and Power

Assembly, Test and Packaging Operator
Sector:
Electrical and Electronics

Warehouse Associate / Assistant / Material Handler
Sector:
Medical Devices

Assistant, Retail Virtual Warehouse
Sector:
Wholesale and Retail Trade

Highly Impacted Roles Career Pathways

(Continue)

Roles

PROCESS TECHNICIAN / MAINTENANCE TECHNICIAN

Key Responsibilities:
Sets up, maintains, and troubleshoots high-speed machinery, ensuring safety and compliance within a food production plant.

Examples of Additional Skills Required and Analysis

AI / DIGITAL SKILLS

1. **Automated Equipment and Control Systems Configuration:**
Technicians skilled in automation have an advantage in transitioning into more advanced roles, as this is key to maintaining and optimising automated systems, ensuring minimal downtime and maximum operation/production efficiency.

2. **Automated Process Design:**
This skill is essential for designing efficient, automated workflows to enhance production/operation speed and maintain consistency of product quality, which is essential to advance into engineering roles.

3. **Computer Systems Validation:**
This skill opens opportunities in IT systems and industrial automation whereby the technician will be able to maintain the automated systems and ensure they are correctly implemented and functioning as intended.

GREEN SKILLS

1. **Environmental Awareness:**
This skill prepares the technicians with awareness of environmental regulations and sustainability goals, which is essential for transitioning into roles focusing on sustainable design and processes.

2. **Sustainable Business Practices:**
Integrating sustainability into daily operations at all levels is vital to ensure compliance with environmental regulations. This skill empowers technicians to apply theoretical knowledge into actionable practices, making them key players in the journey towards a greener future.

3. **Eco-Design Principles:**
This skill is not just about design, it is about innovation. It allows technicians to develop processes and/or products that minimise environmental impact. It is about making a difference, one eco-friendly product at a time.

Possible Roles for Transition Within the Sector

Production Executive

Production Supervisor / Production Planner

Warehouse / Inventory Executive

Possible Roles for Transition into Other Sectors

Engineering & Maintenance Technician
Sector:
Pharmaceutical Manufacturing, Medical Devices

Facilities Technician
Sector:
Electrical and Electronics

Operation & Maintenance - Mechanical Technician
Sector:
Energy and Power

Highly Impacted Roles Career Pathways

(Continue)

Roles

QUALITY CONTROL TECHNICIAN / ASSISTANT / LABORATORY TECHNICIAN

Key Responsibilities:
Supports process and product quality testing activities by preparing equipment and materials, and assisting in the execution of tests.

Examples of Additional Skills Required and Analysis

AI / DIGITAL SKILLS

1. **Advanced Processing Technology:**
Mastering AI-driven and automated technologies allow Laboratory Technicians to transition into R&D-related roles, where they can develop and refine production technologies.

2. **Big Data Analytics:**
Proficiency in big data analytics can help Laboratory Technicians to transition into analytical roles where they use data in monitoring and analysis of quality metrics, improving defect detection and preventing quality issues.

GREEN SKILLS

1. **Environmental Awareness:**
This skill prepares the Laboratory Technician with awareness of environmental regulations and sustainability goals, which is essential for identifying and mitigating environmental risks in the production process.

2. **Sustainable Business Practices:**
Integrating sustainability into daily operations at all levels is vital to ensure compliance with environmental regulations.
This skill helps the Laboratory Technician to apply theoretical knowledge to actionable practices.

3. **Green Manufacturing Design and Implementation:**
Understanding these skills enables alignment of quality control with sustainability goals, ensuring that products meet both quality and environmental standards.

Possible Roles for Transition Within the Sector

- Food Safety / Food Quality Executive
- Food Analyst
- Assistant Food Technologist
- R&D Assistant

Possible Roles for Transition into Other Sectors

- **Quality Control Assistant Laboratory Analyst**
  Sector:
  Pharmaceutical Manufacturing
- **Quality Assurance Assistant**
  Sector:
  Pharmaceutical Manufacturing

Highly Impacted Roles Career Pathways

(Continue)

Roles

LABORATORY TECHNICIAN

Key Responsibilities:
Tests products and samples, manages handling, records results, and prepares materials to ensure safety and quality.

Examples of Additional Skills Required and Analysis

AI / DIGITAL SKILLS

1. **Data Development and Implementation:**
   Proficiency in this skill is critical for managing and analysing data to drive innovation and product development, especially to transition into more advanced sectors such as Pharmaceutical Manufacturing and Chemical.

2. **Digital and AI Fluency:**
   Familiarity with AI and digital tools enables R&D Laboratory Technicians to move into roles in Digital R&D, where they can apply these technologies to research initiatives, accelerating discovery, and improving outcomes.

3. **AI Application:**
   This skill extends beyond merely acquiring new technology; it accelerates innovation. It creates opportunities in AI-related research and innovation management, where AI is utilised to enhance research processes and improve R&D outcomes, contributing to the advancement of future innovations.

GREEN SKILLS

1. **Health, Safety, and Environment (HSE) Procedures Implementation:**
   HSE implementation skills allow R&D Laboratory Technicians to ensure that their research activities are safe and comply with safety and environmental regulations.

2. **Green Manufacturing Design and Implementation:**
   This skill is vital for roles in sustainable product development where the Laboratory Technicians can design and implement eco-friendly manufacturing processes and products, supporting sustainability goals in R&D.

Possible Roles for Transition Within the Sector

Quality Assurance and Quality Control Supervisor / Executive / Laboratory Supervisor

Food Safety / Food Quality Executive

Food Analyst

Assistant Food Technologist

R&D Assistant

R&D Executive

Possible Roles for Transition into Other Sectors

Quality Control Assistant Laboratory Analyst
Sector:
Pharmaceutical Manufacturing

Laboratory Supervisor
Sector:
Chemical

Calibration Technician/Lab Technician
Sector:
Aerospace

Highly Impacted Roles Career Pathways

(Continue)

Roles

TRANSPORTATION ASSISTANT

Key Responsibilities:
Responsible for the safe, efficient, and timely operation of heavy vehicles for loading, moving, and unloading goods, while supporting general transportation operations.

Examples of Additional Skills Required and Analysis

AI / DIGITAL SKILLS

1. **Data Mining and Big Data Analytics:**
Proficiency in analysing transportation data allows a Transportation Assistant to transition into more strategic roles in logistics and supply chain where data-driven and decision-making is vital in improving efficiency and reducing costs.

2. **Advanced Technology Integration:**
Mastering AI-driven and automated technologies allows the Transportation Assistant to streamline logistics operations, improving the efficiency of tasks such as route planning, inventory management, and real-time shipment tracking.

GREEN SKILLS

1. **Sustainable Transportation Management:**
Knowledge in this area is essential to prepare the assistance for roles in sustainable logistics in reducing the environmental impact of transportation activities.

2. **Sustainable Business Practices:**
Integrating sustainability into daily operations at all levels is vital to ensure compliance with environmental regulations. This skill helps the Transportation Assistant to apply theoretical knowledge to actionable practices.

3. **Environmental Protection Management:**
This skill is essential for addressing and mitigating environmental damage caused by transportation activities, thus ensuring compliance with environmental regulations.

Possible Roles for Transition Within the Sector

Warehouse Storekeeper / Inventory Coordinator

Forklift Operator

Possible Roles for Transition into Other Sectors

Assistant, Retail Virtual Warehouse
Sector:
Wholesale and Retail Trade

Warehouse Associate / Assistant / Material Handler
Sector:
Medical Devices

Coordinator, Logistics & Transport
Sector:
Wholesale and Retail Trade

Highly Impacted Roles Career Pathways

(Continue)

Roles

CREW LEADER

Key Responsibilities:
Oversees floor staff and reservations, manages operations, drives improvements, delivers exceptional service, and ensures adherence to standards.

Examples of Additional Skills Required and Analysis

AI / DIGITAL SKILLS

1. **Advanced Technology Integration:**
   Mastery of new technologies assists Crew Leaders in transitioning to roles such as Operations Managers or Technology Integration Specialists, enabling them to lead teams in adopting new technologies and ensuring smooth transitions and operational efficiency.

2. **Digital Marketing & Media Platform Management:**
   These skills are important for roles in Marketing Management or Digital Strategy in managing business' digital presence and marketing efforts, driving customer engagement and sales.

GREEN SKILLS

1. **Consumer Sustainability Education:**
   Basic knowledge about sustainability is vital so that the individual will be able to share and educate customers on sustainability, enhancing brand reputation and customers' confidence in the brand.

2. **Sustainable Business Practices:**
   Integrating sustainability into daily operations at all levels is vital to ensure compliance with environmental regulations.
   This skill helps the individual to apply theoretical knowledge to actionable practices and lead the adoption of sustainable practices within the team, ensuring alignment with environmental goals and regulatory requirements.

Possible Roles for Transition Within the Sector

Chief Steward

F&B Executive

Service & Kitchen Supervisor

Service Supervisor / Executive

Possible Roles for Transition into Other Sectors

Customer Service Trainer
Sector:
Global Business Services

CRM (Customer Relationship Management) Specialist
Sector:
Global Business Services

Associate/ Assistant, Marketing
Sector:
Wholesale and Retail Trade

Highly Impacted Roles Career Pathways

(Continue)

Roles

SERVER / SERVICE CREW

Key Responsibilities:
Executes and ensures excellent service in managing table setup and order accuracy using Point of Sale (POS) systems, as well as adhering to hygiene standards at all time.

Examples of Additional Skills Required and Analysis

AI / DIGITAL SKILLS

1. **Data Mining:**
   Proficiency in data analysis helps Servers move into roles like Data Analysts or Customer Insight Specialists, where they analyse customer's data to improve service offerings and provide personalised recommendations.

2. **Data Modelling and Design:**
   Skills in web modelling and design are vital in transitioning to roles that require creating and managing digital platforms, especially in marketing to enhance online presence and customer engagement.

3. **Emerging Technology Synthesis:**
   Understanding new technologies is not just a skill, it is a necessity for Servers. It prepares them for roles in technology integration or innovation management, ensuring they are always ready to adapt and stay competitive in a rapidly changing service industry.

GREEN SKILLS

1. **Sustainable Facilities Management:**
   With knowledge of sustainable facilities management, Servers can contribute to reducing energy and water consumption, minimising waste, and adopting effective recycling practices within operations. This will help individuals transition to facility management and operational roles in other sectors.

2. **Sustainable Business Practices:**
   Integrating sustainability into daily operations at all levels is vital to ensure compliance with environmental regulations. This skill helps the individual apply theoretical knowledge to actionable practices.

3. **Environmental Awareness:**
   This skill prepares Servers to be conscious of environmental regulations and sustainable goals, which enables them to practise it at the workplace and educate.

Possible Roles for Transition Within the Sector

- **Service & Kitchen Supervisor**
- **Service Supervisor / Executive**
- **Barista**
- **Kitchen Steward / Kitchen Assistant**

Possible Roles for Transition into Other Sectors

- **Representative, Customer Experience**
  Sector:
  Wholesale and Retail Trade
- **Retail Coordinator, Online Store**
  Sector:
  Wholesale and Retail Trade
- **Assistant, Retail Digital Marketing**
  Sector:
  Wholesale and Retail Trade
- **Assistant, Retail E-Business**
  Sector:
  Wholesale and Retail Trade
- **Assistant, Retail Virtual Warehouse**
  Sector:
  Wholesale and Retail Trade
- **Sales Assistant, Operations**
  Sector:
  Wholesale and Retail Trade

Projected Number of Highly Impacted Employees

According to the TalentCorp Demand Model Projection, approximately 11% (200,000) of employees will be at risk in the next three (3) to five (5) years due to highly impacted roles.[31]

Summary of Highly Impacted Roles

Food Manufacturing	**Production** • Production Operator • Process Technician / Maintenance Technician	**Quality Control and Quality Assurance** • Quality Control Technician / Assistant / Laboratory Technician
	Research & Development • Laboratory Technician	**Logistic and Supply Chain** • Transportation Assistant
Food Services	**F&B Services** • Crew Leader • Server / Service Crew	

Findings

Based on the TalentCorp Demand Model Projection, the workforce in the FMS core business is expected to be approximately **730,000 by 2029**. According to assessments by industry experts, around 11% of these employees, approximately **200,000, may face job risks within the next three (3) to five (5) years** as a result of roles being significantly affected.[32]

It is important to note that industry players are cognisant of AI, Digital, and Green strategies to achieve sustainable growth and maintain competitiveness. This understanding drives businesses to invest in comprehensive operational shifts, from the production line, warehousing, and kitchen operations to customer-facing functions like food and beverage services.

- With the rise of digitalisation in the production line and quality controls, more of the routine tasks can now be automated; industry players indicate roles such as **Production Operator, Laboratory Technician, and Quality Control Technician** will be highly impacted, potentially requiring reskilling.
- Industry players are also increasingly digitalising food services operations, which includes self-service kiosks, online ordering, and contactless/QR payment methods to enhance efficiency, causing job reductions that are impacting roles such as **Crew Leader and Server/Service Crew**

Consequently, this is leading to a reduction in headcount across all roles identified as highly impacted. These roles could experience a projected workforce impact of up to 20% in the organisation. As a result, they may be redefined to focus on more value-added services. Employers with roles highly impacted by Digital will need to proactively plan for talent reskilling and pivoting strategies within or across sectors. This is an important step to mitigate job risks and ensure the workforce remains competitive.

31. Impact Study Industry Survey
32. Department of Statistics Malaysia (DOSM); TalentCorp Demand Model Projection

Medium and Low Impacted Roles

Adoption of AI, Digital, and Green Economy catalyse the improvement of content production and delivery, cut across the FMS sector.

- **AI** - Integration of AI into the FMS sector enhances efficiency by optimising processes, automating quality control, predicting maintenance, and personalised food service experience.
- **Digital** - Digital enhances supply chain visibility, ensures data traceability, predicts quality issues, and facilitates online and mobile ordering.
- **Green Economy** - Green economy focuses on reducing carbon footprints through energy efficiency, waste reduction, eco-friendly packaging, sustainable sourcing, compostable materials, locally sourced ingredients, and minimising food waste via composting and smart menu design.

Medium Impacted Roles Analysis

Medium impacted roles mainly centre around using technology to improve content production and delivery. Skills to better understand customer preferences are important as the business moves towards a customer-centric model.

ARTIFICIAL INTELLIGENCE	**AI is being integrated into various stages of the food manufacturing and service process. Hence, employees need to understand AI-driven systems to predict demand more accurately, manage inventory, and lead strategic initiatives for the timely delivery of food products. This role will still require human intervention to a certain extent.**
DIGITAL	**The FMS sector is increasingly integrating digital technologies to enhance customer experience, streamline operations, and stay competitive. The use of basic data analytics skills to generate insights from test results and propose corrective actions are frequently used to mitigate issues in food safety and quality. This role will still require human intervention to a certain extent.**
GREEN ECONOMY	**Developing and implementing green technologies, such as renewable energy sources and biodegradable materials, demands innovation and technical skills moderately. This includes R&D capabilities focused on creating sustainable alternatives to traditional manufacturing processes.**

Food Manufacturing Sector

Job Clusters	Medium Impacted Roles	Skills
Halal Affairs	• Halal Executive / Technician	**Specific Skills** • Food Safety Assessment • Green Manufacturing Design and Implementation • Emerging Technology Synthesis • Automated System Design • Sustainable Food Production Design **Basic Skills** • Adaptability and Resiliency • Coaching and Mentoring • Learning Agility • Sustainability Awareness

Examples – Illustration of Roles

AI can enhance Halal compliance by integrating with IoT devices to monitor production lines and prevent cross-contamination and streamlining certification processes by automating documentation and reminders. Additionally, AI-driven chatbots provide 24/7 consumer support on Halal product queries, building trust.

Production	• Engineering Manager / Maintenance Manager • Process Engineer / Maintenance Engineer	**Specific Skills** • Technology Strategy Design • Automation Process Control • Automated System Design • Sustainable Food Production Design • Food Waste Disposal and Reduction • Automated Manufacturing Maintenance **Basic Skills** • Adaptability and Resiliency • Cognitive Skills • Critical Thinking

Examples – Illustration of Roles

AI machine learning models can detect defects in real-time, ensuring high-quality food products. Furthermore, AI can provide data-driven insights to help engineer and managers make more informed decisions regarding production processes and resource allocation.

Job Clusters	Medium Impacted Roles	Skills
Production	• Production Executive • Production Supervisor / Production Planner	**Specific Skills** • Automated System Design • Advanced Processing Technology • Green Manufacturing Design and Implementation • Food Waste Disposal and Reduction • Big Data Analytics **Basic Skills** • Digital and AI Fluency • Planning and Organising • Communication

Examples – Illustration of Roles

Platforms like SAP, Oracle, and Microsoft Dynamics integrate various business processes and provide real-time data for informed decision-making. Also, tools like Tableau, Power BI, can help analyse production data and identify trends and inefficiencies.

Quality Assurance and Quality Control	• Head of Quality Assurance and Quality Control • Quality Assurance and Quality Control Manager	**Specific Skills** • Quality System Management • Big Data Analytics • Automation Process Control • Green Manufacturing Design and Implementation • Food Safety Assessment **Basic Skills** • Coaching and Mentoring • Change Management • Digital and AI Fluency

Examples – Illustration of Roles

AI and digital quality management systems ensure consistent product quality and compliance with standards, using real-time data to detect and correct deviations.

Food Manufacturing Sector (Continue)

Job Clusters	Medium Impacted Roles	Skills
Quality Assurance and Quality Control	• Food Safety / Food Quality Executive • Quality Assurance and Quality Control Specialist / Laboratory Manager • Quality Assurance and Quality Control Supervisor / Executive / Laboratory Supervisor	**Specific Skills** • Quality Assurance Management • Big Data Analytics • Automation Process Control • Advance Processing Technology • Food Safety Assessment • Sustainable Food Production Design • Laboratory Management **Basic Skills** • Learning Agility • Business Acumen • Digital and AI Fluency

Examples – Illustration of Roles

Machine learning models would analyse historical production data to predict potential quality issues and suggest preventive measures. Furthermore, Digital Quality Management System (QMS) automatically generate audit reports and ensure compliance with regulatory standards, making it easier to manage certifications and inspections.

Research & Development	• Assistant Food Technologist • Food Technologist	**Specific Skills** • Food Product Development • Recipe Formulation • Advance Processing Technology • Food Safety Assessment • Sustainable Food Production Design **Basic Skills** • Adaptability and Resiliency • Communication • Teamwork and Collaboration

Examples – Illustration of Roles

Digital tool such as NutraCoster ensures that the final products, packaging and processes and nutritional data meet the required technical, quality and regulatory standards.

Job Clusters	Medium Impacted Roles	Skills
Research & Development	• Food Analyst • R&D Executive • R&D Chef • R&D Assistant	**Specific Skills** • Food Safety Assessment • Food Product Development • Product Testing • Automation Process Control • Emerging Technology Synthesis **Basic Skills** • Learning Agility • Innovative Thinking • Digital and AI Fluency

Examples – Illustration of Roles

Digital Platforms such as LabWare LIMS and STARLIMS manage laboratory data and workflows, ensuring accurate and efficient data handling.

Logistic and Supply Chain	• Forklift Operator • Warehouse Storekeeper / Inventory Coordinator	**Specific Skills** • Warehouse Automation Application • Inventory Management • Warehouse Performance Measurement • Warehouse Facility Management **Basic Skills** • Adaptability and Resiliency • Cognitive Skills • Communication

Examples – Illustration of Roles

AI and digitalisation tools such as Warehouse Management System (WMS) and Automated Guided Vehicles (AGVs) is integrated ensuring accurate tracking and handling of materials and products.

Food Manufacturing Sector (Continue)

Job Clusters	Medium Impacted Roles	Skills
Logistic and Supply Chain	• Transportation Executive • Warehouse / Inventory Executive	**Specific Skills** • Warehouse Management System Administration • Automation Process Control • Sustainable Logistics Design **Basic Skills** • Adaptability and Resiliency • Cognitive Skills • Teamwork and Collaboration

Examples – Illustration of Roles

Platforms such as Oracle Transportation Management and SAP Transportation Management would assist these roles to optimise route planning, carrier selection, and shipment execution.

	• Demand Planner • Supply Planner	**Specific Skills** • Warehouse Layout Design • Advance Forecasting Techniques • Inventory Management • Supply Chain Optimisation **Basic Skills** • Change Management • Communication • Planning and Organising

Examples – Illustration of Roles

SAP Integrated Business Planning would provide predictive analytics and real-time data integration to enhance forecast accuracy.

Food Services Sector

Job Clusters	Medium Impacted Roles	Skills
F&B Services	• Barista Supervisor / Senior Barista • Barista • Bartender Supervisor • Bartender • Wine Specialist / Demi-Sommelier	**Specific Skills** • Food and Beverage Equipment Maintenance • Food and Beverage Production Management • Food and Beverage Service **Basic Skills** • Communication • Learning Agility • Teamwork and Collaboration

Examples – Illustration of Roles

Digital platforms such as digital menus to aid these roles by presenting updated menus, specials, and promotions, and can be easily changed based on time of day or inventory levels.

	• Assistant Outlet Manager • Service Supervisor / Executive	**Specific Skills** • Customer Relationship Management • Food and Beverage Equipment Maintenance • Regulatory Compliance • E-Commerce Campaign Management **Basic Skills** • Coaching and Mentoring • Innovative Thinking • Digital and AI Fluency

Examples – Illustration of Roles

Integrated POS Systems to aid these roles by handling transactions, track sales data, manage inventory, and generate detailed reports, providing comprehensive insights into outlet performance.

Food Services Sector (Continue)

Job Clusters	Medium Impacted Roles	Skills
F&B Services	• F&B Executive • Service & Kitchen Supervisor	**Specific Skills** • Food and Beverage Production Management • Sustainable Business Practices • Food Science Application **Basic Skills** • Adaptability and Resiliency • Communication • Digital and AI Fluency
Kitchen Operations	• Head Chef • Assistant Head Chef • Chef De Cuisine • Executive Chef	**Specific Skills** • Eco-Design Principles • Hazardous Material Identification • Sustainable Business Practices **Basic Skills** • Planning and Organising • Innovative Thinking • Digital and AI Fluency

Examples – Illustration of Roles

Digital Recipe Management platform to help the impacted roles to store, organise, and standardise recipes, ensuring consistency across all production batches.

Digital Recipe Management systems that store, organise, and standardise recipes, ensuring consistency and ease of access for kitchen staff.

Food Services Sector (Continue)

Job Clusters	Medium Impacted Roles	Skills
Kitchen Operations	• Executive Sous Chef • Sous Chef • Junior Sous Chef	**Specific Skills** • Eco-Design Principles • Hazardous Material Identification • Sustainable Business Practices **Basic Skills** • Teamwork and Collaboration • Communication • Innovative Thinking
	• Chief Steward • Assistant Chief Steward	**Specific Skills** • Waste Management and Reduction • Food Safety and Hygiene • Sustainable Business Practices **Basic Skills** • Learning Agility • Coaching and Mentoring • Planning and Organising

Examples – Illustration of Roles

Integrated Kitchen Management Software can integrate all aspects of kitchen operations, from order processing and inventory management to scheduling and reporting.

Digital dashboards can provide real-time monitoring of cleaning activities and send alerts for any deviations from the schedule or standards, allowing for immediate corrective actions.

Food Services Sector (Continue)

Job Clusters	Medium Impacted Roles	Skills
Kitchen Operations	• Head Baker	**Specific Skills** • Food Science Application • Waste Management and Reduction • Regulatory Compliance **Basic Skills** • Business Acumen • Influencing and Negotiation • Conflict Management

Examples – Illustration of Roles

AI models use historical data to predict potential quality issues based on ingredient variations, process changes, or environmental conditions, allowing for proactive adjustments.

Low Impacted Roles

Low impacted roles require high levels of creativity, judgement, and interaction and are least impacted by the trends. However, skills to leverage technology and drive a sustainability agenda will become more prominent in the future.

ARTIFICIAL INTELLIGENCE	**AI outshines in automating tasks, analysing data, and providing insights through machine learning in the FMS sector. However, its impact is limited to roles requiring complex decision-making, strategic planning, creativity, and deep business understanding.**
DIGITAL	**Digital tools improve specific operational tasks in the FMS sector. However, roles requiring human judgement and strategic thinking heavily rely on human expertise to drive innovation and achieve holistic business objectives.**
GREEN ECONOMY	**These roles indirectly support environmental sustainability by optimising the resources of the sector. However, the direct impact is minimal as these roles are still required to implement and challenge sustainability practices in the organisation.**

Food Manufacturing Sector

Job Clusters	Low Impacted Roles	Skills
Halal Affairs	• Halal Manager / Head of Halal Affairs	**Specific Skills** • Food Safety Assessment • Halal Certification Management • Emerging Technology Synthesis • Green Manufacturing Design and Implementation • Automation Process Control **Basic Skills** • Critical Thinking • Coaching and Mentoring • Business Acumen

Examples – Illustration of Roles

Laboratory Information Management Systems (LIMS) platforms such as LabWare or STARLIMS can assist these roles to manage laboratory samples, track experiments, and store data securely. This ensures accurate and accessible records for research and development activities.

Production	• Production Manager	**Specific Skills** • Automation Process Control • Advanced Processing Technology • Green Manufacturing Design and Implementation • Big Data Analytics • Sustainable Production Design **Basic Skills** • Critical Thinking • Coaching and Mentoring • Business Acumen

Examples – Illustration of Roles

AI can be used to analyse the production process to identify waste reduction opportunities, such as optimising material usage and recycling and ensuring a waste management programme is in place, to minimise environmental footprint.

Food Manufacturing Sector (Continue)

Job Clusters	Low Impacted Roles	Skills
Production	• Head of Production	**Specific Skills** • Automation Process Control • Advanced Processing Technology • Green Manufacturing Design and Implementation • Big Data Analytics • Emerging Technology Synthesis **Basic Skills** • Critical Thinking • Influencing and Negotiation • Change Management

Examples – Illustration of Roles

Basic digital tools such as GPS tracking and digital dispatch system enhances the existing processes but does not fundamentally change the role.

Research & Development	• Head of R&D / R&D Manager	**Specific Skills** • Emerging Technology Synthesis • Advanced Processing Technology • Sustainable Product Development • Big Data Analytics • Innovation Management **Basic Skills** • Cognitive Skills • Sustainability Awareness • Coaching and Mentoring

Examples – Illustration of Roles

Laboratory Information Management Systems (LIMS) platforms such as LabWare or STARLIMS can assist these roles to manage laboratory samples, track experiments, and store data securely. This ensures accurate and accessible records for research and development activities.

Food Manufacturing Sector (Continue)

Job Clusters	Low Impacted Roles	Skills
Logistic and Supply Chain	• Transportation Manager • Warehouse Inventory Manager	**Specific Skills** • Green Logistics Design • Automation Process Control • Supply Chain Optimisation **Basic Skills** • Adaptability and Resiliency • Teamwork and Collaboration • Planning and Organising

Examples – Illustration of Roles

Basic digital tools such as GPS tracking and digital dispatch system enhances the existing processes but does not fundamentally change the role.

Research & Development	• Product Technologist / Innovation Manager	**Specific Skills** • Emerging Technology Synthesis • Product Innovation and Development • Advanced Processing Technology • Sustainable Product Design **Basic Skills** • Business Acumen • Innovative Thinking • Digital and AI Fluency

Examples – Illustration of Roles

The digital tools used by Product Technologists might already be integrated into their workflow (e.g., digital scales, lab equipment, data logging software), providing enhancements rather than a complete overhaul of their tasks.

Food Services Sector

Job Clusters	Low Impacted Roles	Skills
Kitchen Operations	• Group Beverage Manager • Head Barista • Head Bartender • Multi-Outlet Manager / Area Manager • Operations Director / Operations Manager • Outlet Manager	**Specific Skills** • Food and Beverage Equipment Maintenance • Customer Relationship Management • Environmental Protection Management • E-Commerce Campaign Management • Eco-Design Principle **Basic Skills** • Innovative Thinking • Coaching and Mentoring • Planning and Organising

Examples – Illustration of Roles

These roles may use data analytics to track monthly sales performance, identifying top-selling items and underperforming products.

	• Commis Chef • Demi Chef • Senior Cook / Station Chef / Chef De Partie	**Specific Skills** • Food Science Application • Operational Efficiency through Digital Tools • Waste Management and Reduction **Basic Skills** • Adaptability and Resiliency • Communication • Teamwork and Collaboration

Examples – Illustration of Roles

The work for these roles are not highly repetitive, making it less suitable for AI automation. The tasks vary daily and involve responding to real-time kitchen dynamics.

Food Services Sector (Continue)

Job Clusters	Low Impacted Roles	Skills
Kitchen Operations	• Kitchen Steward / Kitchen Assistant	**Specific Skills** • Food Science Application • Operational Efficiency through Digital Tools • Waste Management and Reduction **Basic Skills** • Adaptability and Resiliency • Sustainability Awareness • Innovative Thinking

Examples – Illustration of Roles

Digital tools like inventory management systems and scheduling software can assist kitchen stewards, but they do not fundamentally change the nature of the work, which remains manual and physical.

	• Assistant Pastry Chef • Executive Pastry Chef • Pastry Chef	**Specific Skills** • Food Science Application • Operational Efficiency through Digital Tools • Waste Management and Reduction **Basic Skills** • Learning Agility • Innovative Thinking • Sustainability Awareness

Examples – Illustration of Roles

Using AI tools to create and optimise recipes by analysing large datasets of ingredients, techniques, and customer preferences. For instance, AI can suggest alternative ingredients to improve taste, texture, or nutritional value.

Food Services Sector (Continue)

Job Clusters	Low Impacted Roles	Skills
Kitchen Operations	• Assistant Pastry Cook / Assistant Baker / Kitchen Assistant • Baker • Pastry Cook	**Specific Skills** • Food Science Application • Operational Efficiency through Digital Tools • Waste Management and Reduction **Basic Skills** • Learning Agility • Innovative Thinking • Sustainability Awareness

Examples – Illustration of Roles

Many pastry kitchens or kitchen assistants may have started using basic digital tools such as digital thermometers, but these do not transform the core tasks significantly.

Projected Numbers of Medium and Low Impacted Employees

Approximately 89% (520,000)[33] of medium and low impacted employees require upskilling related to AI, Digital, and Green Economy.[34]

- Based on the assessment and industry feedback, 128 basic and specific skills were identified for the FMS sector, 10% of which are AI/Digital skills and 10% are Green Economy skills.
- Upskilling is essential for 57% of roles classified as medium impacted roles to progress and perform beyond traditional expectations.
- While upskilling is not mandatory for the 32% of roles designated as low impacted roles, continuous self-improvement is advised to maintain relevance and make informed decisions by keeping pace with emerging trends.

33. Department of Statistics Malaysia; TalentCorp Demand Model Projection
34. Impact Study Industry Survey

In-Demand Skills for AI, Digital, and Green Economy | **Training Programmes Available**

AI/ Digital Skills

AI/Digital skills that are essential for roles to adopt for business operations enhancements and overall workforce productivity improvements

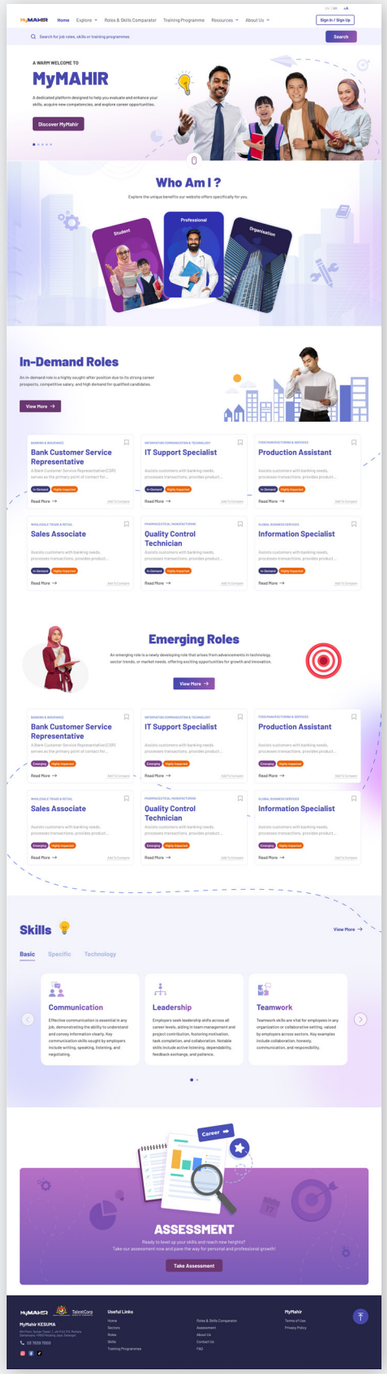
- Advanced Technology Integration
- Big Data Analytics
- Data Mining
- Digital Business Model Innovation
- Data Modelling and Design
- Customer Profiling

Green Skills

Green skills that are needed for roles to integrate sustainability efforts and initiatives into business operations

- Sustainable Transportation Management
- Green Business Innovation
- Waste Management
- Sustainable Facilities Management
- Sustainable Sourcing
- Sustainable Business Practices
- Eco-Design Principles
- Eco-Friendly Site Selection
- Consumer Sustainability Education
- Green Product Design

List of proposed training programmes is accessible on the **MyMAHIR platform**.



Emerging Roles

Global Presence of Emerging Roles in the FMS Sector

The sector is undergoing a significant transformation driven by technological advancements and a growing focus on sustainability. This evolution brings exciting new roles to the forefront, each playing an essential role in optimising processes, enhancing quality, and ensuring food security. The emerging roles are inclusive of both; Food Manufacturing and Food Services sector by introducing advanced technologies and innovative processes that enhance efficiency, sustainability, and product quality on a global scale.

Food Biotechnologist

Food Biotechnologists are becoming increasingly pivotal in global food manufacturing. Their expertise lies in utilising biological processes, such as fermentation and genetic modification, to enhance food products' nutritional value, flavour, and shelf life. They play an important role in developing alternative proteins and improving food safety through biotechnological innovations. **Singapore** is a leader in food biotechnology research. The Singapore Institute of Food and Biotechnology Innovation (SIFBI) employs food biotechnologists to develop sustainable food production solutions.[35]

Bioprocess Engineer

Bioprocess Engineers design and optimise processes for large-scale food production, ensuring efficiency and sustainability. They integrate chemical engineering principles with biological sciences to develop methods for manufacturing food products, including fermentation and downstream processing. Their work is essential in scaling up production from the laboratory to industrial levels, ensuring consistency and quality in food manufacturing. Additionally, the bioreactor revolution is transforming food processing and flavour development. Bioreactors, traditionally used in pharmaceuticals, are now crucial in cultivating alternative proteins and optimising fermentation processes in the food sector. This innovation promises more sustainable food production with enhanced flavours, which highlights the growing demand for Bioprocess Engineers who specialise in designing and managing bioreactor systems, making them vital for the future of food tech and sustainable practices.[36]

35. Temasek, *Temasek establishes the Asia Sustainable Foods Platform to accelerate the commercialisation of sustainable foods in Asia*, 15 November 2021 <https://www.temasek.com.sg/en/news-and-resources/news-room/news/2021/Temasek-establishes-Asia-Sustainable-Foods-Platform-accelerate-commercialisation-sustainable-foods>
36. Forward Fooding, *The Bioreactor Revolution: Transforming Food Processing and Flavor Development*, <https://forwardfooding.com/blog/foodtech-trends-and-insights/the-bioreactor-revolution-transforming-food-processing-and-flavor-development/#>

Data Scientist

Data Scientists in food manufacturing analyse vast amounts of data to optimise production processes, improve quality control, and enhance supply chain management. By applying machine learning algorithms and predictive analytics, they can forecast trends, reduce waste, and increase operational efficiency. Their role is vital in harnessing the power of big data to drive innovation and improve decision-making in the food sector. This is evident when **Siemens** integrated digitalisation and automation in the food and beverage sector. This shift towards smart manufacturing relies on advanced data collection and analytics to optimise production processes, enhance quality control, and improve efficiency. Data Scientists are essential in managing and interpreting this data, helping to drive innovation and maintain competitiveness. By utilising tools such as digital twins and predictive analytics, they can anticipate issues, streamline operations, and meet the growing demands for sustainable food production.[37]

Drone Pilot / Driver

Drone Pilots / Drivers are emerging as vital players in precision agriculture and food manufacturing. They use drones to monitor crop health, optimise irrigation, and precisely apply pesticides. This technology helps in reducing resource usage and improving crop yields. In food manufacturing, drones are also used for inventory management and logistics, enhancing the efficiency and accuracy of operations. Dutch farmers are using drones and precision farming in the floriculture sector. In the **Netherlands**, drones are equipped with sensors to collect data on soil health, plant growth, and pest management. This technology allows farmers to analyse and optimise crop conditions, resulting in more sustainable farming practices. Precision agriculture, supported by data-driven insights from drones, helps farmers reduce resource usage, improve yields, and ensure better environmental outcomes.[38]

System Architect

System Architects in the Food sector design and implement complex IT systems that integrate various aspects of food manufacturing, from supply chain management to quality control. They ensure that these systems are scalable, secure, and capable of supporting the growing demands of the sector. Their role involves coordinating with different departments to create cohesive systems that streamline operations and support strategic objectives. **Japan**'s advanced robotics is transforming food production by automating labour-intensive tasks, improving efficiency, and maintaining quality. In the Food sector, System Architects are essential to designing and managing these integrated systems, ensuring seamless automation and compatibility across operations. Their role is increasingly vital as robots become more embedded in food production processes.[39]

37. Industry Week, *How Digital Innovations is Transforming the Food and Beverages Industry*, <https://www.plm.automation.siemens.com/media/global/en/FB_1A-_1_Siemens_tcm27-59909.pdf>
38. Konica Minolta, *Digital agriculture: how Dutch farmers use precision farming for floriculture*, 6 March 2020, <https://www.konicaminolta.eu/eu-en/rethink-work/business/digital-agriculture-how-dutch-farmers-use-precision-farming-for-floriculture>
39. International Finance, *Japan's robots are conquering the world*, 1 April 2021 <https://internationalfinance.com/magazine/technology-magazine/japans-robots-are-conquering-the-world/>

Sustainability Specialist

The role of Sustainability Specialists in the Food Services sector is not just a local trend but a global movement. This trend is driven by the increasing emphasis on environmental responsibility and sustainable practices. Companies worldwide are integrating sustainability into various facets of their operations, driven by consumer demand, regulatory requirements, and corporate responsibility initiatives. Globally, sustainability roles are becoming central to corporate strategy. In Food Services, this trend is reflected in the emergence of positions such as sustainability managers and directors of innovation and sustainability. These roles often involve developing and implementing sustainability programmes, overseeing sustainable sourcing and supply chain practices and integrating sustainability into product innovation and development.

In many leading companies, sustainability specialists are responsible for reducing environmental impacts, driving cost efficiencies, and fostering innovation. Sustainability specialists are becoming a global cornerstone of the Food Services sector as companies recognise the importance of sustainable practices for long-term success and compliance with evolving regulatory standards. The United Nations Environment Programme (UNEP) urges the need for sustainable food systems in the post-COVID world. It highlights that the pandemic has exposed vulnerabilities in global food systems, such as food insecurity, supply chain disruptions, and environmental degradation. A Sustainability Specialist plays a crucial role in driving these transformations. They help food companies develop and implement strategies that enhance environmental responsibility, improve resource efficiency, and support sustainable sourcing practices. Their expertise ensures that food systems not only recover from disruptions but also become more resilient and aligned with long-term sustainability goals. This role is essential for addressing the challenges highlighted by the pandemic and for fostering a more sustainable and equitable food future.[40]

40. UNEP, *Why sustainable food systems are needed in a post-COVID world*, 14 July 2020 <https://www.unep.org/news-and-stories/story/why-sustainable-food-systems-are-needed-post-covid-world>

Demand Projection for Emerging Roles

Based on the input collected from the industry players during the impact assessment workshop analysis, Government-Linked Companies (GLCs) have an employee size ranging from 125 to 3,500, Multinational Corporations (MNCs) range 1,500 to 11,000, Public Listed Companies (PLCs) range from around 250 employees, and SMEs range from 300 to 1,700 employees.[41]

Six (6) emerging roles have been identified for the FMS sector, namely, Food Biotechnologist, Bioprocess Engineer, Data Scientist, System Architect, Drone Pilot / Driver, and Sustainability Specialist.

Overall, the demand for emerging roles stood around between 1% to 10%. Sustainability Specialist is deemed to be the highest emerging role specifically in PLCs and SMEs with a range between 5% to 10%. The role of Sustainability Specialists in the Food Services sector has seen significant global growth due to the increasing emphasis on environmental responsibility and sustainable practices. Data Scientist is also considered to be in demand in PLCs with 5% projection, reflecting the advancement of AI and digitalisation advancement in the Food Manufacturing sector.

In SMEs, other emerging roles besides Sustainability Specialist ranged about 1% to 2% respectively. This may be due to the lack of resources or awareness to invest in these roles.

As for GLCs and MNCs, demand for these emerging roles are relatively low between 0 – 1% , considering these roles are already existing and in their current talent pipeline.

Based on a survey conducted during the study, the headcount of organisations based on company type ranges from

Multinational Corporations (MNCs):
1,500 - 11,000

Government-Linked Companies (GLCs):
125 - 3,500

Small and Medium-Sized Enterprises (SMEs):
300 - 1,700

Projected Demand for Emerging Roles for each organisation in the next three (3) to five (5) years

	Multinational Corporations (MNCs)	Government Linked Companies (GLCs)	Small and Medium-Sized Enterprises (SMEs)
Food Biotechnologist	1-5	Existed	Not Needed
Bioprocess Engineer	1-5	Existed	Not Needed
System Architect	1-8	0-2	Not Needed
Data Scientist	0-2	Existed	Not Needed
Drone Pilot / Driver	1-2	0-1	Not Needed
Sustainability Specialist	1-2	0-1	Not Needed

41. Talentcorp sector survey on Impact Study Validation Workshop

Chapter 5:
Recommended Initiatives

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Initiative 1: Provide Funding and Incentives to Encourage Adoption of Emerging Technologies and Practices 91

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Initiative 10: Accessible and Practical Training Approach to Cater for Larger Group of Workforce 101

The impact study assessment has yielded valuable insights into the evolving landscape shaped by AI, Digital, and Green Economy trends within Malaysia's FMS sector. 10 recommended initiatives have been developed through extensive collaboration with key stakeholders, including Government, Industry Players, Academia, and Training Providers. These initiatives aim to harness the opportunities identified and address the challenges posed by these transformative trends. By aligning with the needs and aspirations of each stakeholder group, we seek to foster innovation, promote skill development, and ensure the sustainable growth of the FMS sector, the nation's economy, and the workforce.

Summary of 10 Recommended Initiatives

Government

IN1
Provide **Funding and Incentives** to Encourage Adoption of Emerging Technologies and Practices

IN2
Inclusion of Private Sectors in **Regulatory and Policy** Reviews

IN3
Collaboration and Engagement with Industry Players

IN4
Creation of **Technical Leadership or Advisory Body** to Help Individuals or SMEs with **Specialised Expertise and Technical Guidance**

Industry Players

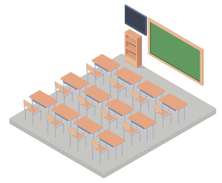
IN5
Enhance **Talent Development** Strategy for Long-Term Success

Academia

IN6
Collaborate with Industry Experts to Integrate **Real-World Practices** in Curriculum and Syllabus

IN7
Collaborate with Industry Players to Design **Effective Internship** Curriculum

IN8
Enhance **Quality of Educators** with Advanced Sector Training and Resources



Training Providers

IN9
Enhance **Training Delivery and Effectiveness** by Onboarding More Credible and Certified Training Providers

IN10
Accessible and Practical Training Approach to Cater for Larger Group of Workforce

Government

IN1 Provide Funding and Incentives to Encourage Adoption of Emerging Technologies and Practices

The introduction of targeted funding and incentive programmes will help stimulate growth and innovation in the FMS sector, particularly among SMEs. The incentives should address specific challenges faced by industry players, such as access to capital, technology, and infrastructure.

Initiatives	Case Studies
IN1.1 **Develop and introduce a range of financial incentives** such as tax breaks, tax credits, and deductions for R&D expenditures, investments in sustainable technology, or the adoption of Industry 4.0 technologies. **IN1.2** **Guide and provide soft loans** to farmer entrepreneurs for investing in AI for them to stay competitive in a market that is increasingly embracing technology. **IN1.3** **Offer low-interest loans or loan guarantees** to support capital investments, such as the purchase of new equipment for facility upgrades. **IN1.4** **Subsidise training programmes for employees and individuals** to acquire new skills related to advanced manufacturing, digital technologies, and sustainable practices. **IN1.5** **Establish or support innovation hubs and incubators** that provide SMEs with access to shared technical expertise, resources, and equipment. **IN1.6** **Allocate grants / funds to universities** that are ready to use their experimental labs for AI, Digital, and Green Economy initiatives.	**Malaysia Digital (MD) Tax Incentive by MDEC:**[42] • MD Tax Incentive is a new outcome-based tax incentive scheme offered to eligible MD companies that undertake activity utilising any of the MD-promoted tech enablers. • The outcome-based approach uses a tiered system for granting tax incentives to encourage companies to spur the economy through investments in high-growth, high-value (HGHV) areas, create new economic clusters, expand the domestic network, and provide a balance between economic growth and environmental, social, and governance sustainability. **Romania Agency for Financing Rural Investments (AFIR):**[43] • AFIR has embraced AI to facilitate farmers' access to EU funds. This innovative approach marks a significant step forward in leveraging technology to enhance efficiency and accessibility in agricultural financing.

42. Malaysia Digital Economy Corporation (MDEC), *What is Malaysia Digital (MD) Tax Incentive?*, <https://mdec.my/malaysiadigital/tax-incentive>
43. Euro News, *Romanian agency uses AI to help farmers get EU funding*, 26 March 2024 <https://www.euronews.com/next/2024/03/26/romanian-agency-uses-ai-to-help-farmers-get-eu-funding>

Benefits

- Investments in AI and digital technologies can significantly boost productivity and innovation, leading to economic growth. By providing tax incentives, governments encourage companies to adopt these technologies, which can enhance the competitiveness of the national economy on a global scale.
- Precision agriculture powered by AI can pinpoint the exact needs of crops for water, nutrients, and pest control, reducing the overall input costs. Soft loans can make such technologies affordable for farmers, who might otherwise be unable to bear the upfront costs.

IN2 Inclusion of Private Sectors in Regulatory and Policy Reviews

Including industry players in regulatory reviews will enhance systems, implementation methods, and effectiveness, particularly for the FMS sector.

Initiatives	Case Studies
IN2.1 **Set up regular Government-Industry consultation forums** where private sector representatives can share insights, challenges, and recommendations. **IN2.2** **Engage the private sector** from the outset of the regulatory review process, allowing them to contribute to the formulation of the agenda and identification of key issues. **IN2.3** **Identify and include a diverse range of private sector stakeholders,** such as industry associations, large corporations, SMEs, and innovators, to ensure comprehensive representation. **IN2.4** **Strengthen public-private partnerships** where private sector expertise and resources can be leveraged to drive regulatory improvements. **IN2.5** **Establish formal mechanisms for the private sector to provide feedback on proposed regulations** and ensure that their input is systematically reviewed and addressed.	**The U.S. Food Safety Modernization Act (FSMA) (2011):**[44] • The Act involved extensive collaboration between the U.S. Food and Drug Administration (FDA) and the food industry to develop and implement new regulations. • Food industry stakeholders, including producers, processors, and retailers, were involved in the rulemaking process, providing feedback on proposed regulations and helping to shape the preventive controls and safety standards. • The industry also participated in training and capacity-building initiatives to ensure compliance with the new requirements.

44. USFDA, *The FDA Food Safety Modernization Act at 10: Reflecting on Our Progress and the Path Forward*, 1 April 2021, <https://www.fda.gov/news-events/fda-voices/fda-food-safety-modernization-act-10-reflecting-our-progress-and-path-forward>

Benefits

- Industry players bring practical knowledge and firsthand experience, therefore their input ensures that policies are grounded, making them more applicable and effective across the sector.
- By involving industry players, governments can strike a balance between protecting public interest and avoiding overly burdensome regulations that could stifle innovation or economic growth.
- Regulations that are developed with industry input are more likely to support the sector's growth and global competitiveness, as they consider the economic realities and market dynamics.

IN3 Collaboration and Engagement with Industry Players

Collaboration between the government, industry players, and other key stakeholders is key in addressing the challenges in the advancement of AI, Digital, and Green Economy for the FMS sector, ensuring that the policies and initiatives are tangible and realistic for implementation.

Initiatives	Case Studies
IN3.1 **Establish Public-Private Partnerships (PPPs)** where the government collaborates with private companies to share the costs and risks associated with the implementation of variation. **IN3.2** **Set up regular Government-Industry consultation forums** where private sector representatives can share insights, challenges, and recommendations. **IN3.3** **Establish shared technology platforms** or sector-wide solutions that facilitate integration and reduce the cost and complexity of implementing new technologies. **IN3.4** **Establish joint initiatives** to develop and implement robust cybersecurity standards and practices that protect data integrity in the FMS sector. **IN3.5** **The government can collaborate with industry players** to develop training programmes and certification courses focused on AI, Digital, and Green Economy, ensuring a continuous supply of skilled workers.	**The Food Policy for Canada:**[45] • The Canadian Government, led by Agriculture and Agri-Food Canada (AAFC), developed the 'Food Policy' through extensive consultations with a broad range of stakeholders, including farmers, food manufacturers, retailers, indigenous groups, and civil society organisations. • Industry stakeholders played a key role in shaping the 'Food Policy,' providing input on food safety, supply chain management, and innovation. The private sector also played a crucial role in implementing the policy's initiatives, such as reducing food waste and improving food accessibility.

45. AAFC, *Food Policy for Canada*, 2019, <https://agriculture.canada.ca/sites/default/files/legacy/pack/pdf/fpc_20190614-en.pdf>

Benefits

- Tax incentives and funding can spur innovation and encourage more companies to explore AI, digitalisation, and green technologies.
- Joint cybersecurity initiatives and subsidies ensure that companies have the resources and knowledge to protect their data effectively.
- Shared platforms and support networks can lower the costs associated with technological integration, making it more accessible for all companies.
- Collaboration with academia ensures that future graduates are ready to meet industry demands, reducing the skills gap over time.

IN4 Creation of Technical Leadership or Advisory Body to Help Individuals or SMEs with Specialised Expertise and Technical Guidance

The government can establish a shared technical leadership or advisory body to provide specialised expertise to individual professionals or SMEs through technical guidance, training, and research support.

Initiatives	Case Studies
IN4.1 **Collaborate with leading industry players** to establish an institute focusing on important areas like packaging, coffee brewing, or other specialised fields. **IN4.2** **Secure funding from both public and private sectors** to support the infrastructure, staffing, and operations. **IN4.3** **Create sector-specific training programmes, certifications, and workshops** tailored to the needs of SMEs and individuals. **IN4.4** **Perform periodical assessments** on the individuals and SMEs to identify gaps and address training needs, ensuring that this programme can effectively support the growth. **IN4.5** **Develop and offer access to state-of-the-art facilities and equipment** for R&D, enabling the targeted groups to innovate without heavy capital investment.	**Singapore A*STAR Initiative:**[46] • The Agency for Science, Technology, and Research (A*STAR) in Singapore has established various research institutes and collaborations aimed at fostering innovation and supporting SMEs in multiple sectors, including Food Manufacturing. • Close collaboration with industry players allows for the development of cutting-edge technologies and solutions and provides R&D access and expert advice to SMEs. • Workshops and training programmes are tailored to the needs of the sector while addressing current trends.

46. The Agency for Science, *Technology, and Research (A*STAR)*, <https://www.a-star.edu.sg/>

Benefits

- Individuals and SMEs are able to gain access to high-level expertise and resources that would otherwise be unaffordable.
- SMEs will be able to innovate more effectively and be exposed to the latest trends and development in the sector.
- Drive growth for the SMEs and individuals who aim to pursue a specific area in the industry.
- Closing the gaps between learning institutions and sectors.

Industry Players

IN5 Enhance Talent Development Strategy for Long-Term Success

Industry players are encouraged to improve talent development strategy by upskilling their employees through targeted training. This is essential for adapting to AI, Digital, and Green Economy trends, ensuring that the workforce is well-equipped to meet the evolving demands of the sector.

Initiatives	Case Studies
IN51 **Provide in-house training and development programmes** through on-the-job training and mentoring programmes to help employees learn new technologies and processes within their work environment. **IN5.2** **Conduct regular technical workshops on emerging technologies** like AI, automation, and data analytics and offer training in soft skills such as communication, teamwork, and problem-solving. **IN5.3** **Provide e-learning platforms and AI-driven learning** through online courses and resources, i.e., using VR and AR technologies for immersive training experiences. **IN5.4** **Utilise AI to create personalised learning paths** for employees and use data analytics to track the progress and effectiveness of training programmes, enabling continuous improvement.	**Nestlé's Immersive In-House Training Programme:**[47] • Nestlé developed VR modules that simulate real-world scenarios within its manufacturing facilities. These modules allow employees to experience and respond to various situations, such as machine operation, maintenance procedures, and safety protocols, in a risk-free virtual environment. • Nestlé uses AR technology to overlay digital instructions and information onto physical equipment. Employees can use AR-enabled devices, such as smart glasses or tablets, to access step-by-step guides, troubleshoot issues, and receive real-time feedback while working on actual machinery.

47. Nestle, *Nestlé speeds up factory support with augmented reality*, 24 July 2020 <https://www.nestle.com/aboutus/research-development/news/nestle-speeds-factory-support-augmented-reality>

Initiatives	Case Studies
IN5.5 **Develop clear career pathways** within the organisation, providing employees with opportunities for advancement based on their skills, performance, and aspirations.	

Benefits

- Ensures that employees remain up-to-date with the latest industry trends and technologies, improving operational efficiency and innovation capacity.
- A well-trained, engaged workforce is more productive and innovative, contributing to the company's growth and competitiveness.
- Enhances employee motivation and engagement by showing them a clear future within the company, which as a result will improve retention rates.

Academia

IN6 Collaborate with Industry Experts to Integrate Real-World Practices in Curriculum and Syllabus

Curriculum development and enhancement via industry partnerships is a collaborative process between educational institutions and businesses. It aims to design and improve academic programmes to better align with the skills and knowledge required in the workforce, ensuring that students are prepared for the current and future demands of the sector.

Initiatives	Case Studies
IN6.1 **Enhance Science and Information Technology (IT) course curricula** to include industry-focused skills and knowledge with guidance from sector guest lecturers to provide hands-on experience and direct exposure to the sector. **IN6.2** **Develop an interdisciplinary curriculum** by combining digital skills with sustainability topics, allowing for a more holistic learning experience. **IN6.3** **Academic institutions should involve industry experts in the curriculum development process** to ensure the syllabus is practical, up-to-date, and relevant, particularly courses related to variation.	**Singapore is developing a Cybersecurity Curriculum through School-Industry Partnership:**[48] • Temasek Polytechnic (TP), a leading vocational and technical institution in Singapore, is partnering with Cybereason, a prominent cybersecurity company, to ensure the curriculum aligns with real-world industry needs.

48. Temasek Polytechnic,< https://www.tp.edu.sg/home.html>

Initiatives	Case Studies
IN6.4 **Schools to design projects that require students to use digital tools** to research and propose solutions to real-world sustainability challenges. **IN6.5** **Introduce the updated syllabus gradually,** starting with pilot programmes or specific grade levels, and incorporate a variety of teaching methods, including project-based learning, experiential learning, and the use of digital platforms.	

Benefits

- Provides students with a solid foundation in the principles and practices of automation, sustainability, and digital technologies, which are increasingly important in modern industry and society.
- Students will gain knowledge of relevant and industry-focused materials, aligning their education with industry needs especially for emerging careers in AI and data science.
- Sector involvement helps institutions adapt to sector needs and maintain high-quality education, ensuring that students acquire the latest skills and knowledge, making them more competitive in the job market.

> **"There should be a shared vision between the government and industry. The world is moving ahead and innovating at a breakneck pace. Malaysia was not around during the First Industrial Revolution and missed the Second Industrial Revolution, so we must not miss Industry 4.0. Therefore, we must have all the infrastructure, people, facilities, and financial incentives to fully leverage the potential of Industry 4.0."**
>
> ***Azhari Arshad, Executive Director, Business Development and Government Liaison of Malayan Flour Mills Berhad***

IN7 Collaborate with Industry Players to Design Effective Internship Curriculum

Academia is encouraged to maintain a close partnership and collaborate with industry players to develop and deliver industry-focused internship programmes, bridging the gap between academic learning and real-world industry experience.

Initiatives	Case Studies
IN7.1 **Academic institutions should establish formal partnerships** with companies in relevant sub-sectors through MoUs, outlining the roles, responsibilities, and expectations of each party. **IN7.2** **Identify skills and competencies required in the workforce** and design internship curriculum that integrate these key areas as well as sector-driven projects to give students hands-on and real-world problem-solving opportunities. **IN7.3** **Implement regular check-ins and performance assessments** to provide feedback on progress and learning outcomes thoughtout the internship. **IN7.4** **Develop career pathway and offer opportunity** for high-performing interns to transition into full-time positions.	**PepsiCo's Industry-Focused Internship Programme:**[49] • PepsiCo has developed a robust internship programme designed to prepare students for future careers in the industry. • The programme is well-integrated with the company's operations, offering interns real-world experience across various functions, including R&D, supply chain management, marketing, and sustainability. • Interns undergo a comprehensive onboarding process that includes training sessions on company culture, industry standards, and specific job roles. • Each intern is paired with a mentor who provides guidance, feedback, and support throughout the internship. • Interns are assigned to projects that address real business challenges. For example, interns in R&D might work on developing new product formulations, while those in supply chain management might focus on optimising logistics operations. • High-performing interns are often offered full-time positions upon graduation. PepsiCo uses the internship programme as an essential recruitment tool, helping to build a robust talent pipeline.

Benefits

- Interns gain practical skills, sector knowledge, and professional networks, making them more attractive to employers.
- Working on real projects gives students a sense of accomplishment and prepares them for the types of challenges they will face in their careers.
- Continuous assessment helps ensure that the internship is meeting its goals and allows for adjustments to improve the learning experience.
- Companies can identify and nurture future talent through internships, reducing recruitment costs and improving employee retention.

49. PepsiCo Career, *Internships & Programs*, <https://www.pepsicojobs.com/internshipsprograms>

IN8 Enhance Quality of Educators with Advanced Sector Training and Resources

Academia needs to equip educators with advanced sector training and access to comprehensive resources. This will elevate the quality of education as it ensures that educators are well-prepared to impart relevant and up-to-date knowledge, fostering a more effective learning environment for the future workforce.

Initiatives	Case Studies
IN8.1 **Provide professional development opportunities** for teachers to be proficient in digital literacy and sustainability. **IN8.2** **Offer resources and training** on effective pedagogical strategies to integrate digital and sustainability topics into various subjects. **IN8.3** **Establish industry-academia partnerships** to provide educators with insights into current industry practices and trends. **IN8.4** **Encourage educators to attend sector conferences, workshops, and seminars** to stay abreast with current trends and developments. **IN8.5** **Promote job shadowing and hands-on training** with sector professionals to provide real-world context to academic teaching. **IN8.6** **Establish feedback mechanisms** where educators can receive constructive input from industry partners and students on their teaching effectiveness.	**SkillsFuture for Educators (SFEd)** is an initiative to advance teachers' skills and promote lifelong learning. **SFEd Professional Development Framework:**[50] • A roadmap that guides teachers to strengthen their practice in six (6) areas including assessment literacy, differentiated instruction and inquiry-based learning. • There are four (4) levels of practice that represent the progression of a teacher's proficiency in a specific area and serve as benchmarks for professional development and growth.

Benefits

- Educators with better understanding and experience with modern sector practices will be able to employ more engaging and impactful learning experiences.
- Educators gain practical insights and understanding of current workplace dynamics, technologies, and challenges, enhancing their expertise and credibility.
- Students receive education that reflects the current state of the sector, making them more competent and job-ready upon graduation.
- Enriches the learning experience with real-world insights and contemporary examples, and fosters mutual learning between educators and sector professionals.

50. Academy of Singapore Teachers (AST), *SkillsFuture for Educators (SFEd)*, <https://academyofsingaporeteachers.moe.edu.sg/professional-excellence/skillsfuture-for-educators/overview/>

Training Providers

IN9 Enhance Training Delivery and Effectiveness by Onboarding More Credible and Certified Training Providers

Training institutions should onboard reputable providers, especially those with expertise in variation of pillars, as these are highly relevant to the FMS sector.

Initiatives	Case Studies
IN9.1 **Training provider to conduct a thorough analysis** of AI, Digital, and Green Economy to identify key trends, technologies, and skills in demand. **IN9.2** **Training institutions need to assess the credibility and certification status** of training providers to ensure they meet the specific needs and standards of the sector. **IN9.3** **Implement a quality assurance programme** that regularly evaluates the effectiveness of training delivery and content. **IN9.4** **Form partnerships with leading companies and sector experts** to enhance the credibility of the training provider. **IN9.5** **Use Learning Management Systems (LMS)** and other digital platforms to deliver training content effectively while tracking learner's progress.	**Singapore's Train the Trainer (TTT) Programme:**[51] • The programme is designed for workplace managers, supervisors, and others in Singapore who are responsible for training, coaching, and assessing employees while also addressing the organisation's educational needs. **Offered Modules** include: - Prepare and Conduct Coaching – This module provides the knowledge and skills needed to prepare and conduct on-the-job training within an organisation. - Design and Develop Training Curriculum – This module provides an overview of identifying training needs and creating in-house training programmes.

Benefits

- Sector input can ensure that training programmes are tailored to the actual needs of businesses, resulting in a workforce with the right skills and knowledge.
- Learners will receive high-quality, sector relevant education including AI, Digital and Green Economy practices.
- Training delivery will continuously improve, maintaining high standards through regular evaluation and ongoing refinements.

51. Singapore Institute of Technical Education, *Train the Trainer (TTT) Programme*, <https://www.ite.edu.sg/courses/part-time-courses/train-the-trainer>

IN10 Accessible and Practical Training Approach to Cater for Larger Group of Workforce

Training providers need to consider an accessible and affordable training approach as this is vital for equipping the workforce with skills needed to succeed in the modern economy. They promote inclusivity, support career development, and ensure that businesses can harness the full potential of AI, Digital, and Green Economy principles to drive growth.

Initiatives	Case Studies
IN10.1 **Collaborate with industry experts** to understand the current and future landscape of the sector and the impact of technological advancements to identify specific needs. **IN10.2** **Include case studies from industry partners and international collaborations** in the syllabus to expose our workforce to different approaches and challenges in AI, Digital, and Green Economy. **IN10.3** **Create short, focused modules** that can be stacked towards a more extensive credential and provide micro-credentials that recognise specific skills and competencies, allowing learners to progress at their own pace. **IN10.4** **Offer various delivery methods, including online, in-person, and hybrid models,** to accommodate different learning preferences and schedules by utilising microlearning and modular approaches. **IN10.5** **Collaborate with local community centres and libraries** to set up learning hubs with internet access and learning materials.	**Micro-Credentials and Community-Based Training in New Zealand:**[52] • New Zealand introduced micro-credentials as part of its education framework to offer more flexible, industry-recognised learning opportunities. • The programme is developed in collaboration with industry partners, with micro-credentials focusing on specific skills such as food safety, digital literacy, and sustainable farming practices. • Community learning hubs have been established in rural areas to address the challenges of geographic isolation, providing access to digital learning resources and in-person training.

Benefits

- Ensures training programmes are relevant to current industry demands, leading to better employment outcomes and addresses skill gaps.
- Ensures that all workers, including those in remote or underserved areas, have equal opportunities to enhance their skills and advance their careers.
- Flexibility of micro-credentials encourages continuous learning by accommodating the varied life circumstances of the workforce.

52. New Zealand Qualification Authority, *Micro-credentials: Information about the structure of micro-credentials*, <https://www2.nzqa.govt.nz/qualifications-and-standards/about-qualifications-and-credentials/micro-credentials/>

1 **GOVERNMENT**

Industry to leverage on the tax funding and incentives applicable for AI, Digital, and Green Economy to upskill and reskill employees.

2 **GOVERNMENT**

Collaboration between key stakeholders is key in addressing the challenges in the advancement of AI, Digital, and Green Economy, ensuring that the policies and initiatives are tangible and realistic for implementation.

3 **TRAINING PROVIDERS**

Training providers to provide accessible and affordable training programmes for equipping the current workforce with the skills needed to succeed in the modern economy.

4 **ACADEMIA**

Skills development and talent cultivation to nurture and enhance individuals' abilities and competencies to meet personal, professional, and economic goals, through education, training, and practical experiences.

5 **ACADEMIA**

Integration of digital literacy and sustainability awareness into the education system and schools is a strategic approach to prepare students for the rapid changes in the industry.

Taking into account the Initiatives proposed, moving forward, these are the

Top 5 Initiatives

needed to kickstart the workforce transformation towards AI, Digital, and Green Economy to ensure their successful implementation

Conclusion

Malaysia's FMS sector is poised for a transformative shift over the next three (3) to five (5) years, propelled by changing consumer preferences, technological advancements, and economic considerations. These trends are set to bring significant advancements in AI, Digital, and Green Economy, impacting the Malaysian workforce and necessitating a shift in skills and competencies to meet the sector evolving demands. **Contributing 10.4% to the nation's GDP, amounting to RM78.2 billion,[53] the sector must evolve and adapt to these changes to ensure ongoing viability, relevance, and significance**. This evolution will strengthen its standing among regional and global peers and ensure that the domestic workforce remains robust and capable of meeting shifting industrial needs.

The study identified six (6) emerging roles: five (5) in the Food Manufacturing sector and one (1) in the Food Services sector. These roles are tailored to future technological advancements, sector trends, and societal changes. By focusing on these emerging roles, organisations can drive innovation, adopt sustainable practices, and remain competitive and compliant with evolving regulations and market demands.

Additionally, the study identified five (5) highly impacted, 22 medium impacted, and seven (7) low impacted roles for the Food Manufacturing sector, and two (2) highly impacted, 19 medium impacted, and 16 low impacted roles for the Food Services sector.

The focal point of the impact study centres on roles significantly affected by the growth trends of AI, Digital, and Green Economy. Due to these trends, highly impacted roles face a substantial risk of becoming obsolete. Therefore, the study identifies viable career pathways and the necessary skill sets for the Malaysian workforce in the sector, ensuring they are prepared for future challenges and opportunities.

Looking ahead, embarking on this journey of continuous adaptation and innovation will be vital in preparing the FMS workforce for ongoing advancements in AI, Digital, and Green Economy. To achieve this, **the MyMAHIR Future Skills Talent Council (FSTC) will conduct regular needs assessments to identify immediate and future workforce skills gaps, analyse talent demands by sector and educational level, propose strategies, determine essential sector-specific skills, and periodically update these skills in response to technological advancements and evolving operating environments**.

Additionally, the council will align the educational system with the sector's needs while actively fostering collaboration among Government, Industry Players, Academia, and Training Providers to enhance Malaysia's competitiveness and promote sustainable growth in the FMS sector.

Contributing 10.4% to the nation's GDP **RM78.2 bill**

Key trends impacting existing roles:

Artificial Intelligence **Digital** **Green Economy**

The study identified 7 job roles that will be highly impacted by these trends, along with 6 emerging roles, and 22 in-demand skills essential for future advancements.

MyMAHIR Future Skills Talent Council (FSTC) has been set up to prepare for these changes

53. Ministry of Investment, Trade and Industry (MITI), *New Industrial Master Plan 2030: Food Processing Industry*, 2023; Department of Statistics Malaysia (DOSM)

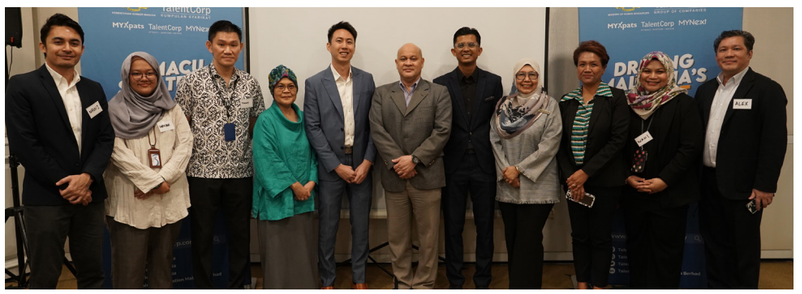
Validation Workshop

Validation Workshop
















Abbreviations

A*STAR	The Agency for Science, Technology, and Research - Singapore
AAFC	Agriculture and Agri-Food Canada
AFIR	Agency for Financing Rural Investments - Romania
AI	Artificial Intelligence
AP	Action Plans
APAC	Asia Pacific
AR	Augmented Reality
ASRS	Automated Storage and Retrieval System
CAGR	Compound Annual Growth Rate
CESA	Centre of Excellence for Sustainable Agriculture
CII	The Confederation of Indian Industry
CPI	Continuous Process Improvement
DASN	Dasar Alam Sekitar Negara
DMO	Digital Manufacturing Operations
ESG	Environment, Social, and Governance
EU	European Union
FDA	Food and Drug Administration - US
FMS	Food and Manufacturing Sector
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GITA	Green Investment Tax Allowance
GITE	Green Investment Tax Exemption
GLCS	Government-linked Companies
HAS	Halal Assurance System
HGHV	High-growth High-value
ICT	Information and Communications Technologies
IoT	Internet of Things
IR4.0	The Fourth Industrial Revolution
IT	Information & Technology
KESUMA	Ministry of Human Resources
MD	Malaysia Digital
MDEC	Malaysia Digital Economy Corporation
MII	Manufacturing Integration and Intelligence
MOF	Ministry of Finance
MOHE	Ministry of Higher Education
MOSTI	Ministry of Science, Technology and Innovation
MDEB	Malaysia Digital Economy Blueprint
MyNSR	Malaysia National Skills Registry
NETR	National Energy Transition Roadmap
NIMP 2030	New Industrial Master Plan 2030
NIST	National Institute of Standards and Technology
PLCs	Public Listed Companies
PRECISE	The Public-Private Partnership for Precision Agriculture
PSDC	Penang Skills Development Centre
R&D	Research and Development
ROI	Return on Investment
SCE	Siemens Cooperates with Education
SDG	Sustainable Development Goals
SFEd	SkillsFuture for Educators
SHRDC	Selangor Human Resource Development Centre
SIT	Singapore Institute of Technology
SMEs	Small and Medium-sized Enterprises
SPM	Sijil Pelajaran Malaysia
SSTC	Sabah Skills and Technology Centre
TalentCorp	Talent Corporation Malaysia Bhd
TMC	The Manufacturing Circle
TP	Temasek Polytechnic
TTT	Train the Trainer - Singapore
US	United States
VR	Virtual Reality

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Malaysia Food Manufacturing Group (MAFMAG)
Malaysia Retail & Chains Association
Nestlé Malaysia
PJ Hilton
QL Kitchen Sdn Bhd
QSR Brands (M) Holdings Sdn Bhd
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