Jobs Transformation Map for Singapore's Food Manufacturing Sector

Preface

Ernst & Young (EY) has been commissioned by Enterprise Singapore (ESG), in collaboration with Workforce Singapore (WSG), to conduct a study and evaluate the impact of key trends on the manpower of Singapore's Food Manufacturing sector.

Phenomenal global changes such as changing client expectations, digitalisation, regulations and the COVID-19 pandemic have and will continue to transform the way food manufacturers operate today and in the future. The study aimed to assess how these emerging technologies and trends will impact the Food Manufacturing workforce in Singapore. Anchoring on the Skills Framework (SFw) for Food Manufacturing, the study sought to understand which job roles will be impacted and how job tasks and skills will change. This was complemented by the manpower job impact analysis to understand future demand and supply for existing job roles in the sector. Lastly, strategic thrusts were identified for the sector where recommendations are put forth, to build a resilient and competitive workforce equipped with the right skills to thrive in a constantly evolving environment.

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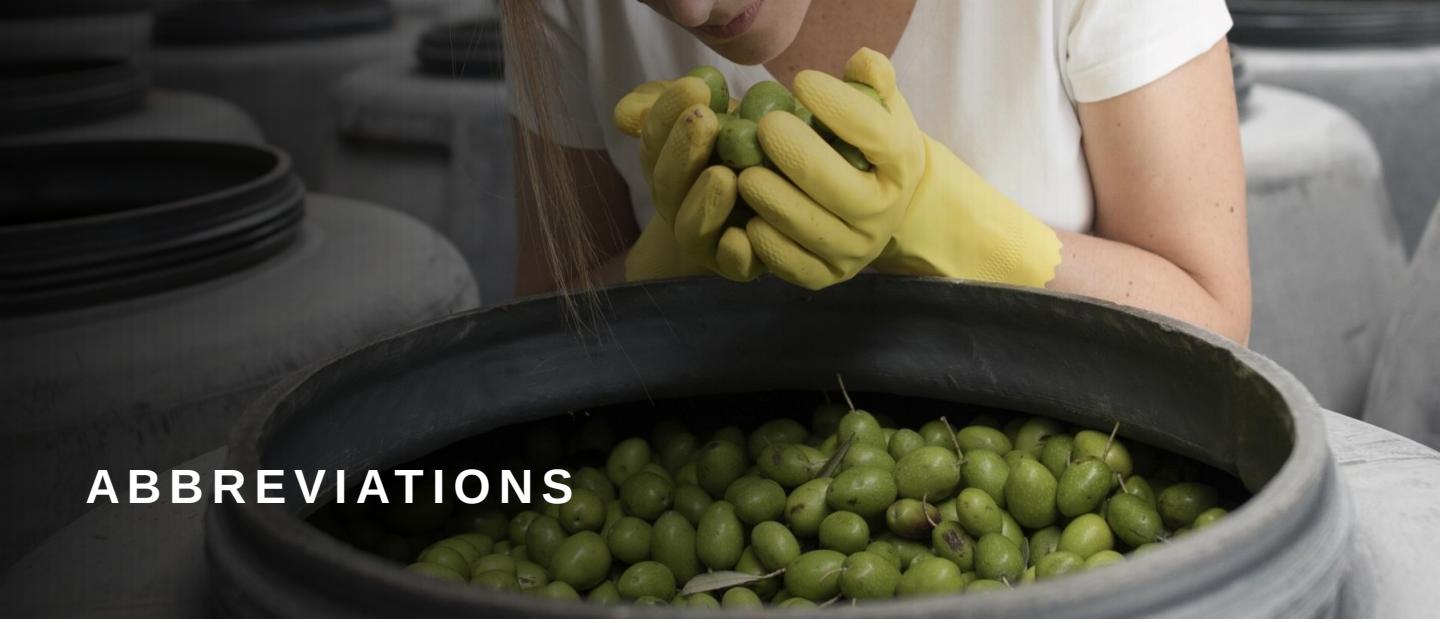


ABBREVIATIONS

Abbreviation	Term	Abbreviation	Term
AI	Artificial Intelligence	**MNC**	Multinational Corporation
AR/VR	Augmented and Virtual Reality	**MOE**	Ministry of Education
BD	Business Development	**MOM**	Ministry of Manpower
CAGR	Compounded Annual Growth Rate	**NTU**	Nanyang Technological University
Coy	Company	**Non-SME**	Non-Small and Medium Enterprise. For the purposes of this study, Non-SMEs are also considered MNCs
CCP	Career Conversion Programme	**PSEI**	Post-Secondary Education Institution
CET	Continuing Education and Training	**QA&QC**	Quality Assurance and Quality Control
ESG	Enterprise Singapore	**R&D**	Research and Development
EY	Ernst & Young	**SFw**	Skills Framework
FGD	Focus Group Discussion	**SIT**	Singapore Institute of Technology
GDP	Gross Domestic Product	**SP**	Singapore Polytechnic
I4.0	Industry 4.0	**SSG**	SkillsFuture Singapore
IHL	Institutes of Higher Learning	**SSOC**	Singapore Standard Occupational Classification
IoT	Internet of Things	**RP**	Republic Polytechnic
ITE	Institute of Technical Education	**WSG**	Workforce Singapore
L&D	Learning and Development		

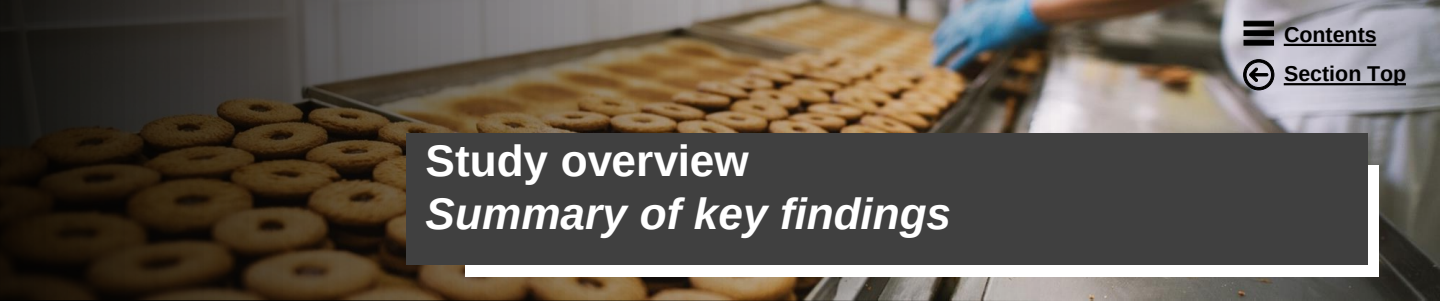
A NOTE ON METHODOLOGY AND FINDINGS

In this study, trends and technologies are considered as the key drivers impacting jobs and skills in the Food Manufacturing sector. While food manufacturers that are affected by these trends and/or adopt technologies may expect the impact of jobs and skills to be as outlined in this report, there are certain factors that may overstate or understate this impact assessment, as outlined below.

This study has been **calibrated to provide a sector-wide view of trends, technology adoption, and impact on job roles and skills** by aggregating insights from multiple industry stakeholders of various sub-sectors, profiles, and perspectives. The **findings need to be interpreted by individual food manufacturers and contextualised to their business operations and job roles,** respectively.

Firstly, this study acknowledges that the **journey and timeline to transformation may vary** across companies	• Food manufacturers within different sub-sectors and of different operating models, business priorities, legacy processes and systems, as well as size and scale of operations adopt trends and technologies at different paces. Certain food manufacturers choose to transform along with or even beyond industry pace, while others may choose to be fast followers, or adopt a strict needs-based approach. • Other considerations in transformation include changing customer preferences, regulatory requirements, and accessibility or availability of solutions (technology or otherwise).
Secondly, this study also acknowledges **that the impact on jobs and skills experienced by food manufacturers may vary** depending on a number of other factors	• Similarly, different pace of adoption of trends and technologies would result in varying impact on jobs and skills. The extent and time horizon of changes to jobs and skills are dependent on food manufacturers' business priorities and people strategies. • The potential outcomes for impacted jobs (e.g., job redesign or incremental changes to a role) and corresponding impact on skills may thus differ across companies.
Thirdly, the historical trends and **future projections** in the **manpower study are triangulated by multiple factors**	• Sector and manpower trends identified from industry outreach and data gained from a sectoral Manpower Survey were overlayed with Singapore's GDP growth rates from MTI Economic Survey, Industry Transformation Map and Industry Digitalisation Plan for Food Manufacturing, and data from participating agencies. • While actual manpower trends for the overall sector may be slightly varied, they are expected to display similar patterns.

1 Study overview



Study overview
Summary of key findings

Introduction

Changing consumer preferences, technological advances, and an increasingly saturated and competitive environment are driving Singapore's food manufacturers to innovate, expand into new markets, and prioritise investments in productivity. More recently, the COVID-19 pandemic has hastened businesses' efforts to adapt in order to thrive within an uncertain and rapidly evolving landscape. Accordingly, the Food Manufacturing workforce is under growing impetus to transform and acquire new skills in preparation for the future of food manufacturing.

To understand the impact of sector trends on the Food Manufacturing workforce, the following key questions were explored through this study:

1

What is the effect of trends and technologies on food manufacturers?

2

How will jobs and skills in the Food Manufacturing sector change as a result?

3

What are the future talent and manpower needs of the sector?

4

What can sector players do to adapt to changes, manage manpower demand, and spur the industry forward?

Summary of key findings

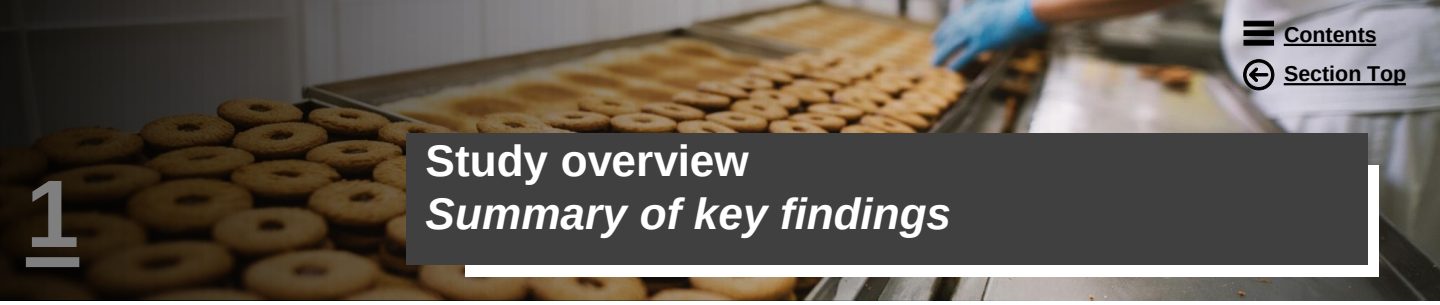
Trends, technologies, and other developments in Food Manufacturing can enable business innovation, growth, and productivity. However, businesses will need to build the right organisational and people capabilities to sustain transformation.

Existing jobs are anticipated to remain relevant in the short- to medium-term[1]. However, job holders will require an extent of reskilling and/or upskilling to prepare themselves for the future, or otherwise risk losing relevancy in the long-term.

The sector's demand for manpower is expected to exhibit a steady increase fueled by business' strategic priorities and growth plans. As a result, businesses will need to effectively leverage available sources of talent to secure the manpower they need.

Key sector players such as food manufacturers, individuals, government agencies, and associations will need to make a concerted effort to enhance capabilities, upskill and reskill the existing workforce, as well as increase the appeal of the sector to better attract and retain talent.

[1]In this study, short-term is defined as between 0 – 2 years; medium-term, 2 – 5 years; long-term, > 5 years.



1 Study overview
Summary of key findings

What is the effect of trends and technologies on food manufacturers?

PRODUCTIVITY – Uplifting productivity and increasing capacity of manufacturing operations through ***digitalisation of operations*** and ***adoption of advanced technologies***

Digitalisation is a crucial enabler of productivity, effective market reach, and successful business outcomes. **Companies will need to adopt digital technologies across multiple functions in an integrated manner to enhance ways of working, decision-making, and overall business decision-making** in order to thrive in an increasingly competitive industry.

In view of technology advancements, food manufacturers will also need to look beyond commonplace solutions and leverage both existing and emerging technologies* to **augment and automate business processes, provide visibility around operational performance, and enable the business to keep pace with a rapidly expanding and evolving consumer market.**

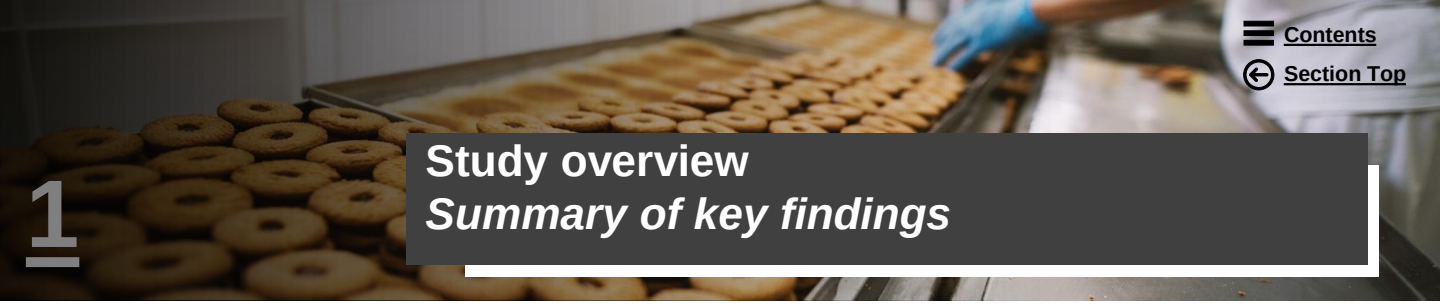
***In addition, the impact of these technologies were explored in this study:**

AI & Big Data	Automated Manufacturing	Autonomous Robots
Digitalisation	E-Commerce	Food Processing and Packaging Technologies
Internet of Things	Manufacturing Analytics	Virtual/ Augmented Reality

INNOVATION – Creating ***differentiated products*** and ***improved business models*** to reap competitive advantages in the industry and remain resilient in a disrupted environment

Changing consumer expectations arising from a combination of changing demographics and eating preferences, exposure to global perspectives and information, as well as progressively health- and wellness-minded consumption, are pushing manufacturers to **grow their capabilities to deliver novel foods** with optimised nutritional content, longer shelf life, more health benefits; and with increased accessibility and convenience to consumers.

Food manufacturers should also consider the concept of business innovation in addition to food innovation, as pressures from within the sector as well as the external global and local environment are push businesses to transform and innovate their businesses in order to cope with disruptions. **New business ideas, channels, and segments are already being launched to capture and sustain business growth, and can be expected to increase in occurrence in coming years.**



1 Study overview
Summary of key findings

What is the effect of trends and technologies on food manufacturers?

INTERNATIONALISATION – Increasing exposure to larger markets and networks through ***expansion overseas*** or ***strategic partnerships with international companies***

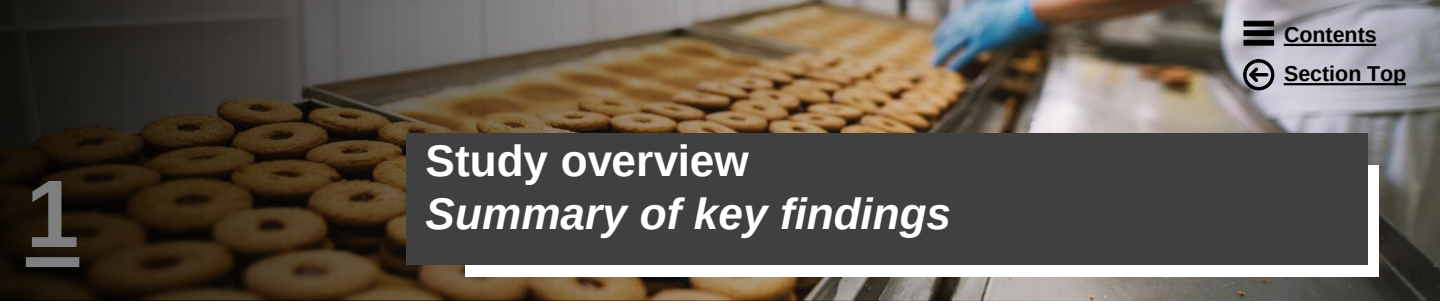
Singapore's reputation as a culinary hotspot, its unique food brands, as well as a supportive ecosystem has empowered local companies to build their businesses overseas, whether directly or through distributorships. **With the increasing saturation of the Singapore consumer market, capturing an overseas market is, and should remain a strategic priority for local food manufacturers.**

In recent years, Singapore's innovation ecosystem has also increased industry ties with international brands, effected through partnerships with local food companies to develop new product lines or distribute food products from overseas, as well as through partnerships with local education institutions to nurture Food Manufacturing talent. **Food manufacturers will need to consider leveraging an increasingly interconnected network to spark innovation and grow their capabilities, thereafter transplanting new knowledge and skills back into their organisation.**

SUSTAINABILITY – Combatting industry practices that threaten the planet's sustainability ***by exploring food tech solutions*** and embracing ***sustainable production***

Shrinking natural resources and the threat of food scarcity compel the sector to explore novel ways of food production. As such, new food technologies are on the rise, seeing industry players across the food value chain **using such technology to increase the volume and quality of raw materials, develop new food sources, and incorporate these new ingredients into known foods**.

The environmental impact of Food Manufacturing is coming under increasing scrutiny. Not only are consumers and manufacturers becoming more sustainability-aware, there is also a national directive for manufacturers to account for packaging use in a bid to become a Zero Waste Nation. Having said that, the **matter of sustainability is also moving beyond packaging and into broader areas like supply chain sustainability and circularity.**



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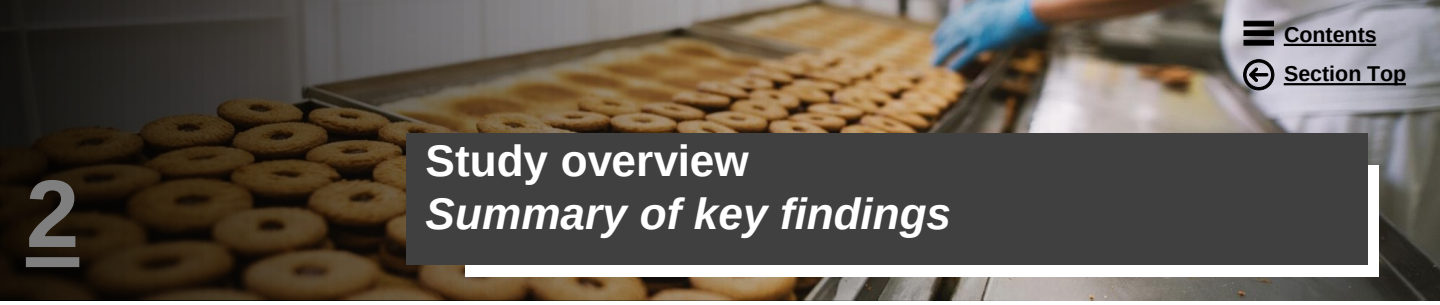
SUSTAINABILITY – Combatting industry practices that threaten the planet's sustainability ***by exploring food tech solutions*** and embracing ***sustainable production***

Considerations for industry players managing the impact of trends were distilled across the 4 key drivers. The considerations are as follows:

1. Developments in food manufacturing and other technologies enable business growth and productivity, but only if manufacturers are able to build capabilities needed to sustain transformation

2. Manpower and talent remain a critical success factor in the sector – businesses and individuals alike will need to enhance their future-readiness by adapting to change, acquiring new skills, and adopting new mindsets

3. Food manufacturers should leverage industry networks to harness synergies, share resources, and boost capabilities, while driving united efforts to influence the desirability of careers in Food Manufacturing



2 Study overview
Summary of key findings

How will jobs and skills in the Food Manufacturing sector change as a result?

An overview of the impact assessment on 22 job roles within the SFw for Food Manufacturing

5 Job roles

will experience a **medium degree of change** in job tasks and will require **job redesign.**
These job roles will transform to take on additional or new duties beyond what is expected, with moderate upskilling or reskilling

- A **moderate** proportion of the job tasks will be substituted by technology or impacted by trends, with human intervention required for high value-adding tasks as against routine, repetitive tasks.
- A fair proportion of the job tasks will be substituted by technology, with human intervention required for value-adding tasks.
- For example, automation, digitalisation, and the use of other advanced technologies such as Internet of Things will augment manual tasks of the **Production Supervisor**, allowing job holders to initiate proactive and data-driven improvements to productivity. As a result, the job holder may need to be reskilled in areas such as business performance management and data analytics.

17 Job roles

will remain **largely unchanged** and **require upskilling**.
These job roles will continue to deliver existing outcomes, with some upskilling required **to keep abreast of developments in the sector**

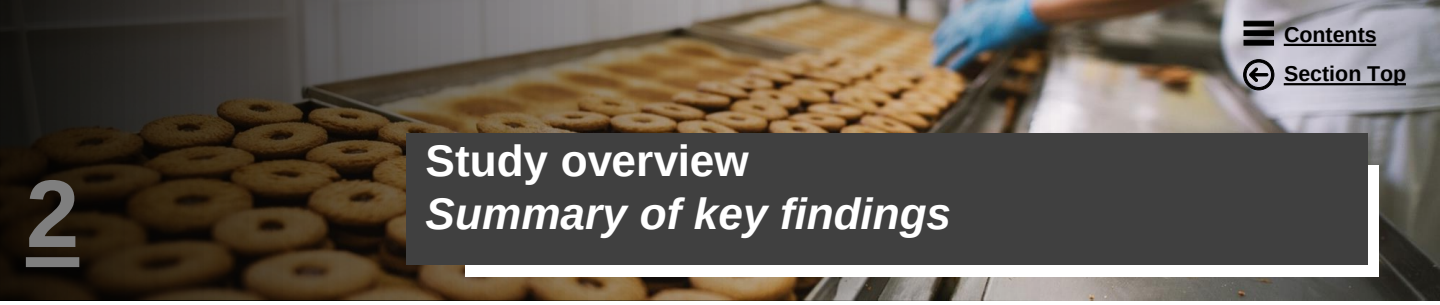
- A **minimal** proportion of the job tasks will be impacted by technology and trends, with some upskilling needed to remain current.
- Job tasks continue to have a high dependence on human intervention, and existing skills or modest upskilling will be sufficient for job holders to remain current.
- For example, the **Food Technologist** would need to acquire some knowledge of emerging food technology to stay abreast of scientific food developments and how they can be used to innovate food products. However, this role, and the tasks and priorities it encompasses, would not be materially changed.

Additionally, according to industry insights, it is unlikely that existing roles will be displaced as a result of trends and technologies in the short- to medium-term

0 job roles

will **experience displacement** as a result of megatrends or technology disruption.
While technologies may augment existing processes and reduce manufacturers' reliance on manpower, this may not necessarily result in obsoletion of jobs. Rather, technology is seen to have an uplifting effect on the existing workforce, mitigating perennial manpower gaps and creation opportunities for reskilling and upskilling of workers. Nevertheless, food manufacturers will need to actively monitor the landscape for further developments and continue to assess their impact on the workforce, while upskilling employees to prepare for future demands.

[1]In this study, short-term is defined as between 0 – 2 years; medium-term, 2 – 5 years; long-term, > 5 years.



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5 Job roles

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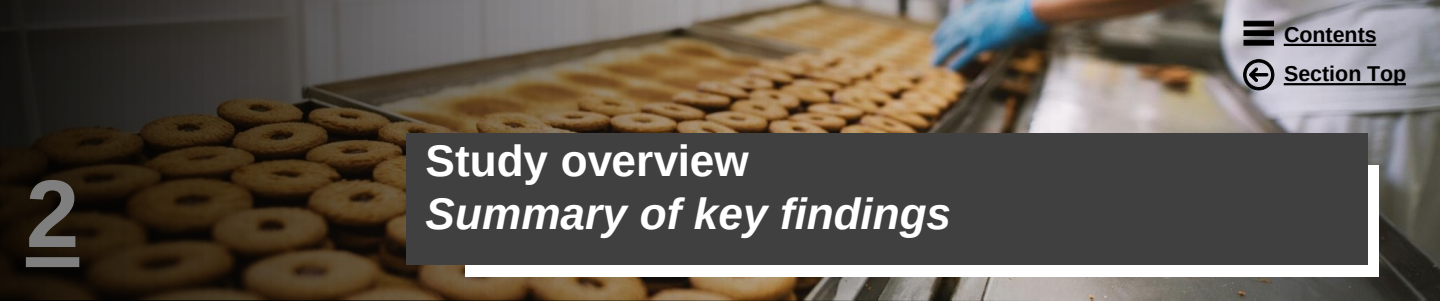
1. Supervisor / Production Planner
2. Process Technician / Maintenance Technician
3. Section Head / Team Leader / Line Operator
4. Production Operator
5. QC Technician / QC Assistant / Laboratory Technician

17 Job roles

will remain **largely unchanged** and **require upskilling**. These job roles will continue to deliver existing outcomes, with some upskilling required **to keep abreast of developments in the sector**

1. Chief Executive/Managing Director
2. Director of Operations / Plant Manager
3. Engineer / Engineering Manager / Maintenance Manager
4. Assistant Engineer / Assistant Maintenance Manager
5. Production Manager
6. QA&QC Manager
7. QA&QC Specialist / Food Safety Specialist / Laboratory Manager
8. QA&QC Supervisor / QA&QC Executive / Laboratory Supervisor
9. Chief R&D Officer
10. Product Technologist / Innovation Manager
11. Food Technologist
12. Assistant Food Technologist
13. R&D Chef
14. General Manager
15. Regional Manager / Export Manager
16. Market Development Manager
17. Assistant Market Development Manager / Market Development Executive

Refer to Section 7 for detailed job dashboards on how specific tasks in the above jobs will be impacted by trends and technologies.



2 Study overview
Summary of key findings

How will jobs and skills in the Food Manufacturing sector change as a result?

In addition, additional or enhanced skills will be required by existing functions in the sector

Production	Quality Assurance and Quality Control (QA&QC)	Research & Development (R&D)	Business Development
Additional Technical Skills and Competencies (TSC)[1] required by these functions			
Business Performance Management	Business Relationship Building	Business Relationship Building	Data Analytics
Data Analytics	Data Analytics	Customer Behaviour Analysis	Emerging Technology
Emerging Technology	Emerging Technology	Data Analytics	Infographics and Data Visualisation
Preventive Maintenance	Technology Application	Emerging Food Technology[2]	Technology Application
Technology Application		Technology Application	
Important Critical Core Skills (CCS)[3] required by these functions			
Adaptability	Adaptability	Adaptability	Adaptability
Collaboration	Collaboration	Collaboration	Collaboration
Communication	Communication	Creative Thinking	Global Perspective
Self-Management	Global Perspective	Problem Solving	Self-Management
Problem Solving	Problem Solving	Transdisciplinary Thinking	Sense Making

… as well as new skillsets that could give rise to emerging job roles

Application of food tech innovations	Automation coding and programming	Data integration, exploration and analysis	Introduction and marketing of novel foods
Industrial production of novel foods	Process engineering and optimisation	Regulatory and legal advisory and compliance	Sustainable manufacturing and management

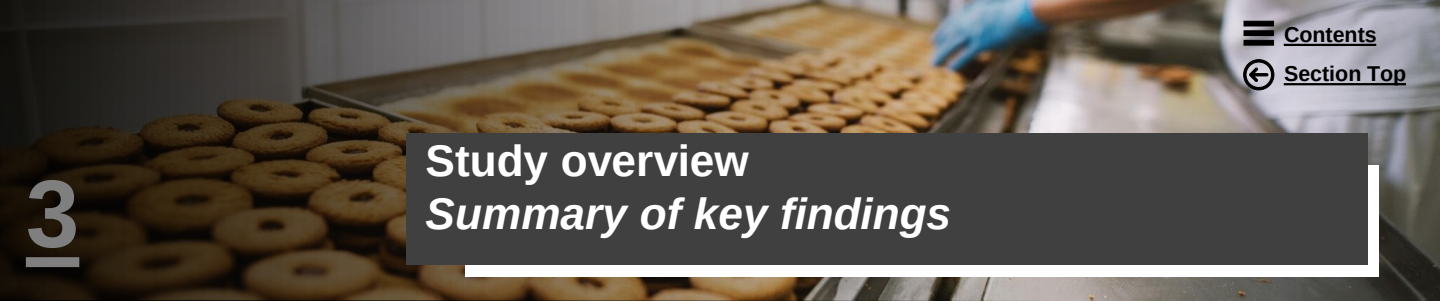
Potential emerging job roles

- **Head of Regulatory Affairs**
- **Process Engineer**
- **Food Biotechnologist**
- **Data Analyst**
- **Novel Foods Technical Services Manager**
- **Sustainability Manager**
- **Bioprocess Engineer**
- **Automation Engineer**

[1]Additional Technical Skills and Competencies (TSC) that are currently not tagged to respective functions' Skills Maps within the Skills Framework (SFw) for Food Manufacturing. Derived from insights from industry across engagement sessions conducted during this study, and aligned to Skills Framework terminology.

[2]A new TSC that does not currently exist within the SFw for Food Manufacturing.

[3]Critical Core Skills (CCS) of importance, derived from industry across engagement sessions conducted during the study and referenced from the Skills Framework (SFw) for Food Manufacturing. Includes skills that are both currently featured and/or new to respective functions' Skills Maps within the SFw for Food Manufacturing.



3 Study overview
Summary of key findings

What are the future talent and manpower needs of the sector?

More than 2,500* jobs over 5 years will be created as the Food Manufacturing sector is projected to experience an average headcount CAGR of 1.8%#

As trends, technological advancements, and other developments impact the food manufacturing sector, job tasks, skills, and expectations of the workforce have begun to evolve.

While food manufacturers' aspirations to innovate, expand, and thrive within the ever-changing landscape will result in a steady and continuous demand for food manufacturing talent, the existing and potential workforce will need to continually progress in the areas of upskilling, reskilling, and technology adoption.

In addition, food manufacturers will also need to consider how they can enhance their ability to attract, retain, and develop talent, ensuring that the manpower and talent demands can be met.

Growth is expected across all functional tracks at varying degrees

Accelerated growth is expected for:

*Functional tracks whose upper range of estimated growth rate is **more than or equal to 1.8%** for the next 5 years*

- Research and Development (4.8%)
- Quality Assurance & Quality Control (2.2%)
- Business Development (2.2%)

Continuous growth is expected for:

*Functional tracks whose upper range of estimated growth rate is **less than 1.8%** for the next 5 years*

- Production (1.6%)
  However, it should be noted that the Production function remains the largest contributor of manpower to the sector (roughly 87% of the total workforce size) and a key function within the sector.

Possible solutions to meet the growing demand for manpower and talent

Given the manpower challenges faced by the sector, such as:

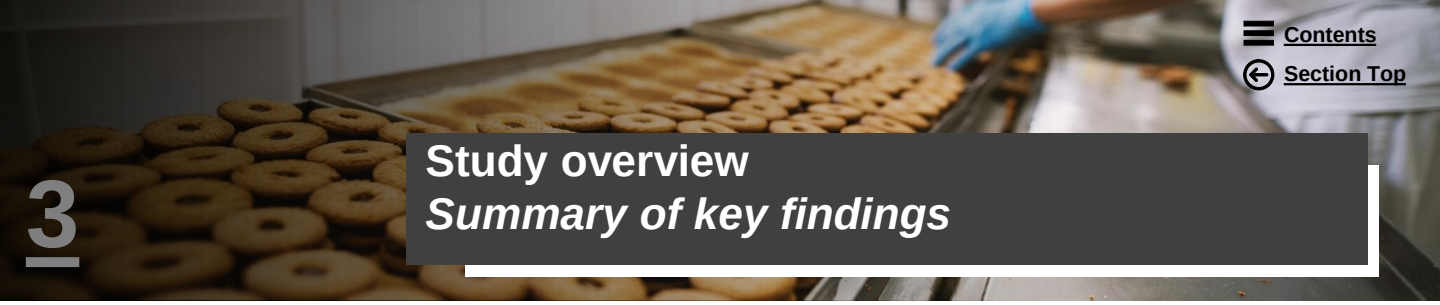
- An ageing workforce
- Uncertain supply of foreign talent
- Singapore's declining birth rate
- Students' interests in other sectors, and corresponding aversion to manufacturing-related industries,

there is a need for food manufacturers to think of creative ways to address manpower and talent demands by enhancing their Employee Value Proposition (EVP) and leveraging other sources of talent to attract new talent.

Food manufacturers can consider alternative sources of talent including Career Conversion Programmes, Work Study Programmes, tapping on inflow from other function tracks or sectors, as well as other measures such as job redesign.

*The sector will experience at least 1.5% headcount growth annually for the period 2022 to 2030, with an average of 1.8% based on sector's demand and historical growth of the sector.

#Compound annual growth rate of manpower



3 Study overview
Summary of key findings

What are the future talent and manpower needs of the sector?

Summary of solutions to meet the growing needs of the sector

Job Redesign

- Typically for medium-impact roles likely to experience a change in tasks as a result of technology implementation, business process review, or in some cases, considerations for mature/aged workers.
- Job redesign, coupled with technology adoption, can mitigate any potential unmet future demand arising from an ageing workforce and/or unstable foreign labour supply by capturing talent from outside of the sector or retaining existing talent, as well as facilitate the uplift of existing workers as they perform new tasks and acquire new skills.
- Information can be found in the detailed job-level Job Dashboards.
- Read more here on how Job Redesign addresses the growing needs of the sector.

Vertical Outflow

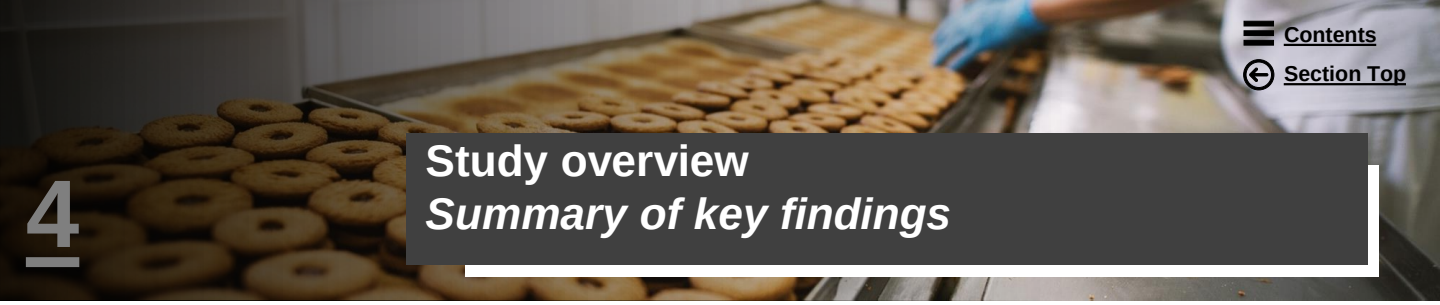
- Bringing in talent from across functional tracks within the company, e.g. Production to Quality Assurance & Quality Control, or R&D to BD, or grooming employees to move to the next level.
- Food manufacturers need to recognise that an individual can have more than one career within a company, and encourage individuals to explore different career paths as a way to retain valued workers and grow the leadership pipeline as well.
- In addition to skills adjacencies, companies should consider individuals' aptitudes and aspirations in facilitating cross-functional movement.
- Read more here on how Vertical Outflow addresses the growing needs of the sector.

Horizontal Outflow

- Talent sources outside of Food Manufacturing sector can be tapped on to mitigate any potential unmet future demand through companies' own recruitment efforts, or national initiatives such as **Career Conversion Programmes.**
- To capture and retain talent from horizontal outflow, food manufacturers will need to evaluate and strengthen employer value proposition.
- This includes evaluating existing career progression, reviewing and revising salary levels as needed in order to remain competitive with other organisations and sectors.
- Read more here on how Horizontal Outflow addresses the growing needs of the sector.

Work-Study Programmes

- Channels fresh graduates with strong foundational knowledge in food manufacturing into the sector
- Targeted at Polytechnic and ITE graduates
- Applicable for Production (Production), Quality Assurance & Quality Control, and R&D
- Read more here on how Work-Study Programmes address the growing needs of the sector.



4 Study overview
Summary of key findings

What can sector players do to adapt to changes, manage manpower demand, and spur the industry forward?

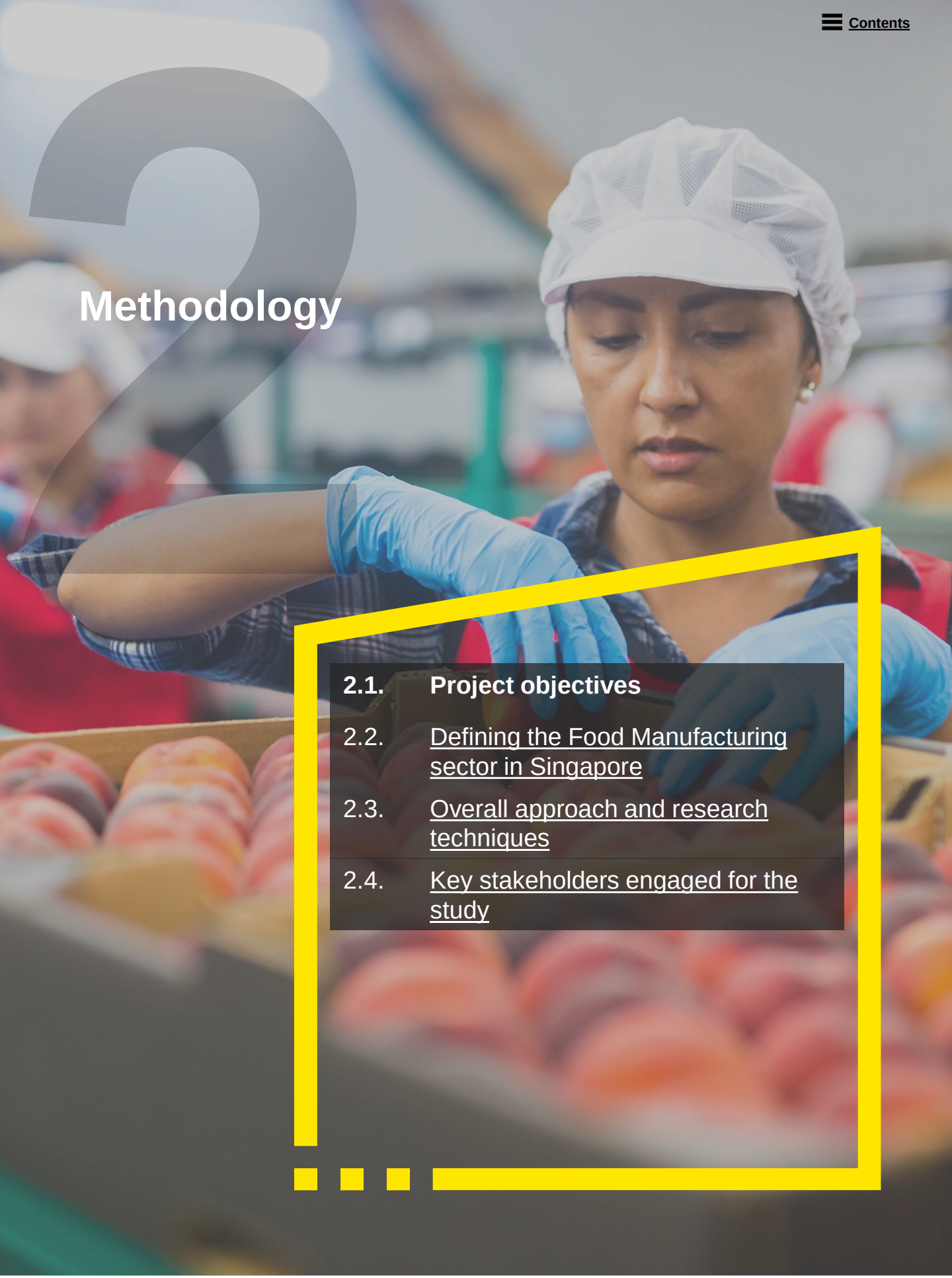
Overview of recommendations

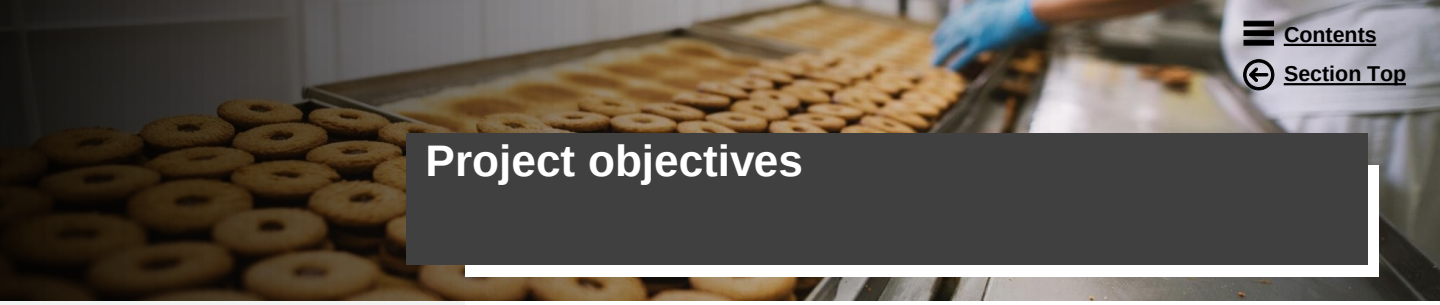
As the Food Manufacturing sector continues to be impacted by trends, technologies, and other developments, key sector players such as food manufacturers, individuals, education institutions will need to work together to uplift the capabilities of business and the workforce, as well as enhance the appeal of the sector to better attract and retain talent.

The following set of recommendations outlines possible ways through which key players within the sector can do their part fo spur the industry forward.

Food Manufacturers	Accelerate efforts to adopt relevant technologies	Leverage available networks and platforms to partner with other industry members to innovate	Emphasise on reskilling and upskilling of the workforce
	Relook at existing jobs in alignment to the future of work in the sector	Embrace talent from outside the Food Manufacturing sector	Reevaluate Employee Value Proposition (EVP) and existing human capital practices
Individuals	Take ownership of picking up new skills and adopt a lifelong learning mindset		
Education Institutions	Drive outreach efforts for Continuing Education & Training (CET) and Work-Study programmes	Raise awareness of career opportunities and pathways in the Food Manufacturing sector	

2 Methodology





Project objectives

This study aims to understand the impact of key global trends and technologies on Singapore's Food Manufacturing sector, with a focus on **envisioning future jobs** and building an ecosystem that nurtures **resilient and competitive talent** equipped with the right skills to thrive in a changing environment.

KEY ACTIVITIES

Identify **key trends and technologies** affecting jobs and skills in Singapore's Food Manufacturing sector in the short-, medium-, and long-term[1]

Assess **impact of key trends** on food manufacturers, Food Manufacturing functions, and the **sectoral workforce**

Understand the **current manpower profile** of the Food Manufacturing sector, and **project the number of jobs that will be created/needed** until 2030

Identify and analyse changes to job roles, critical work functions, key tasks and skills of the workforce in Singapore's Food Manufacturing sector

Identify solutions to assist Singapore's Food Manufacturing sector to manage the impact of key trends, gaps in the workforce, as well as the **opportunities and appropriate responses to challenges and changes** within the sector

[1]Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long-term: > 5 years

2 Methodology

In-scope functional tracks and sub-sectors

Based on the Skills Framework (SFw) for Food Manufacturing, **four functional tracks** in the Food Manufacturing were identified as depicted below:

- Production
- Business Development
- Quality Assurance and Quality Control (QA&QC)
- Research & Development (R&D)

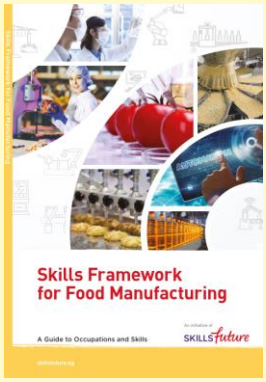
Note: In this study, the following job roles are out of scope as they are typically in-house corporate support roles/roles that fall under different sectors:

- Corporate support roles, such as in admin, HR, IT, and Finance functions
- Supply Chain roles, such as in Warehouse or Logistics functions
- Food Services roles, such as in Retail or Sales functions

However, this study also includes new Food Manufacturing job roles created in response to sectoral trends and changing business needs.

The **SFw for Food Manufacturing** served as the primary reference point to define the scope of the sector, functional tracks and job roles, as well as the existing skills and competencies.

Click on the image on the right for more information on the SFw.



The agencies and EY jointly reached out to companies across 11 Food Manufacturing sub-sectors

- Food Tech
- Confectionery & Snacks
- Dairy
- Edible Oils & Spices
- Sauces
- Noodles
- Beverage
- Seafood
- Cooked Food
- Bakery
- Meat

In-scope functional tracks and job roles

SFw for Food Manufacturing Career Map

Production

Chief Executive / Managing Director

Director of Operations / Plant Manager

- Engineer / Engineering Manager / Maintenance Manager
- Assistant Engineer / Assistant Maintenance Manager
- Process Technician / Maintenance Technician
- Production Manager
- Supervisor / Production Planner
- Section Head / Team Leader / Line Operator
- Production Operator

Quality Assurance and Quality Control (QA&QC)

- QA&QC Manager
- QA&QC Specialist / Food Safety Specialist / Laboratory Manager
- QA&QC Supervisor / QA&QC Executive/ Laboratory Supervisor
- QC Technician / QC Assistant / Laboratory Technician

Research & Development (R&D)

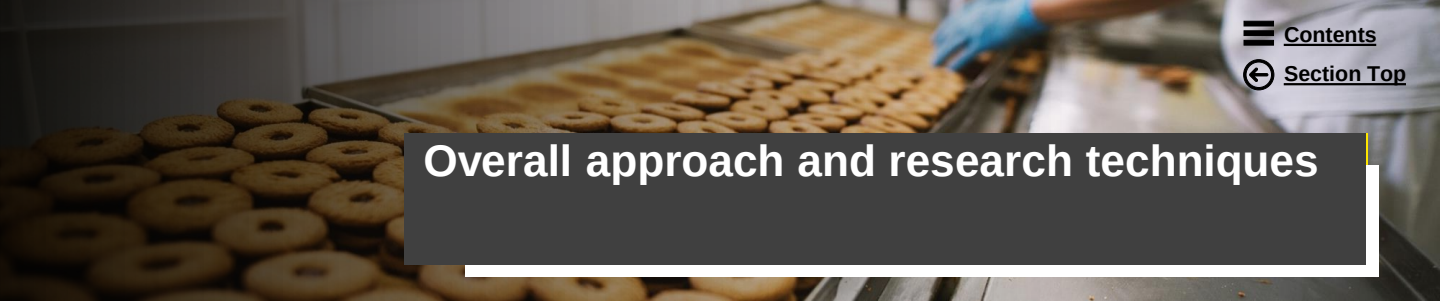
Chief Executive / Managing Director (cont'd)

- Chief R&D Officer
- Product Technologist / Innovation Manager
- Food Technologist
- Assistant Food Technologist
- R&D Chef

Business Development

- General Manager
- Regional Manager / Export Manager
- Market Development Manager
- Assistant Market Development Manager / Market Development Executive

2 Methodology



Overall approach and research techniques

We adopted a **four-step approach** and utilised various qualitative and quantitative research techniques to generate insights and meet the objectives of the study.

APPROACH

1 Local and global trends scoping

As a first step, we **identified key trends** affecting the sector, jobs, and skills that will have a significant impact on the Food Manufacturing workforce. Next, we **consulted EY SMEs and conducted in-depth interviews with key industry players** to validate trends and solicit inputs for our preliminary impact analysis on jobs and skills. These formed the basis for subsequent impact analysis.

2 Jobs and skills impact analysis

To assess the **impact of trends and technologies** on job roles, we utilised qualitative and quantitative techniques to identify:

- Job roles that require job redesign
- Future skills required to perform the existing and evolving job roles
- Emerging job roles being created in the sector.

3 Manpower study

We analysed the historical headcount and wage trends in the Food Manufacturing sector to **identify demand projections** for the sector, up to 2030.

4 Recommendation

As a final step, we used the insights gathered to develop **recommendations** to help the sector move forward.

RESEARCH TECHNIQUES

Thought Leadership and Research

- Thought leadership from ESG, WSG, EY
- Academic publications
- Research papers

Industry Insights

- Executive Interviews with selected industry players
- Focus Group Discussions
- Consultations with EY Subject Matter Experts[1]

Data Sources

- Internal data[2]
- Company Surveys[3]
- IHL Surveys[4]

[1]EY professionals with subject matter expertise across the Food value chain
[2]Obtained from relevant government agencies
[3]Surveys released to Food Manufacturers on workforce demographics and projections
[4]Surveys released to Institutes of Higher Learning on cohort size and graduation size of food manufacturing-related courses

Overall approach and research techniques & Details of Step 1 and Step 2

1 IDENTIFY TRENDS

- Identified key trends affecting **the sector, jobs, and skills** that will have a significant impact on the Food Manufacturing workforce

2 VALIDATE TRENDS

- Conducted Executive Interviews with selected industry players to validate trends and **solicit inputs for preliminary impact analysis** of jobs and skills

3 DEVELOP DASHBOARDS

- Conducted **preliminary assessment** of **impact on jobs and skills**, and developed job dashboards describing nature, extent and time horizon of impact

4 VALIDATE DASHBOARDS

- Conducted **Focus Group Discussions (FGDs)** with representatives from food manufacturers and education institutions to **validate assessment of impact on jobs and skills**

5 REFINE DASHBOARDS

- Made refinements to the dashboards **based on qualitative inputs from FGDs**

6 DEVELOP JOBS AND SKILLS IMPACT ANALYSIS

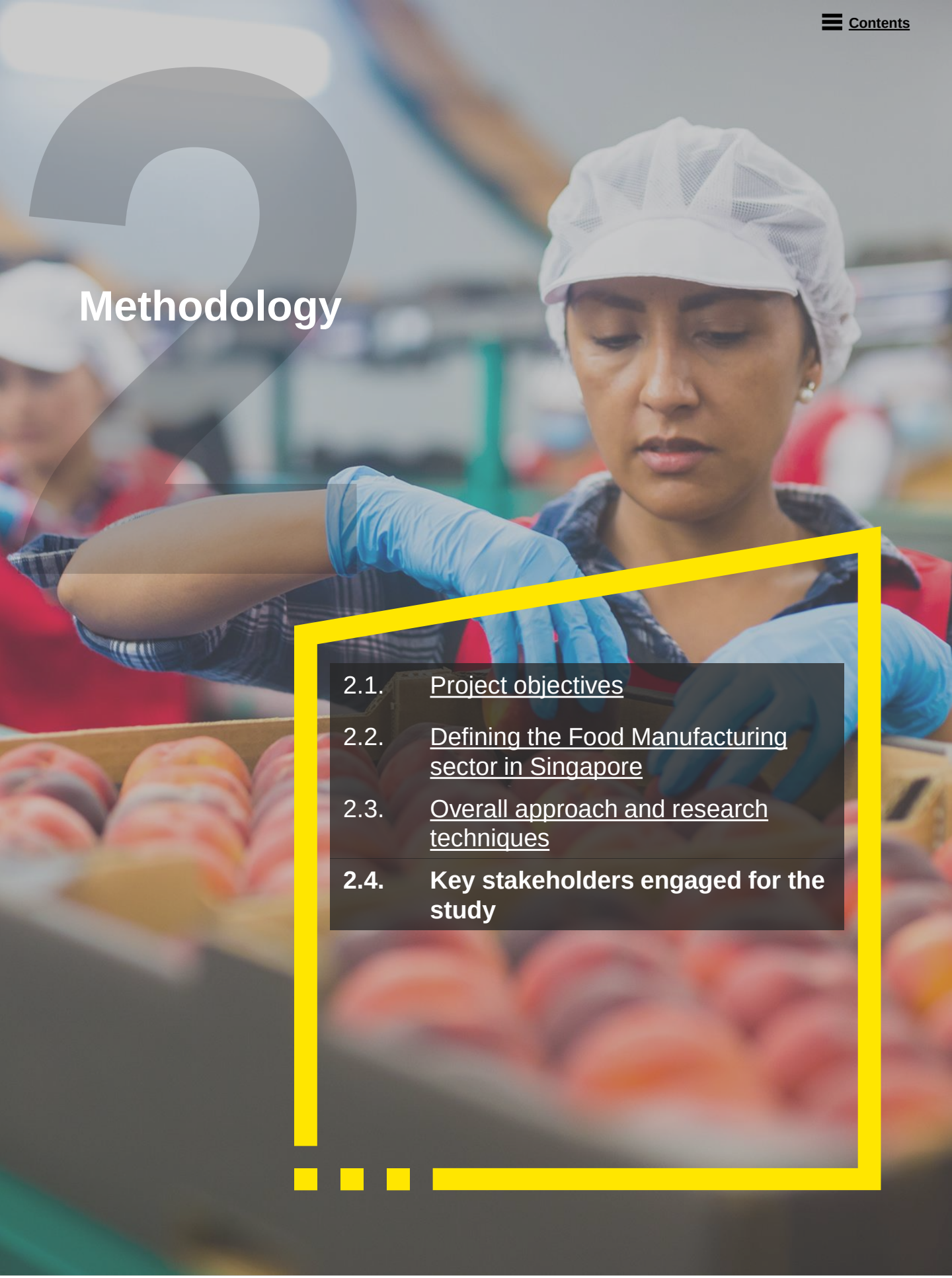
- **Consolidated findings** to develop final analysis of impact on jobs and skills, and **identified solutions** to manage the impact of trends

29 engagement sessions conducted

1. In-depth Interviews	2. Focus Group Discussions (FGDs)
Conducted **22**[1] in-depth interviews with key stakeholders in the Food Manufacturing sector to **gather insights** on sector trends, skills and capabilities required of the sector and to identify emerging jobs within the sector	Conducted **7 Focus Group Discussions** with representatives from food manufacturers and education institutions to **validate assessment** on the impact to jobs and skills within the sector

[1]Includes 21 Executive Interviews conducted with Food Manufacturers and 1 interview with the Food and Drinks Allied Workers Union (FDAWU)

2 Methodology



Overview of key stakeholders

2	42	1	7
Government Agencies	**Food Manufacturers**	**Trade Associations, Chambers, and Unions**	**Education Institutions**

• Enterprise Singapore
• Workforce Singapore
• Ministry of Manpower
• SkillsFuture Singapore
	• 42 food manufacturers jointly identified by agencies and EY, who represent the sector across 11 main sub-sectors
	  ○ Bakery
	  ○ Beverages
	  ○ Cooked food
	  ○ Dairy
	  ○ Food tech
	  ○ Meat
	  ○ Noodles
	  ○ Oils and spices
	  ○ Sauces
	  ○ Seafood
	  ○ Snacks and confectionery
	  ○ Others
		• Food, Drinks, and Allied Workers' Union
		
		The project team also received support from Singapore Food Manufacturers' Association, Singapore Bakery & Confectionery Trade Association in reaching out to the sector
			• Nanyang Technological University (NTU)
			• Singapore Institute of Technology (SIT)
			• Singapore University of Technology and Design (SUTD)
			• Republic Polytechnic (RP)
			• Singapore Polytechnic (SP)
			• Temasek Polytechnic (TP)
			• ITE College East

For a full list of the participating organisations, please refer to the Appendix – Acknowledgments

Food Manufacturing trends

Overview of challenges, drivers of growth, and technology enablers impacting the sector

Through in-depth executive interviews and focus group discussions, **5 challenges, 4 drivers of growth, and 9 technology enablers** have been identified in this study as key factors having an impact on jobs and skills in the Food Manufacturing sector.

- **Challenges** describe the external and internal pressures faced by food manufacturers
- **Drivers of growth** describe food manufacturers' responses to challenges faced
- **Technology enablers** describe available technological solutions to support various drivers of growth

CHALLENGES

- Manpower and talent shortages
- Changing consumer expectations
- Saturated local consumer market
- Lack of natural resources

*COVID-19 exerting a **compounding effect** on challenges*

DRIVERS OF GROWTH

While the sector faces significant challenges, there are avenues for growth[1]…

- **Productivity** enabled by digitalisation and advanced technologies
- **Innovation** of food products and business models and processes
- **Internationalisation** through expansion into other markets and strategic partnerships
- **Sustainability** of food sources and manufacturing practices

TECHNOLOGY ENABLERS

Enabled by the following developments and technologies in the sector…

AI & Big Data	Automation	Autonomous Robots
Digitalisation	E-Commerce	Food Processing and Packaging Technologies
Internet of Things	Manufacturing Analytics	Virtual/ Augmented Reality

Details on **challenges, drivers of growth**, and **technology enablers** can be found on the following pages.

[1] Adapted from strategic levers described in the Industry Transformation Map for Food Manufacturing

Challenges impacting the sector

The following challenges were derived from industry insights gathered across various engagement sessions such as executive interviews and focus group discussions, and capture key concerns raised by food manufacturers across a variety of sub-sectors.

CHALLENGES

Manpower and talent shortages

Shortage of local talent continues to be a persistent challenge for food manufacturers. Reasons include **mismatch between the type of capabilities and skills sought after by employers** and the talent that is currently available, and **negative perceptions of the working environment and prospects** offered by the sector.

Changing consumer expectations

Consumers are resetting their expectations and food manufacturers need to deliver to the needs of the smart consumer. Shifts that companies are seeing include an **increased focus on health, wellness, and sustainability**, as well as the **rise of the homebody economy** and preference for **shopping online.**

Saturated local consumer market

Given Singapore's small population, food manufacturers operate in a consumer market **highly saturated by both local and imported products**. To remain competitive, manufacturers will have to **differentiate their brand, continuously innovate, and expand their reach to other international markets.**

Lack of natural resources

Due to Singapore's small land mass and limited agricultural output, a significant proportion of food and ingredients have to be **imported from elsewhere in an increasingly disrupted world**, posing a challenge to the nation's food security and **requiring diversified, and agile import strategies and networks**.

COVID-19 exerting a compounding effect on sectoral challenges

COVID-19 has presented major obstacles to the industry in the form of **disrupted global food supply chains, heightened regulations on food and workplace health and safety, and restricted labour supply**. Manufacturers have had to reevaluate and innovate business models as well as adopt creative solutions to mitigate a shortfall in resources.

Drivers of growth and technology enablers impacting the sector

In response to challenges, the broad sector leverages the following drivers of growth coupled with technology enablers that allow food manufacturers to thrive in a dynamic and evolving environment. Both components will need to be considered in tandem while exploring impact to manufacturers, jobs, and skills.

DRIVERS OF GROWTH

1. **Productivity** – Uplifting productivity and increasing capacity of manufacturing operations through digitalisation of operations and adoption of advanced technologies
2. **Innovation** – Creating differentiated products and improving business models to reap competitive advantages in the sector and remain resilient in a disrupted environment
3. **Internationalisation** – Increasing exposure to larger markets and networks through expansion overseas or strategic partnerships with international companies
4. **Sustainability** – Combatting industry practices that threaten the planet's sustainability by exploring food tech solutions and embracing sustainable production

TECHNOLOGY ENABLERS[1]

AI and Big Data
Collection and analysis of massive datasets with the help of artificial intelligence to swiftly understand trends and derive actionable business insights.

Automation
Use of machines to automate Food Manufacturing activities, such as conveyor belts, automated ovens, cutting and forming machines, mixers and blenders.

Autonomous Robots
The use of robots are emerging additions to production and can reduce manual labour and human intervention by independently performing activities such as sorting and transportation.

Digitalisation
Adopting digital ways of working through a host of business solutions that span across and connect various activities and information across an organisation.

E-Commerce
Expansion of the business into the e-commerce space through leveraging online retailers to market products directly to consumer, or even developing a proprietary e-shop.

Food Processing and Packaging Technologies
Methods and technologies relating to the packaging and processing of food products to allow for innovation, better taste, quality, shelf-life etc.

Internet of Things
Leveraging interconnection via the internet of computing devices embedded in food production equipment and machinery, enabling them to send and receive data in real-time.

Manufacturing Analytics
Using operations and events data gathered in real time to ensure quality, increase yield, and optimise processes and resources to improve production performance.

Virtual/Augmented Reality
Technologies relating to the creation and delivery of an enhanced or simulated version of the real physical world, to improve or substitute a human experience.

[1] Adapted from strategic levers described in the Industry Transformation Map for Food Manufacturing

Impact of growth drivers and technology enablers to food manufacturers

1

DRIVER | PRODUCTIVITY
Through digitalisation and advanced technologies

DIGITALISATION

Food manufacturers recognise digitalisation as a crucial enabler of productivity, effective market reach, and successful business outcomes. **Companies will need to adopt digital technologies across multiple functions in an integrated manner to enhance ways of working, decision-making, and overall business decision-making** in order to thrive in an increasingly competitive industry.

Impact to food manufacturers

- Food manufacturers across different stages of business growth and digital maturity are progressively exploring and adopting digital solutions to optimise resources, streamline operations, and interconnect business functions. Companies that are delayed on the uptake will risk foregoing the productivity gains needed to sustain and grow the business.
- Solutions include digital checklists and forms, implementation of various digital systems such as Enterprise Resource Planning systems, Supervisory Control and Data Acquisition (SCADA) Plant Management, Manufacturing Execution System, Warehouse Management Systems, and Inventory Management Systems.
- As companies implement these solutions, they will need to engender transformation in workers' mindsets as well as adoption of new skillsets to transit the workforce into an increasingly digital environment.

ADVANCED TECHNOLOGIES

In view of technology advancements, food manufacturers will also need to look beyond commonplace solutions and leverage new technologies to **augment and automate business processes, provide visibility around operational performance, and enable the business to keep pace with a rapidly expanding and evolving consumer market.**

- Food manufacturing companies are also increasingly venturing into advanced technologies, such as Industrial Internet of Things (IIoT), intelligent automation and robotics, Artificial Intelligence (AI) and Big Data, and to a lesser extent, Blockchain, Augmented and Virtual realities (AR/VR), as well as additive manufacturing to enhance productivity and efficiency.
- While such technologies augment existing processes and may reduce manufacturers' reliance on manpower, this may not necessarily result in obsoletion of jobs. Rather, technology is seen to have an uplifting effect on the existing workforce, mitigating perennial manpower gaps, allowing for reskilling of workers, and enhancing the value of Food Manufacturing jobs across all functions.
- Consequently, food manufacturers will need to deftly manage organisational changes arising from the adoption of advanced technologies, and ensure that sufficient training and support are provided to employees to adjust to new ways of working.

Impact of growth drivers and technology enablers to food manufacturers

2

DRIVER | INNOVATION
Of food products and business models and processes

FOOD INNOVATION

Changing consumer expectations arising from a combination of changing demographics and eating preferences, exposure to global perspectives and information, as well as progressively health- and wellness-minded consumption, are pushing manufacturers to deliver novel foods with **optimised nutritional content, longer shelf life, more health benefits; and with increased accessibility and convenience to consumers.**

Impact to food manufacturers

- Food manufacturers are and should continue to develop new products and modify existing recipes to cater to consumers' changing tastes and preferences for healthy eating without compromising on taste.
- In addition, they will need to adjust to shifting modes of consumption, such as increased online buying, home-cooking, demand for ready-to-consume products, and single-serving portions – these require investments not only in recipe development and modification, but improved processing and packaging methods or technologies to preserve quality and extend shelf-life.
- To identify viable opportunities for food innovation and develop suitable products, food manufacturers should explore means to collect, harness, and apply consumer data and insights, and inform the product development process.

BUSINESS INNOVATION

Pressures from within the sector and the external global and local environment are pushing food manufacturers to transform and innovate their businesses in order to cope with disruptions. **New business ideas, channels, and segments are being launched to capture and sustain business growth.**

- As food manufacturers' customers – both individuals and businesses – change the way they shop, companies have begun to sell on digital as well as in established physical marketplaces. While many companies seem to swiftly adopt a multichannel approach, they may also soon need to pivot to omnichannel to remain competitive by offering a seamless customer experience, as well as showcasing a strong and consistent brand.
- Food manufacturers will need to look for creative ways to expand and sustain the business, such as exploring new business segments like contract manufacturing for other manufacturers or food establishments, spinning off business functions to commercialise services, or even acting as a distributor for other Food Manufacturing brands. Business leaders are therefore required to look beyond day-to-day operational challenges to craft a long-term growth vision for the company.

Impact of growth drivers and technology enablers to food manufacturers

3

DRIVER | INTERNATIONALISATION
Through expansion into other markets and strategic partnerships

OVERSEAS EXPANSION

Singapore's reputation as a culinary hotspot, its unique food brands, as well as a supportive ecosystem has empowered local companies to build their businesses overseas, whether directly or through distributorships. **With the increasing saturation of the Singapore consumer market, capturing an overseas market remains a strategic priority for food manufacturers.**

Impact to food manufacturers

- To thrive in international markets, food manufacturers will need to build a deep and real-time understanding of the competitive environment and target consumers (e.g., carry out competitor intelligence and consumer demand analysis, study local flavours and tradition, etc.) in order to develop and sell differentiated products that appeal to local tastes and preferences.
- In addition, food manufacturers will need to employ suitable strategies of expansion that consider multiple factors such as brand visibility, time-to-market, logistics-associated costs, and price competitiveness.
- In anticipation of the growing demand for products, food manufacturers will need to increase production capacity, ensure that requisite safety and quality standards are being adhered to, and finally, that relevant export regulations have been complied with to facilitate the smooth transfer of products across borders.

STRATEGIC PARTNERSHIPS WITH OVERSEAS COMPANIES

In recent years, Singapore's innovation ecosystem has **encouraged increased industry ties with international brands**, effected through partnerships with local food companies to develop new product lines or distribute food products from overseas, and partnerships with local education institutions to nurture Food Manufacturing talent.

- Food manufacturers can tap on a growing network of partners to pursue food innovation projects. These are especially attractive to small- and medium-sized enterprises who may not have the knowledge, resources, and expertise required to carry out such projects.
- While these partnerships may jumpstart manufacturers' foray into Research and Innovation, they will also need in-house capabilities to scale pilot projects and incorporate new products or processes into their existing operating environment.

Impact of growth drivers and technology enablers to food manufacturers

4

DRIVER | SUSTAINABILITY
Of food sources and manufacturing practices

RISE OF FOOD TECH

Shrinking natural resources and the threat of food scarcity compel the sector to explore novel ways of food production. As such, new food technologies are on the rise, seeing industry players across the food value chain **using such technology to increase the volume and quality of raw materials, develop new food sources, and incorporate these new ingredients into known foods**.

Impact to food manufacturers

- With advancements in high-tech farming, urban agriculture, and aquaculture, food manufacturers should begin to explore and discover new sources of raw materials, while also improving Food Manufacturing processes to ensure that improvements in quality in raw materials can be preserved and passed on to end consumers.
- In addition, the sector should anticipate a rise in consumer awareness and demand for emerging food such as alternative proteins, cultivated proteins and nutraceuticals, as the relevant technologies and know-how become increasingly available, and these products become more accessible to the mass market. Food tech companies will need to scale production quickly, ensuring the right facilities, equipment, people, and processes are in place to support market demand.
- In a similar vein, food manufacturers in other sub-sectors should begin to explore opportunities to incorporate such new ingredients into new or existing product lines.

SUSTAINABLE PRODUCTION

The environmental impact of Food Manufacturing is coming under increasing scrutiny. Not only are consumers and manufacturers becoming more sustainability-aware, there is also a national directive for manufacturers to account for packaging use in a bid to become a Zero Waste Nation. Having said that, the **matter of sustainability is also moving beyond packaging and into broader areas like supply chain sustainability and circularity.**

- Food manufacturers need to evaluate the sustainability of established business processes and activities, such as raw materials sourcing and procurement as well as production.
- In addition, manufacturers will be required to adopt a judicious approach in the use of unrecyclable packaging material as the government puts in place mandatory reporting of packaging usage. Manufacturers may even have to begin exploring packaging alternatives in anticipation of growing national measures to drive sustainability.
- Finally, food manufacturers have begun and should increasingly discover ways to upcycle by products of manufacturing activities and even seek opportunities to re-purpose food wastes and commercialise it to other stakeholders in the food value chain such as agriculture or aquaculture enterprises, or even to the mass consumer market.

Considerations arising from impact to food manufacturers

Considerations for industry players managing the impact of trends were distilled across the 4 key drivers and are as follows:

Developments in food manufacturing and other technologies enable business growth and productivity, but only if manufacturers are able to build capabilities needed to sustain transformation	• Generally, there is a need for capabilities in scaling and managing technology adoption, scaling food research and innovation projects (including scaling up of emerging food pilots to industrial production), e-commerce and omnichannel management, as well as in undertaking sustainability initiatives. • While these capabilities may be outsourced or hired on contractual basis in the short-term, food manufacturers will need to start planning for upskilling of the current workforce, or talent acquisition, in order to implement and sustain pilot projects or initiatives that demonstrate business value.
Food manufacturers can derive mutual benefit from partnerships with other industry members, whether company, associations, or education institutions	• In resource-limited Singapore, food manufacturers stand to gain significant advantages from partnering or collaborating with others in the industry. For example, partnerships between SMEs and MNCs support the former in gaining deep technical expertise, and the latter in gaining exposure and platforms for joint-distribution and development. • Likewise, companies that partner with research houses and institutes also reap upsides from an exchange of knowledge, sharing of resources, and in the case of partnerships with education institutions, opportunities to groom and attract potential talent.
Manpower and talent remain a critical success factor in the sector, industry members have a part to play in influencing the desirability of careers in Food Manufacturing	• While food manufacturers' adoption of advanced technologies and development of innovative foods may gradually elevate the perception of the tasks performed and create better desirability for the sector, companies will also have to evaluate their workforce practices (e.g., availability of career development opportunities, redesigning roles to increase value-add, etc.) to enhance their value proposition as employers. • Additionally, education institutions and government agencies also play a role in creating awareness of the sector and highlighting it as an industry of choice to potential talent, whether fresh graduates or mid-careerists.

Refer to **Section 6** for detailed recommendations on how food manufacturers can mitigate the impact of challenges and leverage trends and technologies to move forward.

Impact to functions in Food Manufacturing

PRODUCTION

- While jobs in this function will continue to be in demand as businesses grow, **attracting and retaining talent are key challenges** for the sector due to shrinking talent sources, particularly from overseas, as well as low public perceptions of the nature of work and career opportunities.
- The growing use of advanced technologies will **enable greater visibility of labour productivity and machine utilisation on the shopfloor**, and even replace manual tasks to alleviate manpower challenges and **make room for more value-added activity on the shopfloor, leading to the redesign and uplift of ground-level production roles.**

QA&QC

- Job holders in this function will need to **stay abreast of changing food regulations both in Singapore and in overseas target markets** in order to advise on quality assurance and quality control procedures, as well as necessary adaptations to manufacturing processes.
- The growing use of advanced technologies **will improve the ability to monitor and detect hygiene and quality lapses, safeguarding food safety and reducing possible food recalls**, as well as enabling the ability to track product quality post-distribution. This function will need to be familiar with and even adopt these technologies to meet consumers' heightened expectations on food safety and quality.

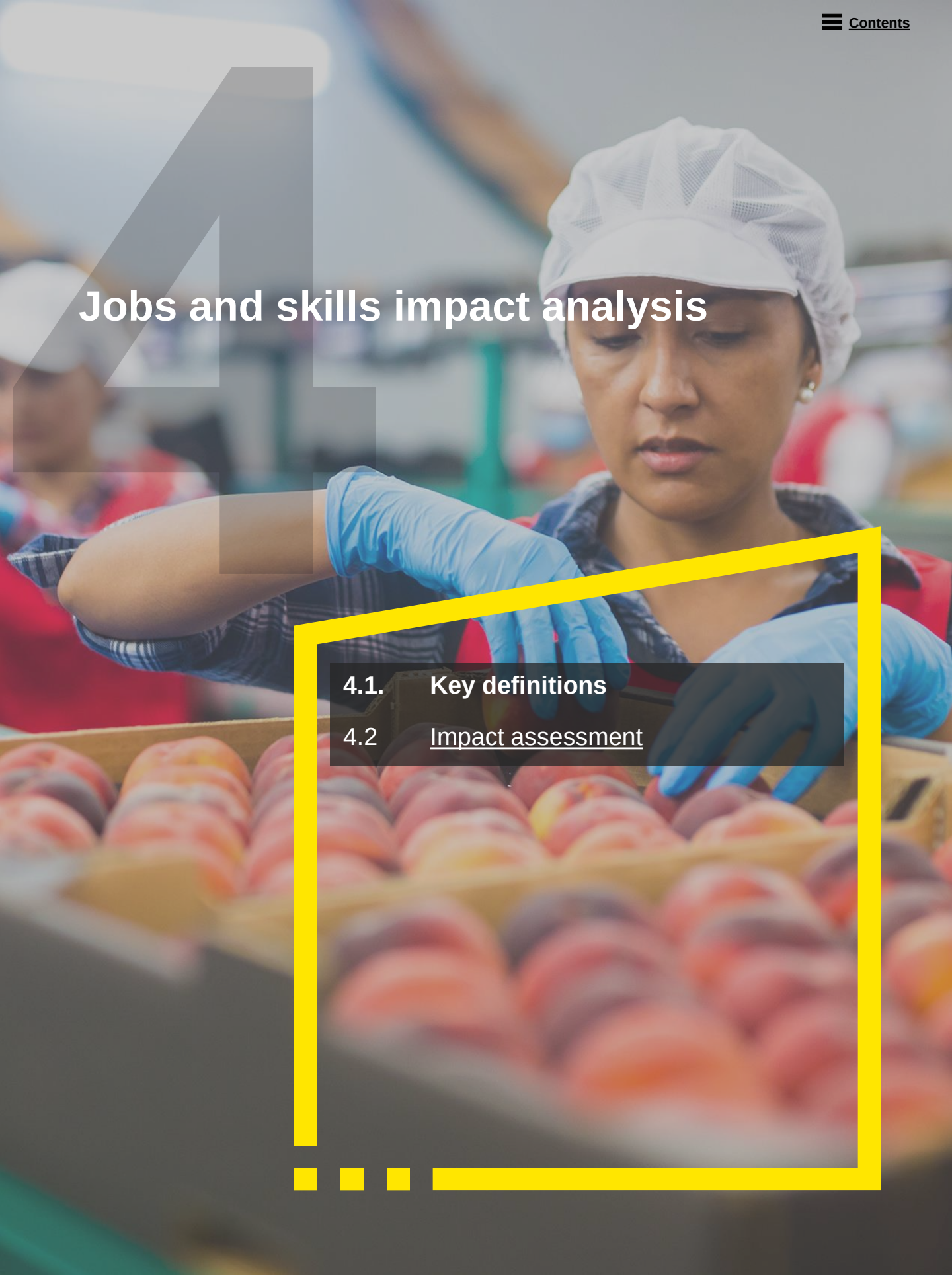
BD

- This function will need to **spearhead the growth of new business segments and channels**. This would require a development of new skillsets such as having a global perspective, and job holders will need to **creatively source for revenue streams, manpower, capabilities, and space to support new business directions.**
- The growing use of digital platforms and advanced technologies will not only enhance the **availability of consumer data and businesses' ability to harness and draw new insights** from this information, but also **enhance the overall customer experience** in order to remain a competitive, top-of-mind brand for consumers.

R&D

- Given global food issues and changing consumer expectations, this function remains key to driving new product development and must stay abreast of, or even apply breakthroughs in the industry to remain competitive and relevant.
- A niche group of research and development personnel qualified in the areas of alternative protein research and production is also emerging, with potential future demand for local talent in relevant disciplines such as bioengineering and chemical engineering.
- The role of the Assistant Food Technologist will shift to be filled by more interns instead of full-time staff – this creates opportunities for manufacturers to capture and groom potential young talent by providing exposure to and generating interest in the sector.

4 Jobs and skills impact analysis



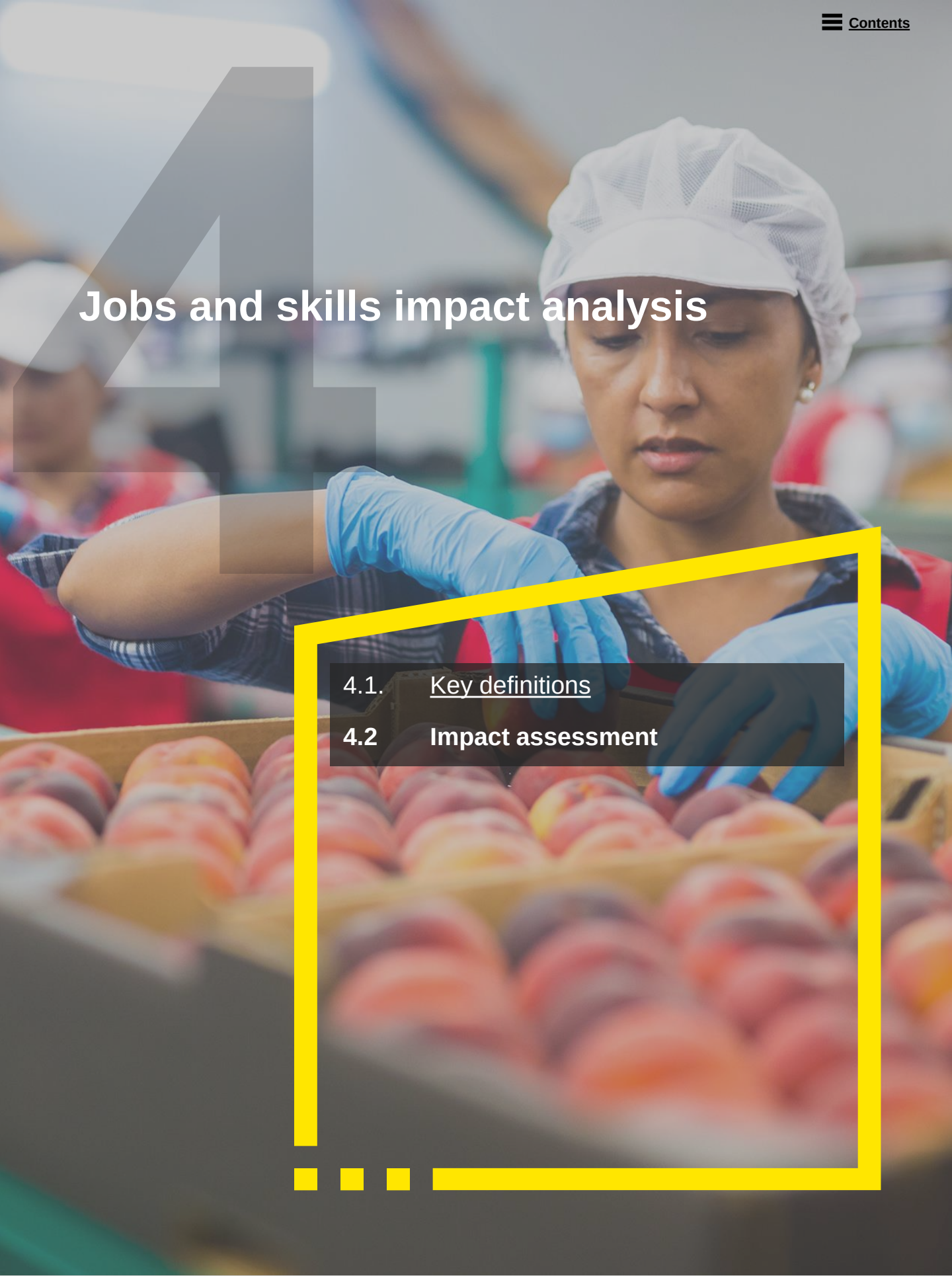
Job role impact assessment
Key definitions

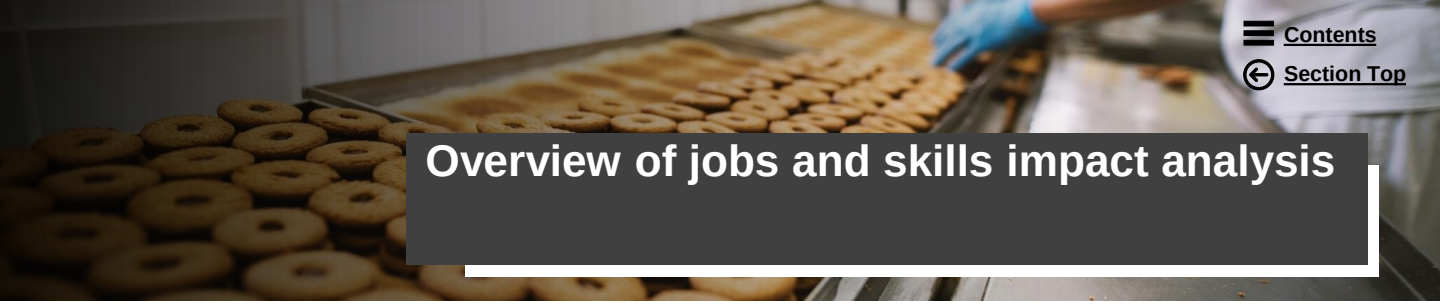
DEGREE OF CHANGE IN JOB TASKS	EXPECTED OUTCOMES
HIGH (H)	A **SIGNIFICANT** proportion of the job tasks will be impacted by technology and trends, thus minimising or eliminating the need for human intervention	The job role will undergo **DISPLACEMENT** Job role will become obsolete i.e. it will converge with another job role and/or be replaced by new job roles
MEDIUM (M)	A **MODERATE** proportion of the job tasks will be substituted by technology or impacted by trends, with human intervention required for high value-adding tasks as against routine, repetitive tasks	The job role will require **REDESIGN** A fair proportion of the job tasks will be substituted by technology, with human intervention required for value-adding tasks
LOW (L)	A **MINIMAL** proportion of the job tasks will be impacted by technology and trends, with some upskilling needed to remain current	The job role will change **INCREMENTALLY** Job tasks continue to have a high dependence on human intervention, and existing skills or modest upskilling will be sufficient for job holders to remain current

TIME HORIZON OF IMPACT*		
Short-term Current to 2 years	**Medium-term** 2 to 5 years	**Long-term** > 5 years

*Time horizon of impact is independent across the degree of change in job tasks

4 Jobs and skills impact analysis





Overview of jobs and skills impact analysis

Given the challenges, trends, and technologies at play, job holders in the Food Manufacturing sector need to pivot to the **new ways of working and upskill/reskill to remain relevant to the needs of the sector**. The subsequent jobs and skills impact analysis aims to study **3 key areas of the Food Manufacturing workforce** in Singapore.

How will jobs evolve with trends and technologies?

Based on the SFw for Food Manufacturing, the study examined the impact of trends and technologies on a total of 4 functional tracks and 22 job roles.

The study uncovered tasks that would be automated, augmented, or remain unchanged. Accordingly, each role is assessed to be highly, moderately, or minimally impacted, resulting in displacement, job redesign, or incremental changes respectively.

OUTCOME: 22 job dashboards highlighting changes to job roles – how tasks will evolve based on trends and technologies, and the time horizon for expected changes

What new and additional skills are required for the sector?

Through industry engagements across this study, we sought inputs from sectoral players on new or additional skills sought by the sector.

The study uncovered both technical and critical core skills required by the industry at a functional level, which are aligned to the Skills Framework for Food Manufacturing.

OUTCOME: Identified additional or enhanced skills required by existing functions within the SFw for Food Manufacturing, with another **8 broad emerging sets**

What are the possible emerging job roles within the sector?

Following the identification of new and additional skills required, possible emerging job roles were uncovered through the study's research on emerging roles as well as insights from industry engagements. The pace of creation of these roles range from short-, medium-, to long-term, and include roles that can either absorb existing workforce through upskilling, or would require the attraction of new talent from outside the Food Manufacturing sector.

OUTCOME: Job descriptions for 8 emerging roles and 4 reskilling roadmaps to illustrate mobility of existing food manufacturing talent into applicable emerging roles

A snapshot of the impact assessment for each role

SFw for Food Manufacturing Career Map

Production		Quality Assurance and Quality Control (QA&QC)
Chief Executive / Managing Director L		
Director of Operations / Plant Manager L		
Engineer / Engineering Manager / Maintenance Manager L	Production Manager L	QA&QC Manager L
		QA&QC Specialist / Food Safety Specialist / Laboratory Manager L
Assistant Engineer / Assistant Maintenance Manager L	Supervisor / Production Planner M	QA&QC Supervisor / QA&QC Executive/ Laboratory Supervisor L
Process Technician / Maintenance Technician M	Section Head / Team Leader / Line Operator M	QC Technician / QC Assistant / Laboratory Technician M
	Production Operator M	

Legend:

- **L** Incremental impact on job tasks, upskilling required
- **M** Moderate proportion of job tasks impacted, redesign required
- **H** Significant proportion of job tasks impacted, possible displacement

A snapshot of the impact assessment for each role (cont'd)

SFw for Food Manufacturing Career Map

Research & Development (R&D)		Business Development
Chief Executive / Managing Director L		
Chief R&D Officer L		General Manager L
Product Technologist / Innovation Manager L		Regional Manager / Export Manager L
Food Technologist L	R&D Chef L	Market Development Manager L
Assistant Food Technologist L		Assistant Market Development Manager / Market Development Executive L

Legend:

- **L** — Incremental impact on job tasks, upskilling required
- **M** — Moderate proportion of job tasks impacted, redesign required
- **H** — Significant proportion of job tasks impacted, possible displacement

Snapshot of impact assessment across the sector

Within the next 5 years, out of the 22 job roles…

5 job roles

will experience a **medium degree of change** in job tasks, and will require **job redesign.** These job roles will transform to take on additional or new duties beyond what is expected, with moderate upskilling or reskilling

17 job roles

will **remain largely unchanged** and require **upskilling.** These job roles will continue to deliver existing outcomes, with some upskilling required to keep abreast of developments in the sector

0 job roles

will **experience displacement** as a result of megatrends or technology disruption. While technologies may augment existing processes and reduce manufacturers' reliance on manpower, this may not necessarily result in obsoletion of jobs. Rather, technology is seen to have an uplifting effect on the existing workforce, mitigating perennial manpower gaps and creation opportunities for reskilling and upskilling of workers

Impact assessment across the sector

MEDIUM	LOW
85.2%[1] of the sector headcount	**14.8%[1] of the sector headcount**
1. Supervisor / Production Planner 2. Process Technician / Maintenance Technician 3. Section Head / Team Leader / Line Operator 4. Production Operator 5. QC Technician / QC Assistant / Laboratory Technician	1. Chief Executive/Managing Director 2. Director of Operations / Plant Manager 3. Engineer / Engineering Manager / Maintenance Manager 4. Assistant Engineer / Assistant Maintenance Manager 5. Production Manager 6. QA&QC Manager 7. QA&QC Specialist / Food Safety Specialist / Laboratory Manager 8. QA&QC Supervisor / QA&QC Executive / Laboratory Supervisor 9. Chief R&D Officer 10. Product Technologist / Innovation Manager 11. Food Technologist 12. Assistant Food Technologist 13. R&D Chef 14. General Manager 15. Regional Manager / Export Manager 16. Market Development Manager 17. Assistant Market Development Manager / Market Development Executive

[1]Assessed based on the size of the Food Manufacturing workforce across in-scope job roles.

Snapshot of impact assessment across the sector

In addition, additional or enhanced skills will be required by existing functions in the sector

Production	Quality Assurance and Quality Control (QA&QC)	Research & Development (R&D)	Business Development
Additional Technical Skills and Competencies (TSC)[1] required by these functions			
While most of the following skills are not new skills, these TSCs are currently not tagged to the following functions within the Skills Framework for Food Manufacturing. According to insights from industry engagements, these TSCs will be required in the future for job roles within respective functions.			
Business Performance Management Data Analytics Emerging Technology Preventive Maintenance Technology Application	Business Relationship Building Data Analytics Emerging Technology Technology Application	Business Relationship Building Customer Behaviour Analysis Data Analytics Emerging Food Technology[2] Technology Application	Data Analytics Emerging Technology Infographics and Data Visualisation Technology Application

TSC	Description
Business Performance Management	Implement the organisation's performance systems to meet business plans and objectives by establishing performance indicators, tracking progress and addressing gaps to enhance productivity and performance.
Business Relationship Building	Formulate business partnership strategies and establish relevant networks of strategic partners that provide value to the organisation to enhance networks with other industry players, including food manufacturers, associations, unions, and research houses.
Customer Behaviour Analysis	Devise customer behaviour analysis tools and approaches and perform analysis on information pertaining to customer behaviours, and deriving insights to inform innovation and formulation of new products.
Data Analytics	Collect, organise, and analyse structured or unstructured data to create insights systematically across various job roles and levels.
Emerging Food Technology[2]	Review new developments in emerging food technologies as well as lead the analysis of such technologies for incorporation into product innovation and development.
Emerging Technology	Review new developments in emerging technologies as well as lead analysis of emerging technologies for potential adoption into the operating environment.
Infographics and Data Visualisation	Present data using meaningful visual illustrations, iconographies, graphs and charts for easy and accessible discovery and communication of data insights aimed at specific business objectives.
Preventive Maintenance	Perform scheduled maintenance procedures on equipment without halting business operations to reduce and minimise failures.
Technology Application	Integrate technologies into operations of the organisation to optimise efficiency and effectiveness of processes.

[1]Additional Technical Skills and Competencies (TSC) that are currently not tagged to respective functions' Skills Maps within the Skills Framework (SFw) for Food Manufacturing. Derived from insights from industry across engagement sessions conducted during this study, and aligned to Skills Framework terminology.

[2]A new TSC that does not currently exist within the SFw for Food Manufacturing.

Snapshot of impact assessment across the sector

In addition, additional or enhanced skills will be required by existing functions in the sector

Production	Quality Assurance and Quality Control (QA&QC)	Research & Development (R&D)	Business Development
Important Critical Core Skills (CCS)[1] required by these functions While the following skills are not new skills, these CCS have been highlighted through our industry insights as critical to respective functions.			
Adaptability Collaboration Communication Self-Management Problem Solving	Adaptability Collaboration Communication Global Perspective Problem Solving	Adaptability Collaboration Creative Thinking Problem Solving Transdisciplinary Thinking	Adaptability Collaboration Global Perspective Self-Management Sense Making

CCS	Description
Adaptability	Exercise flexibility in behaviours or approaches to respond to changes and evolving contexts.
Collaboration	Manage relationships and work collaboratively and effectively with others to achieve goals.
Communication	Convey and exchange thoughts, ideas and information effectively through various mediums and approaches.
Creative Thinking	Adopt diverse perspectives in combining ideas or information and making connections between different fields to create different ideas, improvements and solutions.
Global Perspective	Operate in cross-cultural environments, demonstrating an awareness of the wider global context and markets to identify potential opportunities and risks.
Problem Solving	Generate effective and efficient solutions to solve problems and capitalise on new opportunities.
Self-Management	Take ownership of managing one's personal effectiveness, personal brand and holistic physical, mental, emotional and social well-being.
Sense Making	Leverage sources of qualitative and quantitative information and data to recognise patterns, spot opportunities, infer insights and inform decisions.
Transdisciplinary Thinking	Apply concepts from multiple disciplines, and synthesise different areas of knowledge and insights to guide decisions, foster cooperation and drive continuous improvement.

[1]Critical Core Skills (CCS) of importance, derived from industry across engagement sessions conducted during the study and referenced from the Skills Framework (SFw) for Food Manufacturing. Includes skills that are both currently featured and/or new to respective functions' Skills Maps within the SFw for Food Manufacturing.

Snapshot of impact assessment across the sector

New combinations of skills and competencies are also emerging, which could result in potential new jobs.

The below "skillsets" represent responsibilities or tasks not currently featured within the Skills Framework (SFw) for Food Manufacturing and may require different or new Technical Skills and Competencies (TSCs) as well as Critical Core Skills (CCS).

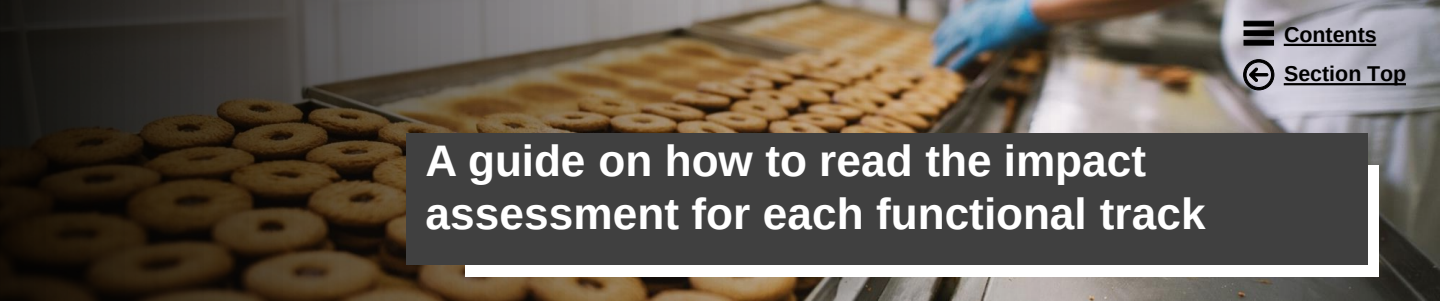
Refer to **Section 5** for possible emerging job role descriptions and relevant reskilling roadmaps.

New skillsets	Rationale
Application of food tech innovations	Technical expertise in food tech innovations and their application in product development may be required as food manufacturers seek to differentiate their brands and product portfolios
Automation coding and programming	Technical expertise in robotic and automation may be required as food manufacturers seek to reduce manual efforts, inefficiencies, and improve productivity through automating production tasks
Data integration, exploration and analysis	Technical expertise in data science and analytics may be required as food manufacturers seek to move from descriptive to predictive and prescriptive analytics and enhance business performance and decision making
Introduction and marketing of novel foods	Technical expertise in understanding how to launch and sell novel food products to customers may be required as food manufacturers gradually industrialise the production of novel foods for the mass market
Industrial production of novel foods	Technical expertise to design the industrial production processes for novel foods or new food products based on food tech innovations may be required as food manufacturers look to bring food innovations from the lab to the mass market
Process engineering and optimisation	Technical expertise in production process engineering and optimisation may be required as food manufacturers look to increase productivity gains by designing new or enhancing existing processes
Regulatory and legal advisory and compliance	Technical expertise in understanding of the regulatory and legal landscapes of target markets may be required as food manufacturers seek to internationalise or launch novel food products
Sustainable manufacturing and management	Technical expertise in sustainable manufacturing and management may be required as food manufacturers seek to reduce wastage and their carbon footprints across all aspects of operations in line with national prerogatives

Food manufacturers should consider the following;

1. **Assess the business case for these "skillsets"** – First, business leaders should understand the emerging skillsets and evaluate the business' need to build such "skillsets". Business leaders will also need to examine their strategies and future plans in order to determine if these capabilities will be required to support the business.
2. **Determine if these "skillsets" can be developed within the existing workforce** – Next, if these "skillsets" will be required to support future business outcomes, business leaders will need to determine if these can be developed within the existing workforce today. If there are overlaps in the skillsets of existing job roles and the above "skillsets", it is possible that certain employees could undergo reskilling or upskilling to fulfil new responsibilities and tasks.
3. **Hire for "skillsets" that the existing workforce would not be able to fulfil –** Finally, if these "skillsets" are new to the business and the existing jobs have been evaluated as having little to no overlap with these "skillsets", i.e. current workforce may be unsuitable to reskill or upskill in these areas, then busines leaders could consider attracting and hiring new employees to fulfil new responsibilities and tasks.

4 Jobs and skills impact analysis



A guide on how to read the impact assessment for each functional track

COMPONENTS WITHIN THE IMPACT ASSESSMENT

Trends impacting the functional track

Automated Manufacturing
Autonomous Robots
Digitalisation
Food packaging & processing
Internet of Things
Manufacturing Analytics
Sustainable production
Virtual/ Augmented Reality

Additional skills required…

- Business Performance Management
- Data Analytics
- Emerging Technology
- Technology Application

Impact level of jobs…

Production Operator	M
Section Head / Team Leader / Line Operator	M
Supervisor / Production Planner	M
Production Manager	L

Refer to Section 8 for detailed job dashboards

The future of Production…

- This function will need to adopt digital means of working, such as using digital checklists, generating digital copies of forms and documentation, using digital tools to perform production planning and scheduling, or even perform workforce management. As a result, while functions need not house expert capabilities in these areas, there will need to be at least a basic to intermediate level of familiarity with digital tools.
- Advanced technologies will enable greater visibility of labour productivity and process efficiency, or even automate standard and repetitive manual tasks in order to make room for more value-added activities, such as continuous process improvements, or cross-training to upskill and create a resilient pool of workers in this function. Given the diverse age groups and nationalities of workforce in this function, it is key to incorporate change management to encourage buy-in and adoption.
- Currently, production function in companies may consist of a higher proportion of mature workers. Food manufacturers will need to attract and retain younger workers, while ensuring a smooth transition and knowledge transfer as mature workers retire and younger workers enter the industry.
- Finally, with the added visibility of production performance, supervisors and managers within this function may be required to establish performance systems and measures, as well as perform root-cause analysis for issues faced to improve the efficiency of teams.

Trends impacting the functional track

- List of trends and/or technologies that will impact the functional track

Additional or enhanced skills required

- Additional skills required by job holders in this functional track

Impact level of jobs

- Provides a consolidated view of impact across the different job roles within the functional track

Impact level of jobs

- Provides an overview of the overall impact of trends on the functional track
- Highlights the outlook of the functional track

Glossary of trends impacting the sector (1/2)

AI and Big Data
Collection and analysis of massive datasets with the help of artificial intelligence to swiftly understand trends and derive actionable business insights

Automated Manufacturing
Use of machines to automate food manufacturing activities, such as conveyor belts, automated ovens, cutting and forming machines, mixers and blenders

Autonomous Robots
Autonomous robots are emerging additions to food processing and production and can reduce manual labour and human intervention in activities such as sorting and transportation

Business Innovation
Conceptualisation and execution of new business ideas to revitalise and reinforce business growth through exploration of new business models, segments, channels

Changing Consumer Preferences
Shifts in preferences including increased focus on health, wellness, and sustainability, as well as the rise of the homebody economy and preference for shopping online or via omnichannel

Digitalisation
Adopting digital ways of working through a host of business solutions, e.g., Enterprise Resource Planning, Customer Relationship Management, Microsoft 360

E-Commerce
Expansion of the business into the e-commerce space through leveraging online retailers to market products direct to consumer, or even developing a proprietary e-shop

Emerging Food Technology
The rise of novel food products such as nutraceuticals or functional food, alternative proteins and cultivated proteins

Glossary of trends impacting the sector (2/2)

Food Innovation
Exploration, conceptualisation, and development of new or improved food products to cater to changing consumer preferences

Food Packaging & Processing
Methods and technologies relating to the packaging and processing of food products e.g., retort packaging, anti-microbial packaging, smart-packaging, fermentation, steaming, infra-red processing, ultra-violet processing

Internationalisation
Expansion of the business to international markets, or entering into strategic partnerships with international companies to reap the benefits of added capabilities, innovation, and new technologies

Internet of Things
Leveraging interconnection via the internet of computing devices embedded in food production equipment and machinery, enabling them to send and receive data in real-time

Manufacturing Analytics
Using operations and events data gathered in real time to ensure quality, increase yield, and optimise processes and resources to improve production performance

Sustainable Production
Manufacturing through economically-sound processes that minimise negative environmental impact while conserving energy and natural resources, and enhancing employee, community, and product safety

Virtual/Augmented Reality
Technologies relating to the creation and delivery of an enhanced or simulated version of the real physical world, to improve or substitute a human experience

Insights from industry outreach – Production (Production)

Trends impacting the functional track

- Automated Manufacturing
- Autonomous Robots
- Digitalisation
- Food packaging & processing
- Internet of Things
- Manufacturing Analytics
- Sustainable production
- Virtual/ Augmented Reality

Additional skills required…

- Business Performance Management
- Data Analytics
- Emerging Technology
- Technology Application

Impact level of jobs…

Production Operator	M
Section Head / Team Leader / Line Operator	M
Supervisor / Production Planner	M
Production Manager	L

Refer to Section 7 for detailed job dashboards

The future of Production…

- This function will need to adopt digital means of working, such as using digital checklists, generating digital copies of forms and documentation, using digital tools to perform production planning and scheduling, or even perform workforce management. As a result, while functions need not house expert capabilities in these areas, there will need to be at least a basic to intermediate level of familiarity with digital tools.
- Advanced technologies will enable greater visibility of labour productivity and process efficiency, or even automate standard and repetitive manual tasks in order to make room for more value-added activities, such as continuous process improvements, or cross-training to upskill and create a resilient pool of workers in this function. Given the diverse age groups and nationalities of workforce in this function, it is key to incorporate change management to encourage buy-in and adoption.
- Currently, production function in companies may consist of a higher proportion of mature workers. Food manufacturers will need to attract and retain younger workers, while ensuring a smooth transition and knowledge transfer as mature workers retire and younger workers enter the industry.
- Finally, with the added visibility of production performance, supervisors and managers within this function may be required to establish performance systems and measures, as well as perform root-cause analysis for issues faced to improve the efficiency of teams.

Insights from industry outreach – Production (Engineering and Maintenance)

Trends impacting the functional track

- Automated Manufacturing
- Autonomous Robots
- Digitalisation
- Food packaging & processing
- Internet of Things
- Manufacturing Analytics
- Sustainable production

Additional skills required…

- Business Performance Management
- Data Analytics
- Emerging Technology
- Preventive Maintenance
- Technology Application

Impact level of jobs…

Process Technician / Maintenance Technician	M
Assistant Engineer / Assistant Maintenance Manager	L
Engineer / Engineering Manager / Maintenance Manager	L
Director of Operations / Plant Manager	L

Refer to Section 7 for detailed job dashboards

The future of Production…

- This function will continue to be in demand as production shifts from labour-driven to engineering-led, and the use of automated systems and autonomous robots increases. Job holders will be required to keep abreast of manufacturing technologies, and work with internal stakeholders as well as external vendors to customise and adopt new manufacturing solutions.
- Advanced technologies such as Internet of Things (IoT) will enable greater visibility of machine utilisation, allowing job holders to derive insights on machine performance and shift from reactive maintenance to preventive or predictive maintenance. This will require job holders to be skilled in the use of IoT technologies and performing manufacturing analytics.
- This function will also need to adopt digital means of working, such as using digital checklists, generating digital copies of forms and documentation, using digital tools to plan and schedule for maintenance, or even perform workforce management. As a result, while functions need not house expert capabilities in these areas, there will need for basic to intermediate level of familiarity with digital tools.
- Finally, with the added visibility of machine performance, supervisors and managers within this function may be required to establish performance systems and measures, as well as perform root-cause analysis for issues faced to improve the efficiency of teams.

Insights from industry outreach – Quality Assurance & Quality Control

Trends impacting the functional track

- AI & Big Data
- Autonomous Robots
- Digitalisation
- Food innovation
- Food packaging & processing
- Internationalisation
- Internet of Things
- Manufacturing Analytics

Additional skills required…

- Business Relationship Building
- Data Analytics
- Emerging Technology
- Technology Application

Impact level of jobs…

QC Technician / QC Assistant / Laboratory Technician	M
QA&QC Supervisor / QA&QC Executive / Laboratory Supervisor	L
QA&QC Specialist / Food Safety Specialist / Laboratory Manager	L
QA&QC Manager	L

Refer to Section 7 for detailed job dashboards

The future of Quality Assurance & Quality Control…

- Jobs in this function are unlikely to be substituted by advanced technologies as human judgement is still critical in the monitoring of production process and application of regulations and standards.
- However, advanced technologies such as AI & Big Data and IoT can be used to improve the ability to monitor and detect hygiene and quality lapses, as well as to enhance efficiency and accuracy during inspection and reporting processes. Hence, job holders will need to have a good understanding of such technologies and how they can be used to improve QA&QC activities.
- This function should remain well-informed of overarching regulatory guidelines, food safety management and control of new food products to inform SOPs and testing procedures.
- To support the expansion of the business into overseas markets, this function will also need to be aware of the export/import regulations of overseas target markets in order to advise on strategies and procedures related to producing/shipping products.
- Going forward, this function will also need to work closely with Production and R&D functions to effect quality procedure improvements.

Insights from industry outreach – Research & Development

Trends impacting the functional track

- AI & Big Data
- Changing consumer preferences
- Digitalisation
- Emerging Food Technology
- Food innovation
- Food packaging & processing
- Internationalisation
- Sustainable production

Additional skills required…

- Business Relationship Building
- Customer Behaviour Analysis
- Data Analytics
- Emerging Food Technology
- Technology Application

Impact level of jobs…

Assistant Food Technologist	L
Food Technologist	L
R&D Chef	L
Product Technologist / Innovation Manager	L
Chief R&D Officer	L

Refer to Section 7 for detailed job dashboards

The future of Research & Development…

- Given global food issues and evolving consumer preferences, this function remains critical to new product development, food production technology and process changes, and must stay abreast of, or even apply, breakthroughs in the industry to remain competitive and relevant, including alternative proteins, cell-based proteins and nutraceuticals, as well as upcycling of food waste and sustainable food packaging.
- This job function will also need to be aware of food regulations and guidelines to ensure any food innovation is compliant and approved for production and sale.
- Job holders in this function will need to be familiar with adopting advanced technologies such as AI & Big Data to enhance the experimentation and modification of recipe to enable successful development of food.
- Going forward, this function is also expected to work closely with Production, QA&QC and Business Development functions to improve the development and launch of new products.
- More specialised jobs may be created in this function, such as the Food Biotechnologist and Bioprocess Engineer as industry players look to enhance food at a chemical level, and conceptualise products for mass production.

Insights from industry outreach – Business Development

Trends impacting the functional track

- AI & Big Data
- Business Innovation
- Changing consumer preferences
- Digitalisation
- E-Commerce
- Food innovation
- Internationalisation
- Virtual/Augmented reality

Additional skills required…

- Data Analytics
- Emerging Technology
- Infographics and Data Visualisation
- Technology Application

Impact level of jobs…

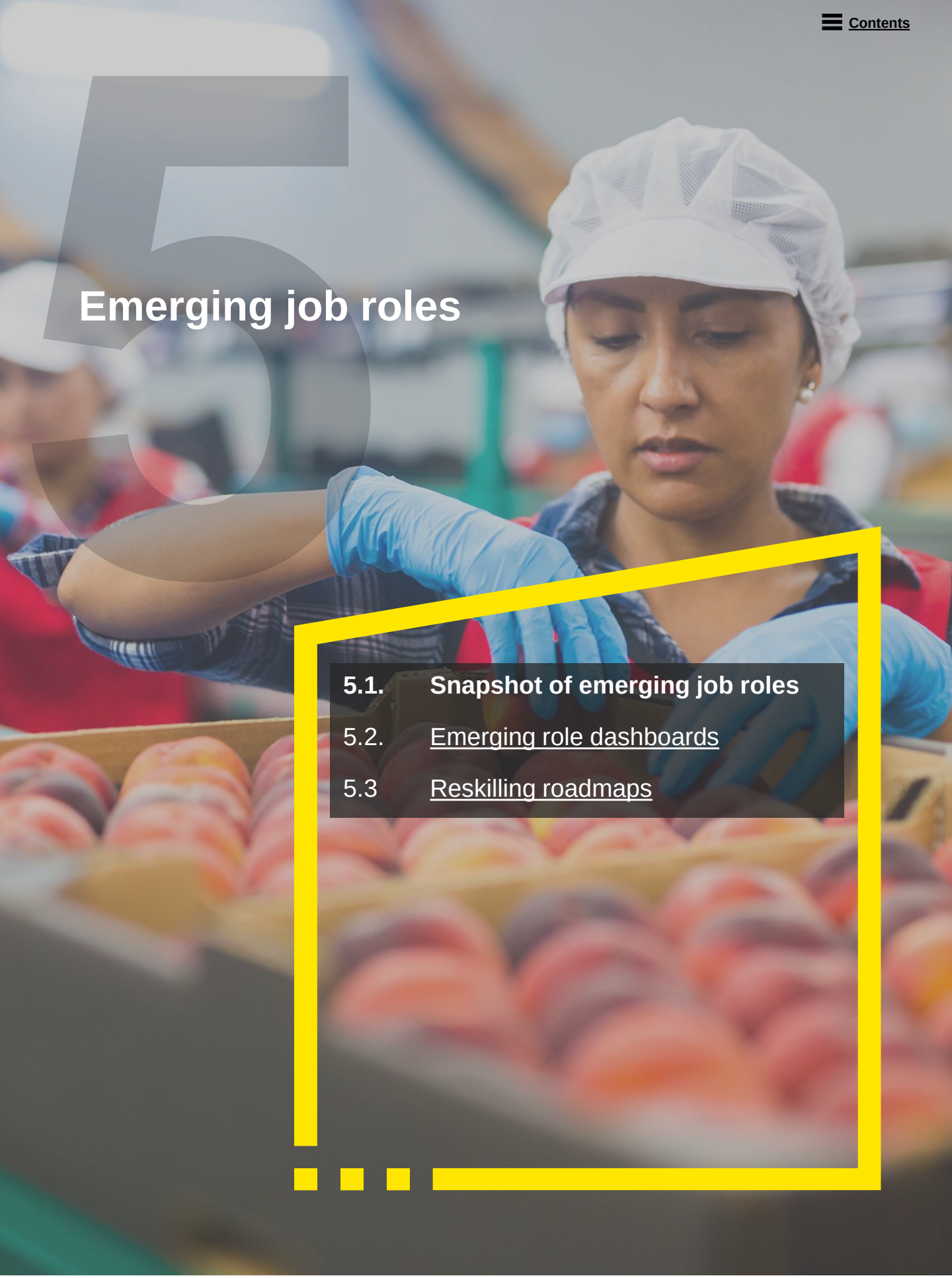
Assistant Market Development Manager / Market Development Executive	L
Market Development Manager	L
Regional Manager / Export Manager	L
General Manager	L
Chief Executive / Managing Director	L

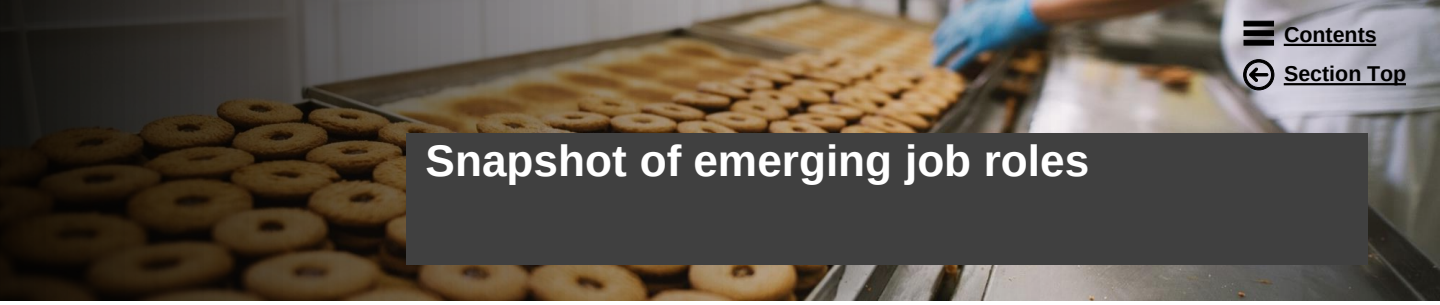
Refer to Section 7 for detailed job dashboards

The future of Business Development…

- To thrive amidst an increasingly competitive environment, this function will need to grow new business segments and channels, and strengthen internal capabilities to be able to build a strong brand and consumer reach in these new business areas.
- Companies may also work with strategic partners for resources and capabilities for innovation, internationalisation, and business resiliency. This function will be key in nurturing these relationships as well as co-developing partnership models that will benefit both parties.
- Advanced technologies such as AI & Big Data will enhance this function's ability to harvest consumer data and generate insights to inform overarching market trends, the business' strategic decisions, and product portfolios and lifecycles.
- This function will also have to keep abreast of other advanced technologies, such as Virtual/Augmented Reality, and leverage them where relevant to build an enhanced customer experience.

5 Emerging job roles





Snapshot of emerging job roles

Through our engagements with the industry across executive interviews, Focus Group Discussions, and the manpower study, we identified **8 emerging job roles** within the Food Manufacturing sector, which are classified into two categories – those which can absorb existing talent from within the sector given moderate upskilling to develop new skills, and those which require deeper technical expertise and possibly talent from outside the sector to fill.

However, the following considerations should also be taken in the creation of these emerging job roles:

1

These job roles are emerging in response to new skillsets[1] required by the sector, as listed below. As such, food manufacturers will need to **determine the capabilities needed by their business**, as well as weigh strategic priorities and people strategies, before deciding to create these new roles.

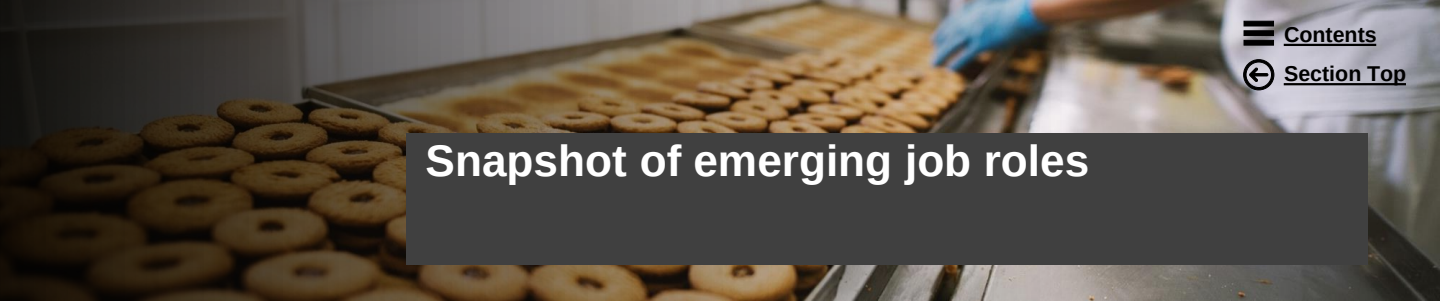
Application of food tech innovations	Automation coding and programming	Data integration, exploration and analysis	Introduction and marketing of novel foods
Industrial production of novel foods	Process engineering and optimisation	Regulatory and legal advisory and compliance	Sustainable manufacturing and management

---

2

Some emerging roles may already be fulfilled by existing employees in food manufacturers today, particularly **roles created on a project or ad-hoc basis**. For example, the role of a Sustainability Manager could be taken on by a Production Manager or an Innovation Manager to run sustainability initiatives in the company (see **Reskilling Roadmaps**), or perform annual reporting for compliance purposes. In this case, while a new job may not be created, food manufacturers will need to assess if existing employees possess the required skillsets, or need to be upskilled/reskilled in order to perform responsibilities of the role.

[1]Broad categories of skills, may be broken down into individual Technical and Critical Core Skills (soft skills) as shown in following pages.



Snapshot of emerging job roles

8 possible emerging job roles and estimated time horizon of prevalence

Short-Term

Head of Regulatory Affairs ✓

Medium-Term

Food Biotechnologist

Medium-Term

Novel Foods Technical Services Manager ✓

Medium-Term

Bioprocess Engineer

Short- to Medium-Term

Process Engineer ✓

Medium- to Long-Term

Data Analyst

Medium- to Long-Term

Sustainability Manager ✓

Medium- to Long-Term

Automation Engineer

Moderate level of reskilling required for existing job roles in the Food Manufacturing sector to take up the above emerging job roles, where **job holders will need to undergo training and continuous education**. As such, reskilling roadmaps are available for job roles exhibiting overlap in technical skills, indicating a possible transfer of talent.

Significant level of reskilling required for existing food manufacturing job roles in the sector to take up these emerging job roles. Further studies and qualifications are required. Companies should also **consider hiring talent from outside of the food manufacturing sector to fill these roles**.

✓ Reskilling roadmaps available

Estimated timeline of demand for emerging job roles:
Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long-term: Beyond 5 years

5 Emerging job roles

Head of Regulatory Affairs

ESTIMATED TIME HORIZON: Short-term*

Trends impacting this role

- Changing consumer preferences
- Food innovation
- Internationalisation

Other considerations

- Companies that are exploring novel foods, or foods under stringent regulations for formulation, health and safety, can consider hiring for this role
- Depending on the company's locations and regulations in other target markets, localised role(s) may be needed

Responsibilities of the role

The Head of Regulatory Affairs provides technical leadership and advice in developing regulatory strategies for the organisation's products in target markets. The job holder engages with external regulatory authorities or professionals and builds a deep knowledge of local and global regulatory frameworks, regulations and requirements to guide the execution of product registrations and management of product lifecycle in alignment with business objectives and market access strategies.

Job Tasks

- Build and maintain a deep understanding of regulations, processes, product registration, import and export laws, and develop suitable strategies to address requirements of target markets
- Identify and track country-specific regulatory requirements and complete the filing of the application materials according to product go-to-market strategy and plans
- Review the validity and completeness of the application materials, ensuring timely follow-up on the progress of submission with the regulatory authorities and responding promptly to any queries
- Provide consultation to other functions and product development teams regarding latest registration laws and regulations in support of support marketing plans, product launches, food certification, and other cross-functional activities
- Review and approve local product information, labels, communications, and claims substantiation as required by local regulations

Technical Skills (TSC) Required

- Continuous Process Improvement
- International Trade Legislation for Business
- New Product Introduction for Food
- Regulatory and Legal Advisory
- Regulatory Compliance
- Risk and Compliance Reporting
- Risk Management
- Stakeholder Management
- Strategy Development

Critical Core Skills (CCS) Required

- Adaptability
- Collaboration
- Communication
- Decision Making
- Global Perspective

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)

Novel Foods Technical Services Manager

ESTIMATED TIME HORIZON: Medium-term*

Trends impacting this role

- Emerging food technology
- Changing customer preferences

Other considerations

- Companies producing novel foods such as alternative proteins and who are approaching other manufacturers or food services establishments to cultivate a customer base will be in need of this role

Responsibilities of the role

The Technical Services Manager is responsible for providing technical advice and support to customers on alternative protein, cultivated protein as well as nutraceuticals during and after product sales. The job holder serves as the lead technical contact for customers, and is required to stay abreast of technology and business practices through internal and external technical collaboration in order to propel the incorporation of the organisation's emerging food product into mainstream foods.

Job Tasks

- Collaborate with customers' Research & Development teams to provide on-site technical support on matters related to the need for and usage of emerging food products
- Compile and analyse data for product pilots, working with customers to test new products to make recommendations on applications
- Stay up-to-date with latest market trends and consumer preferences and and serve as a subject matter expert on the application of emerging food products accordingly
- Organise product information for internal and customer presentations, partnering with sales teams for product demonstrations
- Gather and relay customer feedback to Research & Development, Production, and Business Development teams to assist in any troubleshooting or improvement initiatives required to modify products and strengthen its value proposition to customers

Technical Skills (TSC) Required

- Business Environment Analysis
- Business Networking
- Business Relationship Building
- Business Opportunities Development
- Consumer Intelligence Analysis
- Customer Acquisition Management
- Customer Behaviour Analysis
- Customer Service Innovation Management
- Data Analytics
- Emerging Food Technology Application[2]
- Innovation Management
- Market Research
- Novel Food Product Introduction[2]
- Stakeholder Management
- Technology Application

Critical Core Skills (CCS) Required

- Adaptability
- Communication
- Customer Orientation
- Influence
- Problem Solving

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)
[2]Not existing Technical Skills and Competencies. Highlighted as emerging skill areas and will require further input from industry on knowledge and abilities involved.

Process Engineer

ESTIMATED TIME HORIZON:
Short- to Medium-Term*

Trends impacting this role

- Digitalisation of work processes
- Innovation
- Food processing
- Productivity

Other considerations

- Companies who are looking to optimise production processes across manual and automated steps will be in need of this role, or the capabilities within it

Responsibilities of the role

This role is responsible for optimising Food Manufacturing processes by evaluating existing workflows, identify inefficiencies, and develop plans to improve process efficiencies. Ways to improve process efficiencies may include implementing new processes and/or technologies, removing unnecessary steps and modifying current workflows. Besides creating cost-effective and sustainable production workflows, the job holder should also ensure processes comply to regulatory requirements and internal protocols.

Job Tasks

- Work with different functions, primarily Production function to understand process pain points and use available data to interpret production performance and identify gaps for improvement, while analysing risks associated with different approaches of process changes and evaluating the associated costs and benefits of redesigning processes
- With a strong technical expertise and some level of Food Manufacturing industry knowledge, design and implement process and/or machinery optimisation, and support Production function for smooth transition to operations through training
- Stay abreast of changing regulatory requirements and propose operational policies, standards and procedures to ensure food production processes designed and/or redesigned comply with relevant standards
- Understand and evaluate latest technology trends and equipment for application to production processes, and adapt latest technology to improve processes when appropriate

Technical Skills (TSC) Required

- Change Management
- Continuous Process Improvement
- Data Analytics
- Embedded System Integration
- Emerging Technology
- Facility Design
- Food Manufacturing Process Design
- Good Manufacturing Design and Implementation
- Innovation Management
- Internet of Things Management
- Lean Manufacturing
- Manufacturing Process Management
- New Product Introduction for Food
- Operation Management
- Process Monitoring
- Process Validation
- Quality Assurance Management
- Quality Control Management
- Quality Systems Management
- Solutioning
- Stakeholder Management
- Strategy Development

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)

Process Engineer (cont'd)

ESTIMATED TIME HORIZON:
Short- to Medium-Term*

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Technical Skills (TSC) Required (cont'd)

- Systems Thinking
- Technical Presentation
- Technology Application

Critical Core Skills (CCS) Required

- Adaptability
- Collaboration
- Communication
- Decision Making
- Problem Solving

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)

Sustainability Manager

ESTIMATED TIME HORIZON:
Medium- to Long-term*

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Trends impacting this role

- Sustainable production

Other considerations

- Companies who are keen on undertaking sustainability initiatives will require this role, whether in full-time capacity, or as an expanded job scope for existing staff
- Companies may also opt for a cross-functional Sustainability workgroup led by existing workers

Responsibilities of the role

The Sustainability Manager serves as the organisation's expert on sustainability-related trends, issues, regulations, and policies, and drives relevant initiatives and business practices to help the organisation achieve its sustainability goals. The job holder is also responsible for developing and managing the process of impact modelling as well as data collection and analysis to guide business investments into sustainability projects, and may be required to lead cross-functional teams in executing these projects.

Job Tasks

- Conduct market research to gather data and insights relating to consumer expectations, sustainable food systems, potential technologies, policies, and practices to adopt to mitigate wastages or negative impacts on the environment
- Collaborate with business leaders to develop and chart a sustainability roadmap aligned to the organisation's vision and strategy, identifying key sustainability milestones, pilots, and initiatives for the short- to long-term
- Implement and operationalise a consistent methodology for quantifying sustainability impact and provide oversight to the business in applying this discipline to sustainability goals
- Form and direct cross-functional teams comprising key internal stakeholders to launch sustainability pilots or initiatives in selected areas, guiding teams to design, implement, track, and report on progress toward social sustainability targets

Technical Skills (TSC) Required

- Business Acumen
- Business Performance Management
- Change Management
- Conflict Resolution
- Continuous Process Improvement
- Data Analytics
- Green Manufacturing Design and Implementation
- Market Research
- Project Management
- Technology Application
- Stakeholder Management
- Strategy Development
- Sustainable Manufacturing
- Sustainability Management
- Systems Thinking
- Utilities Management

Critical Core Skills (CCS) Required

- Collaboration
- Creative Thinking
- Decision Making
- Problem Solving
- Transdisciplinary Thinking

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)

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Food Biotechnologist

ESTIMATED TIME HORIZON:
Medium-term*

Trends impacting this role

- Changing consumer expectations
- Emerging food technology

Other considerations

- Companies in the business of novel foods, or exploring food biotechnology in areas such as genetic modification of foods, nutritional genomics and the development of functional foods, will be in need of this role

Responsibilities of the role

The Food Biotechnologist is responsible for providing technical contributions to the development of food innovation and actively leads the identification and execution of emerging food products. The job holder will propose, define and lead project activities in areas such as alternative proteins, cultivated proteins and nutraceuticals in collaboration with internal and external partners, and translate business needs into research approaches and scientific findings into business applications.

Job Tasks

- Develop and execute research activities in selected areas of alternative proteins, cultivated proteins, nutraceuticals and associated technologies, as well as nutrition and sustainability aspects, generating and evaluating new ideas for product and process development to effectively support the creation of new food
- Propose, lead, and execute data analyses to address key research question of relevance for business applications
- Champion and coordinate scientific innovation growth initiatives across the organisation by collaborating with internal and external partners, such as scientists, clinical investigators, and regulatory authorities, to identify emerging trends to meet strategic objectives and potential opportunities for the development of new food
- Implement innovation roadmap and market plans aligned to the business strategy, including short and long-term testing programs for experimental and commercial products and hybrids

Technical Skills (TSC) Required

- Business Environment Analysis
- Business Needs Analysis
- Continuous Process Improvement
- Data Analytics
- Emerging Food Technology Application
- Green Manufacturing Design and Implementation
- Innovation Management
- Novel Food Product Introduction[2]
- Product Improvement
- Product Testing
- Recipe Formulation
- Stakeholder Management
- Technology Application
- Vendor Management

Critical Core Skills (CCS) Required

- Adaptability
- Collaboration
- Creative Thinking
- Problem Solving
- Transdisciplinary Thinking

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)
[2]Not existing Technical Skills and Competencies. Highlighted as emerging skill areas and will require further input from industry on knowledge and abilities involved.

Bioprocess Engineer

ESTIMATED TIME HORIZON: Medium-term*

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Trends impacting this role

- Emerging food technology
- Food processing

Other considerations

- Companies manufacturing emerging food products such as alternative proteins will require the expertise of this role as they move from lab trials to production on an industrial scale

Responsibilities of the role

The Bioprocess Engineer supports the commercialisation of novel foods, facilitating the smooth execution of projects from concept through mass production in collaboration with Research & Development, Engineering, and Production teams. The job holder is a thought leader in process development and improvement, as well as an expert in one or more broad emerging food technologies, and guides the design and implementation of manufacturing processes for such products.

Job Tasks

- Provide subject matter expertise to project teams and functions by offering technical guidance and scientific insight for new process development and process improvements for downstream production of emerging food products such as alternative proteins, cultivated proteins and nutraceuticals
- Determine the financial and operational viability of scaled-up manufacturing for emerging food products, process control, sampling, and monitoring systems and technologies
- Serve as an operational and tactical enabler to develop and improve processes and technologies and ensure compliance with intellectual property laws, regulations and company policies
- Collaborate with Engineering, Maintenance, and Production teams to set up appropriate technology and equipment, as well as implement, validate, and monitor manufacturing processes for emerging food products
- Analyse causes of performance problems and process deviations that may impact production quality and yield, leading root-cause analysis, troubleshooting, and resolution of issues
- Train teams in quality, safety, and other manufacturing requirements and procedures to ensure that finished products meet with organisation’s standards and local regulations

Technical Skills (TSC) Required

- Change Management
- Continuous Process Improvement
- Data Analytics
- Facility Design
- Flexible Facilities Implementation
- Food Manufacturing Process Design
- Good Manufacturing Design and Implementation
- Innovation Management
- Manufacturing Process Management
- Novel Food Product Introduction[2]
- Emerging Food Technology Application[2]
- Operation Management
- Process Modelling
- Process Monitoring
- Process Optimisation
- Process Validation
- Production Performance Management
- Quality Assurance Management

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)
[2]Not existing Technical Skills and Competencies. Highlighted as emerging skill areas and will require further input from industry on knowledge and abilities involved.

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Bioprocess Engineer (cont'd)

ESTIMATED TIME HORIZON:
Medium-term*

Technical Skills (TSC) Required (cont'd)

- Quality Control Management
- Quality Systems Management
- Solutioning
- Systems Thinking
- Technical Presentation
- Technology Application

Critical Core Skills (CCS) Required

- Adaptability
- Decision Making
- Collaboration
- Problem Solving
- Communication

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)

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Data Analyst

ESTIMATED TIME HORIZON:
Medium- to Long-term*

Trends impacting this role

- AI & Big Data
- Internet of Things
- Manufacturing analytics

Other considerations

- For SMEs, a single headcount may be sufficient for managing data across multiple functions
- Larger companies may consider a dedicated Data Analyst per function to manage and analyse function-specific data

Responsibilities of the role

The Data Analyst will assist primarily Production function with preprocessing, modelling and analysis of data from a wide variety of datasets to generate insights and enable informed business and operational decisions. The job holder will also need to use development tools to generate reports and dashboard on production performance. Proficiency in data analytics tools and awareness of emerging trends is key.

Job Tasks

- Work closely with different functions, primarily the Production team, to understand business objectives and translate them into analytics requirements and parameters
- Collect and organise data from internal sources (e.g., IoT-enabled machinery, enterprise system) and external sources (market research or public data) on Food Manufacturing, as well as perform data validation and quality control checks to prepare data for analysis
- Analyse manufacturing data such as production yield, quality and productivity to identify data relationships, patterns and trends to gain important insights that support decision making
- Translate data analyses into actionable insights using dashboards and visualisation tools, and present findings to relevant stakeholders from different functions. Adopting a data-driven perspective, the job holder will propose recommendations for decision making, planning and strategy development
- Contribute to continuous improvement by staying abreast of new and emerging technologies and incorporate relevant ones to improve reporting, including suggesting and implementing any fields or improvements that could be made in systems for capturing the data needed for reporting

Technical Skills (TSC) Required

- Big Data Analytics
- Business Environment Analysis
- Continuous Process Improvement
- Data Analytics
- Data Analytics System Design
- Data Engineering
- Data Governance
- Data Strategy
- Data Synthesis
- Infographics and Data Visualisation
- Internet of Things Management
- Machine Learning
- Programming and Coding
- Project Management
- Stakeholder Management
- Technology Application

Critical Core Skills (CCS) Required

- Collaboration
- Communication
- Creative Thinking
- Problem Solving
- Sense Making

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)

Automation Engineer

ESTIMATED TIME HORIZON:
Medium- to Long-term*

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Trends impacting this role

- Intelligent automation/robotics

Other considerations

- More technologically advanced companies may wish to create this role, as a dedicated personnel to ensure the organisation is at the forefront of productivity

Responsibilities of the role

This Automation Engineer is responsible for using technology to improve, streamline and automate manufacturing processes such that manufacturing is as efficient as possible, while maintaining product quality and adhering to plant protocols and external regulations. Strong technical background and operations knowledge are required to plan, implement and monitor automation technologies.

Job Tasks

- Work closely with Production function to evaluate existing production processes, understand pain points and identify inefficiencies that can be addressed by automation. Develop and implement software and hardware automation systems, while still maintaining product quality and adhering to internal policies and external regulations
- Stay up-to-date with latest technologies and incorporate relevant technologies in production processes to increase efficiency, including collaborating with third party vendors to adopt new automation technologies
- Contribute to continuous improvement by collecting and analysing automation performance data to identify issues, work with Production function to understand root causes and develop corrective and preventive measures
- Train Production team to operate new and/or modified automation systems and processes; train Engineering team to perform maintenance and troubleshooting of automation systems and processes, and provide technical expertise when required

Technical Skills (TSC) Required

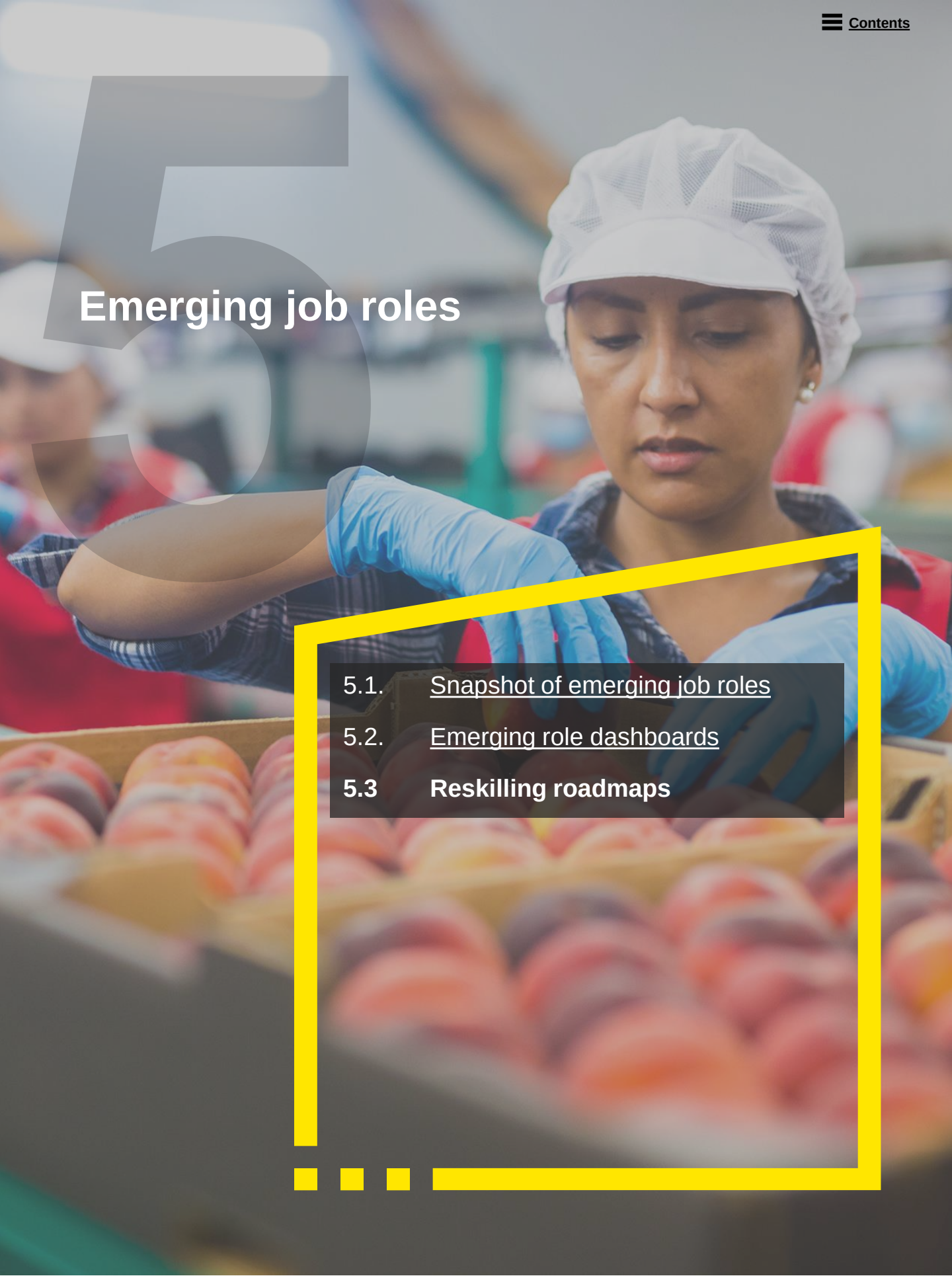
- Automated Food Manufacturing System Maintenance
- Automated Operation Monitoring
- Automated System Design
- Automation Process Control
- Continuous Process Improvement
- Data Analytics
- Food Manufacturing Process Design
- Innovation Management
- Programming and Coding
- Project Management
- Robotic and Automation System Maintenance
- Robotic and Automation Technology Application
- Stakeholder Management
- Technology Application
- Technology Road Mapping
- User Experience Design
- User Interface design
- Vendor Management

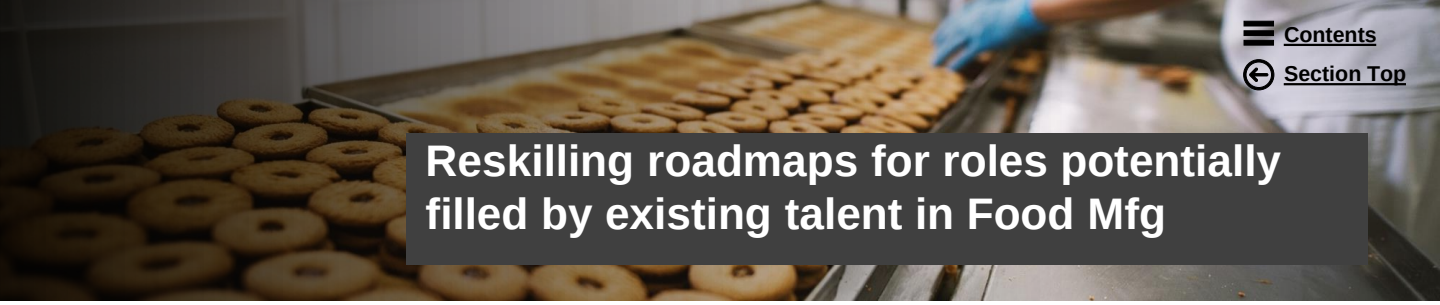
Critical Core Skills (CCS) Required

- Communication
- Collaboration
- Decision Making
- Developing People
- Problem Solving

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)

5 Emerging job roles





Reskilling roadmaps for roles potentially filled by existing talent in Food Mfg

4 out of 8 emerging job roles can be potentially filled by existing talent within the Food Manufacturing sector, with a moderate level of reskilling and upskilling needed to take up new responsibilities. In addition to the job dashboards developed for the following emerging jobs, reskilling roadmaps are also provided for existing job in the sector exhibiting overlap in technical skills as possible career pathways for job holders.

Short-Term

Head of Regulatory Affairs

Medium-Term

Novel Foods Technical Services Manager

Short- to Medium-Term

Process Engineer

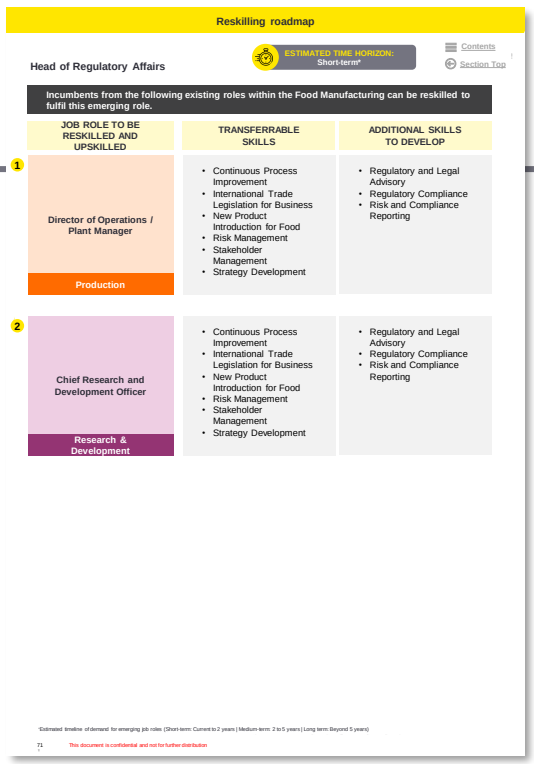
Medium- to Long-Term

Sustainability Manager

COMPONENTS WITHIN RESKILLING ROADMAPS

Job role to be reskilled and upskilled

- Existing job roles within the Food Manufacturing sector assessed to share a significant overlap in transferrable skills with emerging roles, as well as comparable in terms of scope of responsibility within an organisation



Skills listing

- “Transferrable skills” indicate overlap in skills between the emerging role and existing role in Food Manufacturing
- “Additional skills to develop” indicate new skills that job holders in existing roles will need to be reskilled in to take on emerging roles

Estimated timeline of demand for emerging job roles:
Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long-term: Beyond 5 years

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Head of Regulatory Affairs

ESTIMATED TIME HORIZON: Short-term*

Incumbents from the following existing roles within the Food Manufacturing can be reskilled to fulfil this emerging role.

	JOB ROLE TO BE RESKILLED AND UPSKILLED	TRANSFERRABLE SKILLS	ADDITIONAL SKILLS TO DEVELOP
1	**Director of Operations / Plant Manager** **Production**	• Continuous Process Improvement • International Trade Legislation for Business • New Product Introduction for Food • Risk Management • Stakeholder Management • Strategy Development	• Regulatory and Legal Advisory • Regulatory Compliance • Risk and Compliance Reporting
2	**Chief Research and Development Officer** **Research & Development**	• Continuous Process Improvement • International Trade Legislation for Business • New Product Introduction for Food • Risk Management • Stakeholder Management • Strategy Development	• Regulatory and Legal Advisory • Regulatory Compliance • Risk and Compliance Reporting

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)

Novel Foods Technical Services Manager

ESTIMATED TIME HORIZON: Medium-term*

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Incumbents from the following existing roles within the Food Manufacturing can be reskilled to fulfil this emerging role.

	JOB ROLE TO BE RESKILLED AND UPSKILLED	TRANSFERRABLE SKILLS	ADDITIONAL SKILLS TO DEVELOP
1	**Market Development Manager** **Business Development**	• Business Environment Analysis • Business Networking • Business Relationship Building • Business Opportunities Development • Consumer Intelligence Analysis • Customer Acquisition Management • Customer Behaviour Analysis • Market Research • Stakeholder Management	• Customer Service Innovation Management • Data Analytics • Innovation Management • Emerging Food Technology Application[2] • Novel Food Product Introduction[2] • Technology Application
2	**Regional Manager / Export Manager** **Business Development**	• Business Environment Analysis • Business Networking • Business Relationship Building • Business Opportunities Development • Consumer Intelligence Analysis • Customer Acquisition Management • Customer Behaviour Analysis • Market Research • Stakeholder Management	• Customer Service Innovation Management • Data Analytics • Innovation Management • Emerging Food Technology Application[2] • Novel Food Product Introduction[2] • Technology Application

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)
[2]Not existing Technical Skills and Competencies. Highlighted as emerging skill areas and will require further input from industry on knowledge and abilities involved

Process Engineer

ESTIMATED TIME HORIZON:
Short- to Medium-Term*

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Incumbents from the following existing roles within the Food Manufacturing can be reskilled to fulfil this emerging role.

	JOB ROLE TO BE RESKILLED AND UPSKILLED	TRANSFERRABLE SKILLS	ADDITIONAL SKILLS TO DEVELOP
1	**Engineer / Engineering Manager / Maintenance Manager** **Production**	• Change Management • Continuous Process Improvement • Embedded System Integration • Food Manufacturing Process Design • Innovation Management • Internet of Things Management • Manufacturing Process Management • New Product Introduction for Food • Process Validation • Stakeholder Management • Strategy Development • Systems Thinking • Technical Presentation	• Data Analytics • Emerging Technology • Facility Design • Good Manufacturing Design and Implementation • Lean Manufacturing • Operation Management • Process Monitoring • Solutioning • Technology Application • Quality Assurance Management • Quality Control Management • Quality Systems Management

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)

Sustainability Manager

ESTIMATED TIME HORIZON:
Medium- to Long-term*

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Incumbents from the following existing roles within the Food Manufacturing can be reskilled to fulfil this emerging role.

	JOB ROLE TO BE RESKILLED AND UPSKILLED	TRANSFERRABLE SKILLS	ADDITIONAL SKILLS TO DEVELOP
1	**Engineer / Engineering Manager / Maintenance Manager** **Production**	• Business Performance Management • Change Management • Conflict Resolution • Continuous Process Improvement • Green Manufacturing Design and Implementation • Project Management • Stakeholder Management • Strategy Development • Systems Thinking • Utilities Management	• Business Acumen • Data Analytics • Market Research • Technology Application • Sustainable Manufacturing • Sustainability Management
2	**Production Manager** **Production**	• Business Performance Management • Change Management • Conflict Resolution • Continuous Process Improvement • Green Manufacturing Design and Implementation • Project Management • Stakeholder Management • Strategy Development • Systems Thinking	• Business Acumen • Data Analytics • Market Research • Technology Application • Sustainable Manufacturing • Sustainability Management • Utilities Management

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)

Sustainability Manager (cont'd)

ESTIMATED TIME HORIZON:
Medium- to Long-term*

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Incumbents from the following existing roles within the Food Manufacturing can be reskilled to fulfil this emerging role.

	JOB ROLE TO BE RESKILLED AND UPSKILLED	TRANSFERRABLE SKILLS	ADDITIONAL SKILLS TO DEVELOP
1	**QA&QC Specialist / Food Safety Specialist / Laboratory Manager** **Quality Assurance & Quality Control**	• Business Performance Management • Change Management • Conflict Resolution • Continuous Process Improvement • Project Management • Stakeholder Management • Strategy Development • Systems Thinking	• Business Acumen • Data Analytics • Green Manufacturing Design and Implementation • Market Research • Sustainable Manufacturing • Sustainability Management • Technology Application • Utilities Management
2	**Product Technologist / Innovation Manager** **Research & Development**	• Business Performance Management • Change Management • Conflict Resolution • Continuous Process Improvement • Green Manufacturing Design and Implementation • Project Management • Stakeholder Management • Strategy Development • Systems Thinking	• Business Acumen • Data Analytics • Market Research • Technology Application • Sustainable Manufacturing • Sustainability Management • Utilities Management

*Estimated timeline of demand for emerging job roles (Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long term: Beyond 5 years)

Potential sources of talent for roles requiring significant level of reskilling

4 out of 8 emerging job roles will require a significant reskilling given their deep technical background and low skill overlaps with existing Food Manufacturing jobs. Since further studies and qualifications may be required for existing Food Manufacturing talent to move into these roles, companies should consider hiring talent from outside of the food manufacturing sector to fill these roles.

Medium-Term

Food Biotechnologist

- Graduates or mid-career hires qualified in Food Science/Engineering, Material Science, Biochemistry, Bio-organic Chemistry, Biotechnology, or related sciences
- Talent could also come from biotechnology or biopharmaceutical industries

Medium- to Long-Term

Data Analyst

- Graduates or mid-career hires qualified in Data Science, Mathematics, Statistics, Information Systems Management, Computer Science or related fields with relevant experience and know-how in data management and analytics tools
- Talent could also come from a broad range of other industries, including adjacent manufacturing industries

Medium-Term

Bioprocess Engineer

- Graduates or mid-career hires qualified in Biotechnology, Virology, Cell Biology, Bioprocess or related sciences
- Talent could also come from biotechnology or biopharmaceutical industries

Medium- to Long-Term

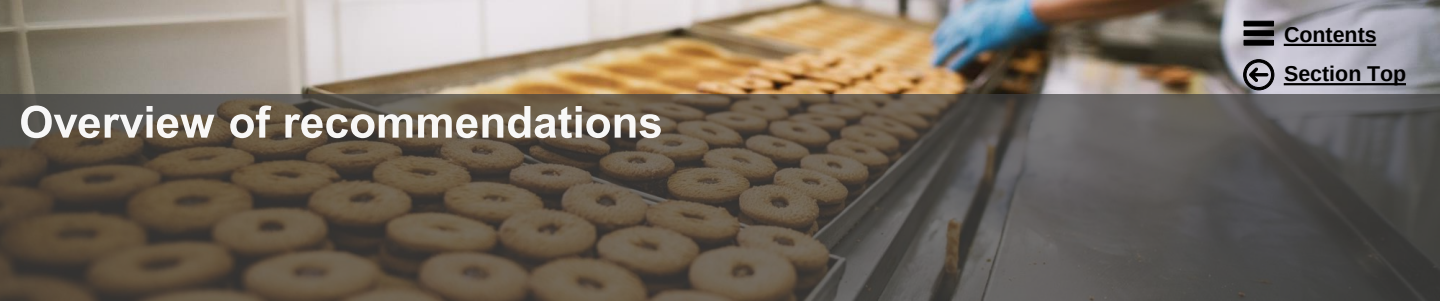
Automation Engineer

- Graduates or mid-career hires qualified in Mechanical, Electronics, Electrical Engineering, or related fields, with relevant experiences in automation design and functional testing
- Talent could also come from a broad range of other industries, including adjacent manufacturing industries

Note
Companies seeking to hire such roles from outside of the Food Manufacturing sector will need to evaluate and review their Employee Value Proposition (EVP) in order to attract and recruit such talent. More details on enhancing EVP can be found in the Recommendations section of this report.

Estimated timeline of demand for emerging job roles:
Short-term: Current to 2 years | Medium-term: 2 to 5 years | Long-term: Beyond 5 years

Future of the Food Manufacturing sector: Recommendations



Overview of recommendations

GIVEN KEY CHALLENGES FACED BY THE SECTOR…

Manpower and talent shortages

Changing consumer expectations

Saturated local consumer market

Lack of natural resources

*COVID-19 exerting a **compounding effect** on sectoral challenges*

…DRIVERS OF GROWTH…

1 PRODUCTIVITY **2 INNOVATION** **3 INTERNATIONALISATION** **4 SUSTAINABILITY**

…AND REFERENCING OVERARCHING SECTOR STRATEGIES[1]

STRATEGIC THRUST #1:
Building enterprise capabilities

STRATEGIC THRUST #2:
Developing human capital

STRATEGIC THRUST #3:
Enhancing enterprise ecosystems

STRATEGIC THRUST #4:
Establishing strong networks and partnerships

WE HAVE UNCOVERED RECOMMENDATIONS FOR THE WAY FORWARD FOR THESE KEY STAKEHOLDERS

Food Manufacturers — RECOMMENDATIONS

Individuals — RECOMMENDATIONS

Education Institutions — RECOMMENDATIONS

Agencies and associations — RECOMMENDATIONS

[1]Enterprise Singapore's three key levers and four strategies

Future of the Food Manufacturing sector: Recommendations

Recommendations for the way forward

While food manufacturers today contend with many challenges amidst a dynamic and evolving environment, there are also many opportunities and avenues for support available to companies. In this section, the report explores a number of recommendations that manufacturers can consider as they embark on their journey to transform and adapt to the demands of the sector.

RECOMMENDATIONS IN THIS SECTION

Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

1 Accelerate efforts to adopt relevant technologies

Improve productivity to uplift the business and increase competitiveness

- The successful adoption of technology is one of the crucial enablers to enhanced productivity, which in turn allows food manufacturers to grow their businesses and flourish in an increasingly competitive and saturated landscape, both locally and in target markets overseas.
- Hence, food manufacturers need to stay abreast of both existing and emerging technologies, and understand how relevant solutions or tools can support their operations.
- Depending on the type of solution, the adoption of technology can help to:
  - Better reach, engage with, and satisfy customers (e.g. e-Commerce)
  - Augment manual and labour-intensive tasks to make room for value-added activities (e.g. automation, digitalisation of manual forms)
  - Increase visibility on manufacturing performance and areas for improvement (e.g. Internet of Things)
  - Enhance the taste, safety, quality, and shelf-life of food products (e.g. various food processing and packaging technologies)
- The type of technology to be adopted varies depending on each food manufacturers' business needs and nature of operations, and business leaders will need to be judicious in their technology investments to ensure that solutions bring about value to the business.
- For example, while end-to-end automation of production processes may present a strong business case for food manufacturers who have high-volume production of relatively simple food products, it may not be as viable a solution for food manufacturers that have a high-mix product portfolio, or manufacture food products that rely on the handicraft of workers. In the latter case, technology solutions would be better geared towards improving labour productivity (such as digitising of Standard Operating Procedures/work instructions/recipes to improve standardisation and reduce errors or re-work).
- The pace and extent of technology adoption also vary according to each food manufacturer's operational readiness and risk appetite.

Continued on next page

1

Recommendations for the way forward

RECOMMENDATIONS IN THIS SECTION

1 Accelerate efforts to adopt relevant technologies

Improve productivity to uplift the business and increase competitiveness

Continued

Smaller companies and/or companies at early stages of technology adoption

- While smaller-sized and growing manufacturers may not yet have the production capacity, critical workforce mass nor workforce capabilities to support investments in a full Enterprise Resource Planning (ERP) system, Manufacturing Execution System (MES), or even venture into manufacturing analytics, business leaders should nonetheless explore other options to enhance productivity. These options may include process redesign in alignment with lean principles to minimise waste and non-value-added activities, as well as job redesign to enhance value-add of workers' responsibilities (see more in Recommendation 3: Relook at existing jobs in alignment to the future of work in the Food Manufacturing sector). At the same time, business leaders can begin to explore digitising manual forms, documents, and records in preparation for future adoption of technology solutions.

Larger companies and/or companies at intermediate stages of technology adoption

- On the other hand, larger and digitally-mature food manufacturers may consider progressing on to advanced stages of technology adoption. These may comprise systems integration to improve connectivity, as well as the use of intelligent and autonomous systems. As business leaders forge ahead to lead the adoption of more complex solutions, proportionate efforts should be invested in facilitating human-machine interactions. This would encompass job redesign to integrate newer technologies into existing roles, as well as training to ensure that workers are able to use these technologies with confidence. Business leaders may also begin to consider recruiting talent with deeper technical expertise to support and sustain technology transformation. These individuals would likely bring in skills in areas such as technology strategy and roadmapping, Artificial Intelligence and Machine Learning, or even programming and coding.

Continued on next page

Recommendations for the way forward

RECOMMENDATIONS IN THIS SECTION

1 Accelerate efforts to adopt relevant technologies

Improve productivity to uplift the business and increase competitiveness

Continued

- Regardless of what stage food manufacturers are in on their digitalisation journey, business leaders should take a long-term view on technology adoption, and regularly assess business priorities and readiness to determine the right time to bring in technology tools and solutions to support the company in various stages of growth (see Figure 7.1 on following page for illustration).
- Business leaders will also need to ensure that the workforce remains up-to-date in acquiring future skills around the successful adoption and use of technology, and ensure that workers are prepared to support the organisation in its digital transformation initiatives in the long-term (See Recommendation 4: Emphasise on reskilling and upskilling of the workforce). By providing employees with the right upskilling opportunities, food manufacturers can build a future-ready workforce.
- Finally, the adoption of technology should be considered as a key proposition within food manufacturers' talent attraction and retention strategies. Digitalisation and the adoption of other advanced technologies indicate a future- and growth-oriented business, which would serve as a unique-selling point to potential hires, especially if food manufacturers are keen on attracting fresh, or young talent into the business.
- To get started on their technology adoption journey, food manufacturers can tap on available government initiatives listed on the following page.

Continued on next page

1

Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

1 Accelerate efforts to adopt relevant technologies

Improve productivity to uplift the business and increase competitiveness

Continued

Guide for food manufacturers to embrace technologies and build a future-ready workforce

Digitalisation Strategy

- Analyse the impact of the emerging trends and technologies affecting the sector and define business strategy
- Develop digital transformation plan according to strategic priorities
- Assess organisation digital readiness and develop implementation plan

Manpower Impact Assessment

- Assess manpower's existing skills and capabilities
- Evaluate the impact of the digitalisation strategy on job roles and skills in the company

Food manufacturers can leverage Impact on job roles and skills and the Job Dashboards in this report to assess impact on manpower

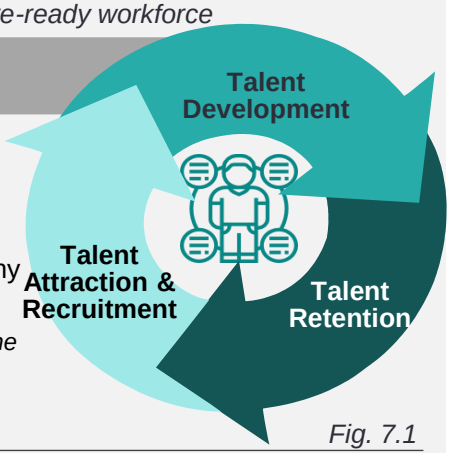


Fig. 7.1

Available initiatives to support food manufacturers' digital agenda

✓ **Company Training Committee (CTC)**

Launched by the National Trades Union Congress (NTUC) to help companies accelerate the adoption of technology at the workplace and support workers' acceptance of new technology

✓ **Enterprise Development Grant (EDG)**

Supports projects that help companies upgrade their business, innovate or venture overseas, including areas such as automation

✓ **Food Manufacturing Industry Digital Plan (IDP)**

Part of the SMEs Go Digital Programme, which aims to make going digital simple for SMEs and provides a step-by-step guide on the digital solutions to adopt at various stages of digital readiness

✓ **Industry 4.0 Human Capital Initiative Enabler Programme**

A hands-on programme that helps companies to successfully get started on their Industry 4.0 transformation

✓ **Productivity Solutions Grant (PSG) for Pre-scoped IT Solutions / Equipment**

Supports the adoption of pre-scoped IT solutions or food manufacturing equipment to support enterprise management and improve productivity

Recommendations for the way forward

CASE STUDY: Tiong Lian Food – Taking a digital leap to improve productivity and uplift business

Established in 1974 as a supplier of fresh chilled pork, Tiong Lian has in recent years expanded its business to be an importer and distributor of pork and other meat products. Today, the three-generation family business has incorporated advanced automation and digitalised processes in its production plant.

Larry Teo, Business Manager of Tiong Lian, shares with us how technology transformation has boosted productivity and created a work environment for employees, especially senior workers, to thrive in.

Overseas market visits and trade shows – where technology ideas originated from

Larry shared that Tiong Lian takes an organic approach in discovering opportunities to enhance its production facility. His father, Benson Teo, the Managing Director of the company, would often visit overseas raw pork suppliers. Through his trips, Benson saw the feasibility and benefits of automation and digitalisation. As a member of the Meat Traders' Association Singapore, the company also regularly participates in overseas trips to gain insight into the global Meat subsector's best practices.

Larry shared that the management team also often attends conferences and trade shows to get a sense of the offerings and advances from other players in the industry. Larry highlighted that while the company learns about a vast variety of technologies, the company remains focused on identifying solutions that are most suitable for Singapore's manufacturing environment and right-sized for Tiong Lian. "It is key that we evaluate digital solutions and technologies based on our own stage of business growth and digital maturity," says Larry.

Digitalising and adopting technology, one step at a time

Tiong Lian recognises the need to create a workplace that keeps pace with technological developments for the business to stay competitive. Since its relocation to a five-story production facility, Tiong Lian introduced a suite of technologies to improve operational efficiency. Instead of putting in place a structured and detailed technology roadmap, the company adopts a progressive approach when sourcing for and implementing technology solutions.

Tiong Lian began its technology transformation journey by implementing the Microsoft Dynamics NAV (Navision), an end-to-end Enterprise Resource Planning system, which the company is currently integrating with its Warehouse Management System. In addition, Tiong Lian's production plant is one of the first few in Singapore that houses an automatic conveyor belt system. The conveyor belt system is integrated with Tiong Lian's ERP system and runs across shop floors. It automatically transports products across workstations and eliminates the need for employees to transport meat manually. Workers can now shift away from exhausting and time-consuming processes and stay within their dedicated stations, to concentrate on their core responsibilities such as deboning, slicing and packing.

Subsequently, the company explored the use of Internet of Things by installing sensors on its manufacturing machines. This aids the company in the collection of production data such as output levels and equipment efficiency. Larry explains that these technologies allow the company to have a better visibility and understanding of its production performance.

Continued on next page

Recommendations for the way forward

CASE STUDY: Tiong Lian Food – Taking a digital leap to improve productivity and uplift business (cont.)

Adopting technologies, especially when it brings drastic changes to employees' ways of working, can be a stressful experience and our workers need every bit of support possible. As leaders, we must walk the talk in modelling the future-state behaviours and ways of working, so our employees feel motivated and supported.

- Larry

As a next step, the company will work on adopting an automatic dashboard for better visualisation and transparency of data captured from various digital systems. Larry also added that the company has plans to develop a mobile application, which will generate sales automatically with a higher level of accuracy. This will enable the company to shift away from traditional calls and manual, error-prone order entries.

Reaping benefits of implementing digital solutions and technology

Incorporating large-scale digital solutions is hardly cheap, but Tiong Lian managed to tap on support initiatives such as ESG grants, making such investments more palatable. More importantly, adopting these technologies have allowed Tiong Lian to reap many benefits including time savings and improved productivity.

Prior to the installation of technology solutions, Tiong Lian's Production Operators often struggled with physically taxing processes, causing productivity to decline over time as workers became tired. Workers have now moved away from laborious tasks, hence enhancing productivity and maximising production output.

Beyond operational efficiency, the company is also seeing positive effects on its workforce such as improved employee loyalty and hiring appeal. Given that the company hires a significant number of mature workers, technology has made the workplace more age-friendly, elevating the company's attractiveness to elderly workers. "Close to 50% of our packers are mature workers and we want to reduce the need to carry heavy things and unnecessary movement. "Since implementing technology, we have observed a higher sense of job satisfaction amongst elder workers. Moreover, they tend to have a longer career with us."

While this is not a common practice in the Food Manufacturing sector, Larry shared that in the long run, Tiong Lian may explore the potential to commercialise its advanced processing capacity by offering processing services to other meat distributors.

Continued on next page

Recommendations for the way forward

CASE STUDY: Tiong Lian Food – Taking a digital leap to improve productivity and uplift business (cont.)

Encouraging employees to adopt

Adopting new technologies often comes with a set of challenges and this is no exception for Tiong Lian. One of the challenges Tiong Lian had to overcome is getting buy-in from production workers. Larry recounted that when the company first purchased meat cutting machines, they were under-utilised. To encourage workers to use the machines more frequently, the management dedicated time and effort to educate employees on how these tools can benefit them directly in their jobs, such as time savings and reduction in laborious work. Having a clear understanding of how the tools will help them personally, employees are now able to better recognise the need to switch to new ways of working.

To further strengthen the transformation narrative, Larry emphasises the importance for leaders to act as early adopters and role models. “Before implementing any form of technology, we are always the first to receive training. Once we are well-equipped with the necessary knowledge and skills, we will be well-positioned to lead and support our employees in the transition.” Larry added that another advantage of doing so is that the leaders can step in to help if there are manpower shortages on the ground.

Key takeaways

In closing, Larry shared two lessons for other food manufacturers looking to accelerate the adoption of digital solutions and technologies:

1. With new technologies emerging every now and then, food manufacturers should stay abreast of those that are relevant to the Food Manufacturing sector. Staying current with the latest advances not only prepares businesses for increased relevancy within the sector and against competitors, but also helps attract and retain talent.

2. Food manufacturers should also build a clear business case before making any technology investment. There are countless technological solutions that are useful and effective, but they may not be the most suitable. Focusing on finding the solution that best addresses the organisation’s needs is key in harnessing technological development.

As technology solutions introduce changes to existing work processes, Tiong Lian also revaluated job tasks and roles in the organisation to better complement the adoption of technology. See pages 100 – 101 on how Tiong Lian redesigns jobs along with its technology transformation.

Recommendations for the way forward

RECOMMENDATIONS IN THIS SECTION

2 Leverage available networks and platforms to partner with other industry members to innovate

Revitalise portfolios with new or improved products to differentiate your brand in the market

- Given that the local Food Manufacturing sector hosts a vast, diverse, and well-connected mix of industry players ranging from large-, medium-, and small-sized enterprises across multiple sub-sectors, to Trade Associations and Chambers (TACs), unions, education institutions, research houses, as well as government agencies, many of which have developed initiatives or offered partnerships to share knowledge, expertise, and resources with the rest of the sector.
- It is within this rich and inter-connected ecosystem that food manufacturers can find the support they need as they carry out business and workforce transformation efforts. Manufacturers of different sizes or sub-sectors should consider leveraging on the strengths of fellow industry partners to collaborate and co-innovate food products.
- In addition to being located at the epicenter of one of the world's fastest growing markets, as well as being a cultural hotspot of East-meets-West, Singapore's food innovation ecosystem has proven to be a major attraction and enabler to global and local companies respectively.
- Additionally, government agencies have recognised Food Manufacturing as a growing sector and aims to develop it into a leading food and nutrition hub in Asia by 2025[1].
- In a similar vein, food manufacturers in Singapore have to likewise reinvent and reinvigorate themselves by continually innovating their products and businesses to remain relevant and thrive in a competitive environment – this is in line with Enterprise Singapore's focus on innovation as a key lever of enterprise growth.
- For food manufacturers who may not have the resources, capability, and time for innovation efforts, there are established food manufacturers, research houses, and education institutions who now offer these means to innovation. Manufacturers can utilise these networks to their advantage (e.g. as listed in Enterprise Singapore's Network of Food Manufacturing Partners[2]).
- While there are manufacturers who have leveraged and benefited from these available networks, still a large proportion can be encouraged to explore these collaborations.
- Some barriers to collaboration could include the perceived lack of capabilities needed to drive and scale up innovation projects within the organisation.

Continued on next page

[1]Food Manufacturing Industry Profile
[2]Enterprise Singapore's Network of Food Manufacturing Partners

Recommendations for the way forward

RECOMMENDATIONS IN THIS SECTION

2 Leverage available networks and platforms to partner with other industry members to innovate

Revitalise portfolios with new or improved products to differentiate your brand in the market

Continued

- To move forward with innovation, food manufacturers are encouraged to consider innovation from the following angles:
  - Good innovation does not have to be complex or ground-breaking. See our case study on page 163 on how one of the oldest coffee shops in Singapore partnered with a food technology start-up to innovate a simple, yet staple hallmark product
  - Companies stand to benefit from the exchange of knowledge and expertise during the process of collaborating with network partners
  - Innovation is an investment for companies in being both market competitive and talent competitive – innovative manufacturers will have an edge in penetrating markets faster, attracting talent for growth, and leading in business expansion
- It may also be worthwhile to note that innovation can span other areas of the business, and is not limited to food innovation. For example, business models and business processes can also be innovated.
- Through the course of this study, industry participants have shared examples of how they have innovated in recent years or plan to innovate in the future, such as:
  - Moving to e-Commerce platforms or setting up their own online shops
  - Providing food processing services to other manufacturers with similar products and in need of facilities
  - Developing proprietary digital solutions and offering software-as-a-service to other food manufacturers
  - Acting as distributors for other local or overseas companies
- To get started on their innovation journey, food manufacturers can tap on available resources listed on the following page.

Continued on next page

Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

2 Leverage available networks and platforms to partner with other industry members to innovate

Revitalise portfolios with new or improved products to differentiate your brand in the market

Continued

Available initiatives to support food manufacturers' innovation journey

✓ **Capability Transfer Programme (CTP)**

Supports organisations in speeding up the acquiring and transfer of global capabilities from foreign specialists to the local workforce, hence ensuring a sustainable supply of local workforce with the requisite skillsets

✓ **FoodInnovate**

A multi-agency collaboration led by Enterprise Singapore to bring a suite of resources to Singapore food companies to help them create and commercialise food products faster, and sell to a larger market. Under this initiative, food companies may also capitalise on Enterprise Singapore's strong network of partners for knowledge, expertise, and resources to pursue food innovation projects. Network of partners include:

- *Food Innovation & Resource Centre (FIRC) – Gain technical expertise on new product and process development, including packaging, shelf life sensory evaluation, automation, and market testing.*
- *Innovate 360 – Singapore's first food incubator with shared facilities such as a co-working space, test kitchen, R&D laboratories, and food production space. It also has mentorship capabilities to help start-ups scale up and network.*
- *Innovation Partner for Impact (IPI) – Use IPI's access to open innovation to scout for suitable solutions from its global network of technology partners and marketplaces*
- *Royal DSM - Bright Science & Technology Innovation Hub – DSM has a comprehensive development and application facility in Singapore to help companies develop functional foods for immunity and wellbeing with ingredients for improved bone, joint, cognitive and eye health.*
- *And many more*

✓ **FoodPlant**

Singapore's first shared facility set up by the Singapore Institute of Technology, Enterprise Singapore and JTC Corporation for small-batch food production to support innovation in the food manufacturing industry

✓ **SkillsFuture Enterprise Credit**

Utilise one-off $10,000 credit provided by the government to cover up to 90% of out-of-pocket expenses on qualifying costs for supportable initiatives, over and above the support levels of existing schemes

Recommendations for the way forward

CASE STUDY: KILLINEY & HOOW FOODS – How Singapore's oldest Hainanese coffeeshop and homegrown food tech startup discovered a winning formula for innovation

Blending tradition and technology in a new brew

Local food and beverage heritage brand Killiney Group and Singapore food tech start-up Hoow Foods made waves in 2019 when they announced their strategic partnership to produce a line of instant beverages. Since then, their collaboration has yielded more than 15 products, including healthier choices of instant coffee. There are further plans to develop another 10 products in 2022 under their joint brand.

This unlikely partnership between a traditional household brand and an up-and-coming start-up has its roots in the primary school years of erstwhile classmates Woon Tien Yuan, second-generation owner of the Killiney brand, and Ow Yau Png, Hoow Foods CEO/co-founder.

When Tien Yuan formally joined the management team of Killiney Kopitiam in 2019, the company was poised for entry into the food manufacturing space. Since this was a new venture for Killiney, Tien Yuan reconnected with Yau Png to explore a collaboration that would allow Killiney to tap on Hoow Food's expertise in food technology and reformulation.

Within the year, what began as casual after-dinner tasting sessions of instant coffee prototypes in Tien Yuan's home grew into a full-fledged, automated manufacturing operation – and Nanyang Beverage was born.

Nurturing a successful partnership amidst obstacles

Hoow Foods chief executive and co-founder Ow Yau Png (left) and Killiney Group Director Wong Tien Yuan Tien Yuan (right)

No partnership is without its challenges, and the collaboration between Hoow Foods and Killiney is no exception.

Tien Yuan recalls the difficulties he faced in convincing other family members within the Killiney management team to give the joint venture with Hoow Foods a try. "In the beginning, this idea was met with resistance. The older generation of food manufacturing leaders tend to prefer what is familiar to them and avoid what they consider 'riskier' business ventures." Undeterred, Tien Yuan took a measured approach by first introducing one instant beverage prototype to his family. As confidence in the quality and appeal of the product grew, so did the management team's openness to this partnership.

"It's important to introduce new ideas gradually. Once the senior leaders saw the success we had with the first product, they were much more willing to work with Hoow Foods."

Continued on next page

Recommendations for the way forward

CASE STUDY: KILLINEY & HOOW FOODS – How Singapore's oldest Hainanese coffeeshop and homegrown food tech startup discovered a winning formula for innovation (cont.)

"Food manufacturing companies are becoming more receptive to partnering with businesses across different sub-sectors. By leveraging on one another's strengths, collaborations allow companies to capture new opportunities in the market and reach new heights.

- Tien Yuan

No collaboration is too small. As startups, we need to put away unrealistic expectations and be open towards partnership opportunities.

- Yau Png

For Yau Png, Hoow Food's challenges were of a different nature. As a young food tech company, Hoow Foods understood that nurturing partnerships with food manufacturers was critical for paving its way into the sector. "The initial coffee-tasting sessions Tien Yuan and I had might have been a casual affair to him, but it was a serious relationship on my end," he jokes. "Behind the scenes, my team and I worked hard to produce high-quality, tasty prototypes. The business relationship that Tien Yuan and I share is extremely precious to me, and I wanted to see it succeed."

According to Yau Png, food tech start-ups like Hoow Foods bring a unique value proposition to the food manufacturing industry. Given the access to technology and technical know-how, Hoow Foods can swiftly innovate and produce prototypes, allowing food manufacturers to respond to market trends quickly.

However, innovation expertise was not the only contributing factor to the strong partnership between the two companies. Yau Png stressed the importance of being humble and trustworthy in business dealings. "It is crucial for start-ups to demonstrate that they are willing to learn and work as a team with food manufacturers, no matter how big or small they are. The industry is still largely run by experienced leaders from the older generation, who value credibility and sincerity highly."

Reaping the workforce benefits of a strong collaboration

To support this venture, Killiney hired a team of eight to run its automated manufacturing line. Interestingly, all eight employees in Nanyang Beverage were hired from outside the food manufacturing sector such as from food services, as well as non-food related sectors. While these employees required reskilling to effectively operate in a food manufacturing environment, Tien Yuan observed that there were clear benefits to this arrangement. For one, the introduction of fresh talent into the company alleviated difficulties in finding food manufacturing workers. In addition, new perspectives that the employees brought from other sectors have also invigorated the company.

Continued on next page

Recommendations for the way forward

CASE STUDY: KILLINEY & HOOW FOODS – How Singapore's oldest Hainanese coffeeshop and homegrown food tech startup discovered a winning formula for innovation (cont.)

For the team at Hoow Foods, this partnership was a valuable learning experience. Younger employees in the company were able to witness the application of food technology to real-world products first-hand, offering a tantalising view into the sector. Yau Png emphasised that such collaboration opportunities are a means to enhance the sector's appeal to young talent. "This change in perceptions of the industry – from staid and traditional, to innovative and exciting – will whet passions and attract more people into the sector."

Key takeaways

In closing, Tien Yuan and Yau Png shared three lessons for other food tech start-ups and food manufacturers seeking collaborations to innovate:

1. Food manufacturers should evaluate their existing networks, resources, and capabilities before exploring any partnerships. By taking stock of what they have, manufacturers will be better able to determine the nature and scope of the partnership they are seeking, and decide on the best way to go about embarking on such a collaboration.
2. Food tech start-ups seeking to collaborate with food manufacturers should work closely with them to set and agree on desired outcomes for the partnership. Different companies have different budgets, sales cycles, and expectations. Clearly defining parameters of the collaboration would help to mitigate any mismatch in parties' expectations.
3. Food manufacturers and food tech start-ups alike should view each other as collaborators, not competitors. By building trusted relationships and joining forces, both are able to reach new customer segments and penetrate target markets quicker.

Recommendations for the way forward

RECOMMENDATIONS IN THIS SECTION

3 Relook at existing jobs in alignment to the future of work in the Food Manufacturing sector

Redesign jobs to uplift careers and transform the workforce

- To manage the challenges of the food manufacturing landscape and the needs of the workforce, as well as the adoption of technologies and continual innovation, food manufacturers will need to reimagine existing jobs.
- The redesign of work processes and tasks in parallel to transformation efforts will help companies to build an agile workforce, maximise productivity and remain competitive in the long run.
- As jobs are redesigned, food manufacturers can expect to reap the following benefits:
  - Improved performance – enhanced productivity, customer experience and employer attractiveness
  - Leaner processes – reduced costs, waste, and increased efficiency
  - Empowered employees – ergonomic workplace, improved employee satisfaction and reduced turnover and errors. Jobs that are thoughtfully redesigned can potentially be more interesting and meaningful to employees, which translate into engaged and productive workforce that can meet business goals.

What is **job redesign?**

- Job redesign involves modifying the way work is performed in an existing job to include more value-adding tasks or increase productivity. It enables companies to align available resources to respond to both internal and external pressures.
- A classic scenario where job redesign can add value is introduction of new technology which changes the work processes and/or skills required of existing jobs.
- For example, by introducing a robotic arm onto a production line to replace a manual step, a company may free up valuable time for a production operator to be cross-skilled and manage multiple lines instead.
- By facilitating these changes, businesses enable their workforce with the right capabilities to maximise the insights and productivity gains from technological advancements.
- However, job redesign could also happen independently of technology adoption, such as in the case of a business process redesign, or redesign of jobs to incorporate age-friendly practices for a mature workforce.

Continued on next page

[1]Enterprise Singapore's Network of Food Manufacturing Partners

Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

3 Relook at existing jobs in alignment to the future of work in the Food Manufacturing sector

Redesign jobs to uplift careers and transform the workforce

Continued

What can **job redesign** look like**?**

JOB ENLARGEMENT

Job enlargement involves **introducing additional tasks** to an employee's original job scope, often due to reduced time required to carry out the original job scope because of improved processes and/or technology use.

Outcomes:

- Increased task variety and learning opportunities
- Improved job satisfaction and expansion of skillsets
- Enhanced employee engagement

JOB RECONFIGURATION

Job reconfiguration involves making an adjustment to an employee's existing job scope by **reshaping priorities and tasks to achieve new outcomes**, often to support a change in company strategy.

Outcomes:

- Increased task variety
- Increased task specialisation
- Reduced non-value add work and increased productivity

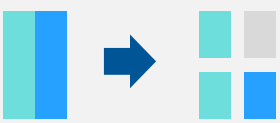
JOB ENRICHMENT

Job enrichment involves **introducing a value-added component at a higher job level** on top of the employee's original job scope, elevating the employee's scope of responsibility and allowing for upskilling.

Outcomes:

- Development of knowledge and skills
- Better preparednessfo r higher-level roles
- Improved job satisfaction from development challenges

JOB SIMPLIFICATION



Job simplification involves **removing redundant or duplicated tasks** conducted by an employee to streamline the job role and reduce unproductive activities, allowing for greater focus in achieving objectives.

Outcomes:

- Reduced work fatigue
- Reduced job monotony
- Reduced task duplication

Continued on next page

Recommendations for the way forward

RECOMMENDATIONS IN THIS SECTION

3 Relook at existing jobs in alignment to the future of work in the Food Manufacturing sector

Redesign jobs to uplift careers and transform the workforce

Continued

What can **job redesign** look like**?**

- By 2030, one in four Singaporeans will be aged 65 and above. Singapore's workforce will age rapidly and the median age is expected to rise from 40.6 in 2010 to 53.7 in 2050[1].
- Propose to change to: Insights from our study also indicate that a significant proportion of workers in the food manufacturing sector today are aged 40 and above.
- Hence, in addition to redesigning jobs to support technology and workforce transformation efforts, companies should also extend special consideration to mature workers by:
  - Establish safe practices to minimise the risk of injuries (e.g. installation of handrails and slip-resistant surfaces) and confirm that work is physically easy (e.g. reduction of manual effort)
  - Place more emphasis on knowledge-based tasks rather than routine tasks
  - Provide necessary training for older workers to ensure they are able to perform their roles effectively
- Detailed information on the future of jobs in the food manufacturing sector can be found in Appendix: Job Dashboards. Companies can use the relevant job dashboards as a guide to redesigning existing jobs, especially for Medium-impact roles such as Process Technician, Production Operator, Section Head / Line Leader, Production Supervisor / Planner, and Quality Control Technician.
- In the short- to mid-term, technology will augment current ways of working for the abovementioned roles, potentially reducing manual tasks and freeing up time for higher value-added work such as performance management, driving improvements, and increasing scope of machines and lines.
- Nevertheless, food manufacturers should continue to observe and stay abreast of technology and trends in the sector, and assess how these may impact other existing jobs in the mid- to long-term. By actively monitoring the external landscape and its effect on the workforce, companies can proactively shape the role and capabilities of its employees to better respond to future challenges.

Continued on next page

[1]Channel News Asia, 17 Aug 2019: Commentary: It is high time for a Ministry on Ageing Issues - CNA (channelnewsasia.com)

Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

3 Relook at existing jobs in alignment to the future of work in the Food Manufacturing sector

Redesign jobs to uplift careers and transform the workforce

Continued

What are the human capital considerations for **job redesign?**

- In embarking on a job redesign exercise, business leaders should keep in mind that it is one of the components in the overall workforce transformation process and should not be considered in isolation. Job redesign should be anchored by companies' overall business strategy (including people and digitalisation priorities) and be further linked to downstream workforce management activities.
- To ensure successful and holistic job redesign, food manufacturers should look into various human capital dimensions, such as:

Learning & Development	Performance Management	Compensation & Benefits	Recruitment & Selection
• Identify skill gap between existing and redesigned job role • Develop training road map to equip employees for the future job role	• Set or revise performance goals of employees in the new redesigned job	• Review existing wages for newly redesigned job based on the breakdown of new tasks and skills required to perform the job	• Incorporate new tasks and skills for redesigned jobs to refine the recruitment and selection processes for internal and external job candidates

- Furthermore, strong and effective change management is needed to ensure the success of the job redesign exercise. Business leaders will need to anticipate and prepare for employees' difficulties in changing current ways of working, adopting and using technology, picking up new skills, as well as concerns around employability and the stability of jobs.
- To mitigate these potential workforce challenges in job redesign implementation, business leaders will need to clearly articulate the rationale for transformation, empower people managers to guide employees through the transition, and actively encourage and facilitate the equipping of workers to adjust to new ways of working.
- To get started on their job redesign journey, companies can tap on available initiatives on the following page.

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Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

3 Relook at existing jobs in alignment to the future of work in the Food Manufacturing sector

Redesign jobs to uplift careers and transform the workforce

Continued

Available initiatives to support food manufacturers' job redesign efforts

✓ **Career Conversion Programme (CCP)**

Supports mid-career individuals in skills conversion and move into new occupations or sectors. Redeployment / Job Redesign Reskilling is a mode of CCP that is targeted at companies that are undergoing business transformation, and highly impacted workers will be provided with training to take on new or redesigned job roles within the same company

✓ **Capability Transfer Programme (CTP)**

Supports organisations in speeding up the acquiring and transfer of global capabilities from foreign specialists to the local workforce, hence ensuring a sustainable supply of local workforce with the requisite skillsets

✓ **Company and Workforce Transformation (CWT) Programme**

Guides businesses to redesign jobs in alignment to current and future business needs

✓ **Industry 4.0 Human Capital Initiative**

Helps companies strengthen their strategic Human Resource planning, workforce development and job redesign capabilities to augment the implementation of Industry 4.0 solutions in a sustainable manner

✓ **Support for Job Redesign under Productivity Solutions Grant (PSG-JR)**

Encourages companies to work with pre-approved Job Redesign consultants to redesign work processes, tasks and responsibilities

Recommendations for the way forward

CASE STUDY: Tiong Lian Food – Tiong Lian redesigns jobs for a future ready workforce

Technology transformation offers an unprecedented opportunity to reshape the workforce

As Tiong Lian accelerates digitalisation efforts and the adoption of technology, the company is committed to bringing their people with them. Job redesign became a key consideration for the company to better harness the capabilities of technology and potential of employees.

Tiong Lian uses job redesign to complement its technology implementation by exploring whether a different combination of tasks may be optimal and how these tasks can be performed better through human-machine interactions. Larry shares a few ways the company has redesigned jobs to empower employees and improve performance. These are summarised in the table below:

#	Job role	Job before redesign	Job after redesign
1	Production Operator	- Production Operator recorded production data manually - Production Operator travelled across stations to move large amount of meat manually	- Central weighing system allows order data to be captured and sent to computers directly - With time freed, Production Operator can now focus on weighing products and those at the end of the production line can perform basic Quality Control checks on finished products - The automatic conveyor system replaces manual transport of meat across stations, allowing Production Operator to focus on tasks that are more difficult to automate, such as meat trimming
2	Team Leader	- Team Leader needed to patrol the shop floor physically to monitor production - Production yield reports were prepared manually, taking up a significant amount of time and effort, while being prone to human error - Decision making (e.g., forecasting order quantity) was primarily based on experience, resulting in occasional deviations and downstream impact at Production level	- Team Leader leverages Internet of Things to track production in real time using data collected by sensors on the shop floor - With data collected, yield reports are generated automatically with higher efficiency and accuracy - Team Leader uses manufacturing data collected to generate insights on production performance such as output, productivity, and equipment efficiency - With time freed, Team Leader can subsequently focus on higher value-added tasks such as production planning and team management - Team Leader leverages basic Excel skills for decision making, while complemented by past work experience

Continued on next page

Recommendations for the way forward

CASE STUDY: Tiong Lian Food – Tiong Lian redesigns jobs for a future ready workforce (cont.)

#	Job role	Job before redesign	Job after redesign
3	Production Manager	- Production Manager gathered production data from Supervisor for subsequent analyses - Production Manager relied heavily on past work experience for strategic planning and decision making	- With Internet of Things, Production Manager has better visibility and transparency of data on a real-time basis, allowing decisions to be made promptly - Apart from work experience, Production Manager works closely with Supervisor to discuss and generate insights from data collected to identify gaps and implement continuous improvement

Job redesign is only one part of the equation

To better support its job redesign efforts, Tiong Lian looks into other dimensions of the workforce management plans such as career planning and compensation and benefits. For instance, instead of rewarding employees entirely based on job titles, Tiong Lian has incorporated a skill-based allowance component in its pay structure. Under this model, employees who have acquired specific skillsets will be rewarded with additional allowance. In addition, Tiong Lian also rewards workers who take on an expanded job scope and one such example is Production Operators. “As Production Operators perform basic QAQC tasks, they are rewarded with an additional allowance for the work,” shared Larry. “We hope that by helping skill-based and task-based allowance, we can cultivate a culture of improvement where employees continually learn and develop to stay relevant.”

In addition, the company also identifies potential career development and progression opportunities for redesigned roles. “By providing more value-added jobs and meaningful careers, we are better positioned to attract talent, especially younger workers,” Larry shared.

Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

4 Emphasise on reskilling and upskilling of the workforce

Build a future-ready workforce equipped with the right skills

Continued

- Yet another crucial enabler to sustained business transformation and success is the timely and continual reskilling and upskilling of the workforce.
- As food manufacturers' most important resource, employees need to acquire future and other in-demand skills such as technology application skills, technical and domain knowledge, as well as soft skills to ensure a resilient and adaptable workforce well-equipped to support the business.
- Therefore, in today's dynamic environment, business leaders and human resources (HR) personnel need to actively take the lead and champion workforce upskilling, creating a culture of lifelong learning.
- While the development of technical skills and know-how in Food Manufacturing remain the top priority for learning, it is also critical for companies to invest in building capabilities in broader skills such as Data Analytics and Technology Application to help employees stay abreast of the latest developments in the sector.
- Other business and foundational skills such as Stakeholder Management, Communication, and Collaboration will largely evolve over time, but companies can use targeted experiential programmes to groom the necessary skillsets.
- For details on the additional or enhanced skills required by existing functions in the sector, please refer to the Jobs and Skills Analysis section of this report.
- Leading practices in workforce upskilling suggest that holistic skills development leverages a hybrid approach encompassing a variety of development options comprising:
  - Education – Formal, structured learning
  - Experience – On-the-job or hands-on learning
  - Exposure – Informal learning to progressively build higher proficiency levels for the requisite knowledge, skills and abilities as one progresses to the next career level
- When planning for learning and development activities, both business leaders and HR personnel need to be cognisant of the different learning needs of various levels of staff. Learning experiences should take into account the demographic profile of the worker, type and level of skill to be acquired, and nature of the worker's job. Creating a fit-for-purpose learning experience with innovative delivery styles will facilitate a smooth reskilling/upskilling process and pave the way for future learning experiences.

Continued on next page

Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

4 Emphasise on reskilling and upskilling of the workforce

Build a future-ready workforce equipped with the right skills

Continued

- In addition, companies can leverage existing initiatives by government agencies and sectoral associations to support their upskilling endeavours. Companies should also consider working with education institutions or training providers in developing suitable curriculum for the workforce, especially if the type of skill or demographic of learners cannot be adequately catered to with available training programmes. Training avenues, especially in the areas of tech adoption and continuous improvement are also available through unions.
- For example, workers in the Production function may require practical technology familiarisation or basic data analytics courses that are contextualised to the manufacturing environment, and these may not be widely available on public training platforms. Hence, business leaders interested in these areas can either work with HR personnel to develop a training, or partner with education institutions and training providers to do so, if they do not have the in-house training expertise.
- Larger companies who possess such in-house training expertise and resources, such as their own in-house training platforms, could consider offering training services to other food manufacturers.

Development options	
EDUCATION	• Instructor-led trainings (can also be done in partnership with IHLs) • Vendor trainings and workshops • Certification programmes • Online learning platforms (e.g. Udemy, Coursera) • Leadership and other short courses • Management development programmes
EXPERIENCE	• Structured On-the-job training (OJT) • Job rotation • Cross-functional teams • Action learning projects • Special stretch projects • Short-term assignments
EXPOSURE	• Knowledge-sharing • Coaching and mentoring • Buddy system • External forums

Continued on next page

Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

4 Emphasise on reshilling and upskilling of the workforce

Build a future-ready workforce equipped with the right skills

Continued

- On the one hand, this would contribute to the uplift of capabilities in the sector, and on the other, strong branding as subject matter experts and market leaders.
- Finally, effective upskilling of the workforce requires concerted and integrated efforts across both companies and employees. Business leaders will need to model and cultivate a mindset of continuous learning for staff to emulate.
- To get started on their workforce upskilling journey, companies can tap on available initiatives in the section below.
- There is strong governmental support, particularly for smaller companies, in alleviating cost challenges associated with upskilling of the workforce, to encourage food manufacturers to take on necessary programmes to be future-ready.

Available initiatives to support food manufacturers' job redesign efforts

✓ **Career Conversion Programme (CCP)**

Supports mid-career individuals in skills conversion and move into new occupations or sectors. Redeployment / Job Redesign Reskilling is a mode of CCP that is targeted at companies that are undergoing business transformation, and highly impacted workers will be provided with training to take on new or redesigned job roles

✓ **Company and Workforce Transformation Programme**

Helps companies assess workforce skills gaps and training needs, develop effective OJT blueprints, and help HR personnel better deliver workplace training

✓ **Company Training Committee (CTC)**

Launched by the National Trades Union Congress (NTUC) to help companies develop near-, mid- and long-term business strategies and workforce plans as well as support workers in upskilling

✓ **Enhanced Training Support for SMEs**

Offers additional support for SMEs in the form of higher course fee subsidies for company-sponsored trainings

✓ **SkillsFuture Enterprise Credit**

Utilise one-off $10,000 credit provided by the government to cover up to 90% of out-of-pocket expenses on qualifying costs for supportable initiatives, over and above the support levels of existing schemes

Recommendations for the way forward

RECOMMENDATIONS IN THIS SECTION

5 Embrace talent from outside the Food Manufacturing sector

Explore a range of talent supply sources to address manpower gaps

- Food manufacturers need to actively explore various talent supply sources that have not been traditionally tapped on to grow their workforce. This is to ensure that the sector's growth is unencumbered by manpower shortages.
- Manufacturers can explore talent supply sources such as mid-careerists. This includes talent from other sectors and freelancers (such as recruiting retired food manufacturing experts on advisory basis, or even members of the non-working and other retirees). These individuals possess diverse experience and can undergo reskilling/upskilling on relevant technical skills.
- As such talent may require time to pick up food manufacturing-related skills or knowledge, companies will need to have a strong onboarding and learning and development strategy to ensure that new talent can pick up the relevant skills in an efficient manner, such as developing targeted experiential programmes to groom the necessary skillsets, or assessing current standard operating procedures and redesigning work to facilitate the quick uptake of new responsibilities.
- Food manufacturers can also engage students through Work-Study programmes targeted at ITE, Polytechnic and University graduates, who possess foundational knowledge in applicable skillsets.
- Food manufacturers should take the following considerations to further attract mid-careerists and freelancers into the sector:
  - Recognise relevant prior experience of mid-careerists to reduce barriers to entry. For example, transferrable skills from other manufacturing sectors can be counted towards hiring decisions. In addition, business leaders and HR personnel should be aware of compensation and benefits benchmarks of comparable jobs in other sectors, and explore ways to close any gaps, if possible, to enhance their attractiveness and ensure talent competitiveness
  - Leverage training programmes to bridge skills gaps for mid-careerists and bring them up to speed quickly and thoroughly
  - Leverage existing programmes such as the CCP for Food Manufacturing Professional/Associate, WSG Career Matching Services to attract and reskill mid-careerists
  - Partner with IHLs in providing internship opportunities to capture talent from Work-Study programmes early, and provide accelerated career-entry track for graduates with exemplary performance during their internship stint

Continued on next page

Recommendations for the way forward

RECOMMENDATIONS IN THIS SECTION

5 Embrace talent from outside the Food Manufacturing sector

Explore a range of talent supply sources to address manpower gaps

Continued

- To get started on their talent attraction journey, companies can tap on available initiatives in the section below.

Available initiatives to capture talent from outside the Food Manufacturing sector

✓ **Career Conversion Programme (CCP)**

Offers skills conversion programmes such as CCP for Food Manufacturing Professional/Associate, CCP for I4.0 Professionals/ Executives and Associates as well as CCP for Internationalisation Professionals. These programmes help mid-careerists move into new or emerging roles in areas such as food safety, food innovation, food regulatory, quality assurance and expertise in operating new machineries or systems

✓ **SGUnited Mid-Career Pathways Programme**

Allows companies to fill positions with mid-career individuals who bring with them a wealth of work experience. Upon completion of the attachment, companies may consider hiring well-performing individuals as permanent employees

✓ **WSG Career Matching Services**

Helps employers match job openings to suitable local candidates

Recommendations for the way forward

CASE STUDY: French Food Factory – How French Food Factory is building a company culture of continuous learning and attracting talent from outside of the food manufacturing industry

Upskilling as a steppingstone to productivity

Four years ago, when the French Food Factory's local café chain Saybons observed that an increasing number of customers were ordering soups for takeaway, founder and managing director Daphane Loke saw an opportunity to branch into the food manufacturing space. Since then, Saybons has launched a range of ready-to-eat meals, pasta sauces, and soup packs – a move that bode well for the brand as the trend of home consumption grew, particularly during the recent COVID-19 pandemic.

To cope with the resulting demand for ready-to-eat meals, the French Food Factory has explored various means to improve the productivity of its operations, such as automating steps in their production processes and upskilling employees. To Daphane, investments in both these areas are equally crucial in strengthening French Food Factory's capabilities. "Without technology, we would not be able to operate at our current capacity. Without people, we would not be able to operate at all. Having said that, it's important that our employees continue to learn and grow instead of remaining at status quo. Through upskilling our workforce, the business is able to remain competitive."

Daphane adds that upskilling extends beyond the technical skills required to perform day-to-day tasks to soft skills such as communication and collaboration. "Besides basic skills related to food manufacturing, or even more advanced skills in technology and automation, developing interpersonal skills is an evergreen priority for us. In our company, employees of diverse backgrounds and disciplines are required to work closely together. When they can understand and be understood by one another, that's when effective collaboration can take place."

Tapping on a mix of platforms to train the workforce

Founder and Manager Director of French Food Factory, Daphane Loke

The French Food Factory applies several different training approaches to effectively upskill and reskill employees. Depending on the types of skills required, profile of individual workers, and worker's aspirations, training might be carried out on-the-job, through external courses, or even national initiatives such as Career Conversion Programme and Work-Study programmes.

For example, on-the-job training is used to equip workers with essential skills in basic food hygiene and machine operation. These trainings cater especially well to mature workers, who may prefer hands-on learning outside of the classroom, and inmate workers under the Yellow Ribbon's Private-Sector Participation Scheme[1], who are unable to attend external trainings.

Continued on next page

Recommendations for the way forward

CASE STUDY: French Food Factory – How French Food Factory is building a company culture of continuous learning (cont.)

Employees are also offered opportunities to upskill themselves through external programmes, particularly if more complex skills or official certifications are required. In the case of machine troubleshooting and maintenance, for instance, the French Food Factory works with machine vendors to impart these skills to relevant employees. Employees are also sent for external courses in food safety and food science-related topics.

In addition, the French Food Factory leverages national initiatives such as Career Conversion Programme and Work-Study Programmes to recruit and train individuals to take up full-time roles in the company. These programmes have allowed not only fresh graduates, but reskilled mid-careerists from outside of the food manufacturing sector to confidently take on jobs with the French Food Factory. In one notable example, an ex-Restaurant Chef from the food services sector looking for a change in environment was successfully brought on as a Production Chef through Workforce Singapore's Career Conversion Programme. Recounting other similar examples, Daphane observed that such mid-career hires have injected fresh perspectives and enthusiasm into the company. "We employ a number of mid-careerists who have joined us from other industries, and they have demonstrated a lot of passion for food manufacturing and the work we do. I believe that there are more of such individuals out there in the market, and we are definitely looking to bring them into our company."

Overcoming barriers and rallying workers to continually upgrade their skills

Initially, the idea of upskilling was met with resistance from workers. Mature or older workers who had left their schooling years behind them were hesitant about returning to a classroom environment. Furthermore, since most external courses are offered in English, upskilling also presented a challenge to workers with a limited command of the language.

To combat these obstacles, Daphane and her team make sure to educate employees about the importance of upskilling and provide suitable learning experiences for different workers. "We often encourage employees to consider training as way to upgrade themselves and grow their careers. Thankfully, our employees have responded well and many of them are happy to undergo upskilling."

"We also try to make it easy for employees to pick up new skills. For example, if employees do not feel comfortable attending courses held in English, we'll send someone who is more proficient in the language to attend the course on their behalf and have them share what they have learnt with the rest. By making such adjustments, our employees no longer feel intimidated by training and are more receptive towards learning new things."

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Recommendations for the way forward

CASE STUDY: French Food Factory – How French Food Factory is building a company culture of continuous learning (cont.)

These efforts to encourage and facilitate workforce upskilling have since yielded positive results. Daphane observes that not only are employees more confident and competent at their jobs, but they also find increased satisfaction in what they do. “When our people pick up new skills and apply them at work, they are happier and tend to stay with us longer. Training is an investment that has really paid off for our employees, and we hope that this culture of learning will continue to grow.”

Making learning a culture in the workplace

Despite the successes that the French Food Factory has experienced thus far, Daphane acknowledges that the culture of learning must be continually cultivated. One way that the management team is motivating employees to take ownership of their own learning and development is through involving them in the company’s strategic plans and decision-making. By empowering employees to be part of the company’s growth, Daphane hopes that they will begin to proactively acquire new knowledge and skills needed to steer the company in the right direction.

“There are many exciting developments happening within food manufacturing that could potentially transform careers in the sector. However, the workforce needs to be willing to upskill or reskill themselves in new areas, such as technology and automation, to make the most of these career opportunities and contribute to the growth of the company.”

Key takeaways

In closing, Daphane shared three lessons in workforce upskilling for food manufacturers and other players in the food manufacturing ecosystem:

1. Besides investing in upskilling and reskilling of the workforce to improve employee productivity and boost morale, food manufacturers should also consider other means to do so, such as:
    - Investing in technology and automation to streamline processes and support employees in day-to-day tasks
    - Redesigning the work environment to make it conducive and safe for employees
    - Providing employees with career development or progression opportunities to grow their careers within the sector
2. Food manufacturers should also be open to recruiting talent from outside of the food manufacturing sector, leveraging national initiatives such as Career Conversion Programmes as a source of mid-careerists.
3. Sectoral agencies and associations should also continue driving efforts to increase awareness and outreach of such initiatives to fuel upskilling, reskilling, and recruitment of talent into the sector.

Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

6 Reevaluate Employee Value Proposition (EVP) and existing human capital practices

Enhance your image as an employer to attract the best talent

- Food manufacturers play a key role in elevating sector appeal and business leaders should rethink their employer branding and Employee Value Proposition (EVP) to better differentiate themselves from their competitors, which may include not only other food manufacturers, but adjacent sectors from which they wish to attract talent as well.
- Hence, companies should actively define and differentiate the value they can offer to both existing and potential employees, and find channels and avenues to actively communicate this (e.g. through education institutions, company website, and/or social media platforms)
- For example, SMEs may wish to highlight their lean and agile organisation structures, offering wide exposure to Food Manufacturing operations and opportunities to be involved in business transformation and food innovation, while non-SMEs may wish to highlight established career pathways and international networks.
- Irrespective of company size, manufacturers should take active steps to align and integrate HR policies and practices with their EVP to create a consistent, yet differentiated message on the benefits of being employed with them.

What is an **Employee Value Proposition (EVP)?**

- An EVP is a unique set of offerings provided by an organisation to its workforce in return for the skills and capabilities employees bring to the organisation. Essentially, an EVP is the company's promise to any employee about what he or she can experience or receive while working at this company.
- An EVP is typically captured in a statement, or a set of statements, and may include features such as:
  - Culture
  - Ways of working
  - Career opportunities
  - Work aspects
  - Benefits

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Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

6 Reevaluate Employee Value Proposition (EVP) and existing human capital practices

Enhance your image as an employer to attract the best talent

What is an **Employee Value Proposition (EVP)?**

- Consider the following elements. Which elements are relevant to your company's current value proposition, or describes what your company aims to embody as an employer?

PEOPLE	ORGANISATION	WORK	OPPORTUNITY	REWARDS
Collegial work environment	Communication	Travel	Career management	Compensation
Co-worker quality	Diversity	Work environment	Speed of progression	Benefits
Leader quality	Empowerment	Job impact	Promotion	Recognition
People management	Market position	Job match	Training and development	
Senior leadership	Fairness and ethics	Work-Life Balance	Job security	
	Organisation size	Accommodation		
	Technology	Job Satisfaction		

Examples:

▪ Supportive and forward-looking senior leadership ▪ Family-like organisation culture ▪ Strong emphasis on teamwork and collaboration	▪ Building a fair work environment ▪ Encouraging open and agile communication ▪ Empowered workers enabled by technology	▪ Providing resources for people to fulfil their jobs ▪ Performing meaningful and value-added job tasks ▪ Ensuring a safe work environment	▪ Putting in place the right L&D programmes ▪ Providing employees with career opportunities	▪ Benchmarking pay ▪ Offering non-monetary rewards ▪ Conducting regular and fair performance and wage reviews

★ Possible strengths SMEs can focus and leverage on given finite resources

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Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

6 Reevaluate Employee Value Proposition (EVP) and existing human capital practices

Enhance your image as an employer to attract the best talent

Why is an **Employee Value Proposition (EVP)** important?

- An authentic and consistently implemented EVP has an impact on major activities through an employee's lifecycle, and can enable food manufacturers to attract, secure, and retain the talent it needs to grow.

Attract:

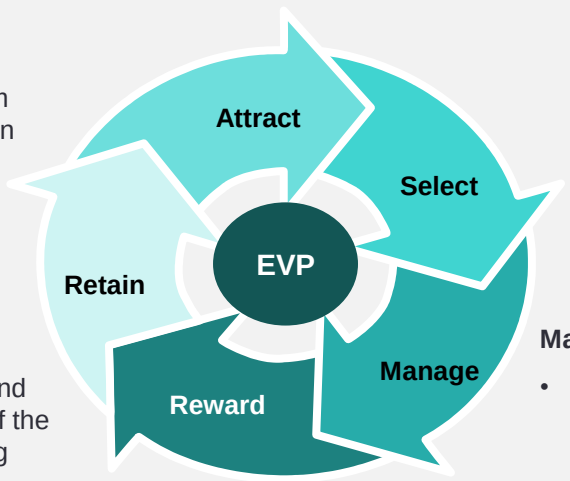
- Clearly communicate desired attributes by candidate profile
- Engage candidate in broad value not just remuneration
- Establish employment expectations

Select:

- Refine selection criteria to target applicants who are culturally aligned

Retain:

- Reduce turnover by differentiating organisation's offer against competing external offers
- Strengthen rewards and career progression system to increase talent attraction competitiveness



Reward:

- Deliver on the tangible and intangible components of the employment offer, driving engagement and commitment
- Reinforce broad based value of company employment

Manage:

- Align organisational strategies and processes to overarching value proposition
- Perpetuate desired culture through aligned and consistent EVP messaging

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Recommendations for the way forward

FOOD MANUFACTURERS

RECOMMENDATIONS IN THIS SECTION

6 Reevaluate Employee Value Proposition (EVP) and existing human capital practices

Enhance your image as an employer to attract the best talent

Designing an EVP	
STEP 1	**Lay the foundation** • Establish principles to support the EVP • Establish the employment elements to be considered for including in EVP
STEP 2	**Build the evidence base** Collect evidence through surveys, focus groups, etc. to understand: • People preferences • What the organisation is currently doing well in • The unique characteristics of the organisation • The competitive environment
STEP 3	**Design the EVP** • The EVP must take into account what is important to people, what the organisation can deliver and its unique characteristics • Consideration is given to brand alignment
STEP 4	**Implement and maintain the EVP** • Assign ownership and resources to ensure that policy & processes are constantly aligned to EVP • Market and communicate the EVP • Review the EVP

- A successful EVP should have the following:
  - Alignment with organisation vision and strategy
  - Buy-in from senior leadership
  - Authentic reflection of working within the organisation
  - Alignment with people practices across the employee lifecycle (such as Recruitment, Performance Management, Training & Development, Career Development)
  - Measures of success to track the effectiveness of an EVP
  - Communicated clearly across appropriate channels (such as company website, and/or social media platforms)
- Separately, along with reevaluating EVP, business leaders should be aware of leading people practices, and adopt them as necessary in support of building a meaningful employee experience, which lends to a strong EVP.
- To get started on their journey to build EVP and strong people practices, companies can tap on available initiatives on the following page.

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Recommendations for the way forward

RECOMMENDATIONS IN THIS SECTION

6 Reevaluate Employee Value Proposition (EVP) and existing human capital practices

Enhance your image as an employer to attract the best talent

Continued

Available initiatives to support food manufacturers' people practices

✓ **Enterprise Development Grant (EDG)**

Supports projects that help companies upgrade their business, innovate or venture overseas. One of the areas the grant supports is Human Capital Development, covering areas such as Employee Value Proposition, Employee Engagement & Communication and Learning & Development

✓ **Institute of Human Resource Professionals**

Offers support to assess health of people practices (including EVP), understand employee sentiments, and receive help on adopting leading people practices

Recommendations for the way forward

CASE STUDY: Asia Pacific Breweries (APB) Singapore – How Asia Pacific Breweries (APB) Singapore is enhancing its image to become an employer of choice

Shortages in talent and manpower have been a perennial challenge for food manufacturers in Singapore. More recently, a combination of the COVID-19 pandemic and government measures to encourage a healthier mix of locals and foreigners in the workforce have intensified businesses' struggles to recruit manpower. These challenges have prompted food manufacturers to redouble their efforts in innovation and upgrading their human resources practices to increase their appeal as employers.

One such company, Asia Pacific Breweries (APB) Singapore, home to the Singapore-born and well-loved Tiger Beer, and part of the HEINEKEN Company, is on a journey to redefine the image of working within food manufacturing sector. Shaun Ee, People Director, and Mario Goh, Human Resources Business Partner, share some ways that APB Singapore is shaping its proposition as an employer of choice.

Creating a brewery of the future

Shaun Ee, People Director of APB Singapore

Mario Goh, Human Resources Business Partner of APB Singapore

One way that APB Singapore is reinvigorating perceptions of food manufacturing is through embarking on technological transformation. Leveraging the HEINEKEN Company's global capabilities and resources, the business has adopted various advanced technology solutions to enhance the productivity and safety of its operations in recent years.

For example, technology such as the Internet of Things (IoT) and digital sensors are used on the shopfloor to track operations in real-time, reducing the need for manual effort to monitor production performance. This has allowed employees to focus on more value-added tasks such as data analysis, problem-solving, and continuous improvement.

APB Singapore also utilises Virtual Reality (VR) as an immersive training tool to simulate emergency scenarios, such as a fire, and allow workers to learn the procedures of responding safely and effectively in such situations. Yet another technology solution that APB Singapore has successfully adopted is the use of drones to conduct distillery tank inspections and cleaning. As a result, workers no longer need to climb into the tanks to do so, greatly reducing safety risks associated with such tasks.

To help employees adjust to new technologies, the company involves its people managers in first piloting solutions, then training teams to adopt solutions and adapt to new ways of working. Shaun credits a strong change management process and a 'leave no man behind' approach to APB Singapore's success in technology adoption.

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Recommendations for the way forward

CASE STUDY: Asia Pacific Breweries (APB) Singapore – How Asia Pacific Breweries (APB) Singapore is enhancing its image to become an employer of choice (cont.)

When companies roll out initiatives like graduate programs to attract young talent, it is key to recognise that people managers, who provide trainees with direct guidance and coaching, can make or break the experience. Designing the program is only the first step. Moreover, it is crucial to identify the right mentors with the disposition and desire to develop people and leverage them to create a great experience for employees.

- Shaun

"Here at APB Singapore, we are continuously exploring new ways on how digitalisation can be used to enable our employees in their work, not displace them. Getting our people onboard APB Singapore's tech transformation is a crucial step towards making us a brewery of the future, which we hope will spark interest and excitement for both our existing and future talent."

Developing talent with intention

APB Singapore is also making a concerted effort to recruit and develop young talent as future leaders of the organisation.

The Asia-Pacific Graduate Program (APGP) that launched in 2016, and the Supply Chain Graduate Program (SCGP) that followed in 2021 are examples of how APB Singapore is creating meaningful experiences for its fresh hires. The APGP is a 2-year program that aims to develop a holistic range of functional skills in graduate trainees by placing them on rotations across multiple business tracks. Across the duration of the programme, participants benefit from guidance from a mentor, as well as an overseas stint in one of the many HEINEKEN's operating companies in Asia Pacific.

Riding on the success of APGP, the SCGP was designed for young talent with a passion for Supply Chain. Participants of the program take on three Supply Chain-related assignments in areas such as Engineering and Planning to build targeted technical skills and experiences. Upon completion of the program, graduates take on team leadership roles and enter an accelerated career pathway with the company.

Shaun credits partnerships with education institutions as key to increasing awareness of the programs among graduating students. "Through our relationships with local universities, we were able to get the word out to students when we first launched our graduate programs. This created interest in working with us and that has helped us to get the program off the ground."

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Recommendations for the way forward

CASE STUDY: Asia Pacific Breweries (APB) Singapore – How Asia Pacific Breweries (APB) Singapore is enhancing its image to become an employer of choice (cont.)

Know exactly why you are recruiting talent. Given the current manpower crunch, there may be a rush for companies to fill open positions as quickly as possible. However, this is also a great opportunity to evaluate the current and future talent needs of your company. Take time to identify and recruit candidates with potential, and nurture them to grow into future leaders of the company.

- Mario

In addition to its efforts to recruit and develop fresh graduates, APB Singapore also places a strong emphasis on building a pipeline of young talent through its internship program. Within this program, interns are given a taste of the end-to-end brewing process and are offered the opportunity to work on cross-functional projects with other interns.

“Such cross-functional work allows interns to gain exposure to various areas of the business and collaborate with interns from other teams to solve problems. Through this process, our interns are able to gain a better appreciation of the business, and at the same time, build a tightly-knit community with their peers.”

Designing an engaging and inclusive employee experience

Shaun and Mario recognise that designing an engaging and inclusive employee experience is central to elevating employer branding. “Driving improvements in the employee experience allows us to become the employer of choice,” Mario says. “Employee engagement starts right at the beginning of any employee’s time with us and lasts throughout their time at APB Singapore.”

To help new joiners assimilate quickly and effectively into the company, ABP has invested effort into creating a holistic and hands-on onboarding experience, even with the limitations of the recent pandemic. Activities such as market visits and brewery tours have been integrated into the onboarding process to give new joiners a better understanding of APB Singapore products and business. A newly developed HR chat box is also available to provide remote support and address any queries new joiners might have.

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Recommendations for the way forward

CASE STUDY: Asia Pacific Breweries (APB) Singapore – How Asia Pacific Breweries (APB) Singapore is enhancing its image to become an employer of choice (cont.)

In addition, APB Singapore puts a heavy focus in strengthening employee engagement throughout the year. For example, APB Singapore conducts climate surveys and hosts townhalls to encourage open and transparent discussions amongst employees and business leaders. People managers are also encouraged to hold frequent discussions with team members on their performance, career aspirations, and areas for development. Shaun also attests to the importance of building a diverse, yet inclusive company culture in attracting and retaining APB Singapore's talent. In fact, diversity and inclusion (D&I) is one of the key pillars in APB Singapore's employer value proposition. To this end, APB Singapore has adopted D&I practices such as raising the company's retirement and re-employment ages beyond legislated requirements to accommodate senior workers, as well as celebrating occasions like International Women's Day. "In APB Singapore, we pride ourselves on having a diverse workforce. However, a diverse workforce would not be an effective one if it were not united – and it's crucial for the business to facilitate meaningful and trusted relationships between employees for the company to grow and progress."

Finally, APB Singapore acknowledges that millennials and Gen Z jobseekers have a growing passion for jobs with a social purpose. The shift in employee expectations was accelerated by the COVID-19 pandemic, when an increasing number of young adults were prompted to re-evaluate their career goals and priorities. To stay ahead in the hiring market, APB Singapore is committed to doing environmental and social good, as well as weaving it into the fabric of its corporate culture.

Key takeaways

In closing, Shaun and Mario shared learnings for food manufacturers who wish to attract and retain workers and younger talent in particular:

1. To position themselves as employers of choice, food manufacturers will need to define and continuously improve on their employer value proposition. This includes:
    - Establishing channels and platforms to engage the workforce and understand their needs
    - Providing employees with the resources and tools (digital and otherwise) to perform their jobs
    - Ensuring the right processes, leaders, and culture are in place. Companies will also need to cater to different generation's expectations of personal and professional development.
2. Food manufacturers looking to attract fresh graduates should consider partnering with education institutions to create interest in their business and raise awareness of internship and hiring opportunities.
3. Besides partnering with education institutions, food manufacturers should also collaborate with unions, government agencies, and trade associations to drive talent outreach efforts.

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Future of the Food Manufacturing sector: Recommendations

Recommendations for the way forward

INDIVIDUALS

Individuals in the Food Manufacturing sector too have a part to play in uplifting the capabilities of the industry and will need to ensure that they remain up-to-date on their skills. By adopting a lifelong learning mindset and actively seeking opportunities to upskill and reskill, individuals will be able to successfully navigate current and future demands of the sector, maintain or even increase their employability, and support their organisations in transformation.

RECOMMENDATIONS IN THIS SECTION

Take ownership of picking up new skills and adopt a lifelong learning mindset

Acquire technical and soft skills needed to bring your career to the next level

- According to our findings from this study, while technology is unlikely to replace Food Manufacturing jobs in the short- to mid-term, expectations of the workforce to acquire technology-related skills are rising.
- As food manufacturers continually innovate and explore new technologies, employees will be required to comfortably use digital tools and incorporate them into current ways of working. Picking up skills such as Emerging Technology, Technology Application, and Data Analytics, along with increasing their proficiency in technical aspects of their jobs, will help individuals to differentiate themselves as future-ready employees.
- In addition, there is a focus on transferrable “soft skills” as well, such as Adaptability, Collaboration, Communication, which will enable individuals to better cope with change and transformation and work well with others within their organisations.
- Hence, individuals should:
  - Be proactive in their professional development – take the initiative and actively seek for opportunities to learn and develop current and future skills
  - Leverage available resources to support their learning journey
  - Embrace change-readiness and agility by recognising the dynamic landscape of the food manufacturing
  - Stay abreast of changes in the sector, career opportunities, and individual job roles, as well as anticipate how jobs may change so as to identify the right learning opportunities that can prepare them to take on new or modified job tasks, or even the next level of their careers
- To get started on their upskilling journey, individuals can tap on available initiatives on the following page.

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Recommendations for the way forward

INDIVIDUALS

RECOMMENDATIONS IN THIS SECTION

Take ownership of picking up new skills and adopt a lifelong learning mindset

Acquire technical and soft skills needed to bring your career to the next level

Continued

Available initiatives to support food manufacturers' people practices

- ✓ **SkillsFuture Credit**

  Aims to encourage individuals to take ownership of their skills development and lifelong learning

- ✓ **SkillsFuture Study Award**

  Supports early- to mid-career professionals in acquiring new knowledge and skills needed for the industry

Future of the Food Manufacturing sector: Recommendations

Recommendations for the way forward

EDUCATION INSTITUTIONS

As the bridge between graduates and the Food Manufacturing sector, education institutions play a key role in shaping the sector's pipeline of talent and generating an interest in food manufacturing careers. Additionally, education institutions' partnerships with industry members create a feedback loop that enables the development of strong future-oriented curriculum to support both pre-employment and continued education programmes. Considering the unique position of education institutions, they can influence the supply of skilled, fresh talent into the sector to address gaps in both manpower and skills. As such, the following section explores two key recommendations for educators to adopt, or otherwise continue practicing.

RECOMMENDATIONS IN THIS SECTION

1 Drive outreach efforts for Continuing Education & Training (CET) and Work-Study programmes

Channel fresh talent to grow the sector and mitigate gaps in capabilities

2 Raise awareness of career opportunities and pathways in the Food Manufacturing sector

Advocate for the Food Manufacturing sector a career of choice

Recommendations for the way forward

EDUCATION INSTITUTIONS

RECOMMENDATIONS IN THIS SECTION

1 Drive outreach efforts for CET and Work-Study programmes

Channel fresh talent to grow the sector and mitigate gaps in capabilities

- CET programmes and Work-Study programmes serve as an important source of talent to help support the sector's growth. Given that insights from this study indicate a continued increase in manpower demand, education institutions will need to drive outreach efforts for these programmes, to both food manufacturers and individuals alike. The focus on future-geared modules will help to build stronger technical skills for Food Manufacturing workers and professionals.
- Successful outreach efforts begin with the design and delivery of future-oriented programmes. CET coordinators, Work-Study coordinators, and education institutions should partner with sectoral agencies, associations, and food manufacturers to design modules incorporating in-demand and emerging skills, as well as skills aligned with the SFw for Food Manufacturing. This is to ensure the workforce will be equipped with applicable skills as well as sector-specific context and knowledge.
- As various programme coordinators and education institutions work closely with sector stakeholders to offer relevant programmes, they should also consider the following:
  - Where necessary, courses should comprise appropriately "right-sized" learning to complement programme participants' work content and demands of jobs, and sufficiently upskill them to meet the sector's needs in the short-term. "Right-sized" learning should take into account the learning duration, proficiency level, course medium, and participants' demographics and preferences to design a palatable and sustainable learning experience.
  - Curriculum should be continually reviewed and updated through dialogues with sector stakeholders to discuss trends, the future of the sector, and corresponding skills required. This will allow curriculum designers to be agile in responding to the demands of the sector and offer relevant upskilling in a timely manner.

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Recommendations for the way forward

EDUCATION INSTITUTIONS

RECOMMENDATIONS IN THIS SECTION

1 Drive outreach efforts for CET and Work-Study programmes

Channel fresh talent to grow the sector and mitigate gaps in capabilities

Continued

- Moreover, programme coordinators should also partner closely with sectoral agencies, associations, and food manufacturers to better articulate the value proposition of participating in CET and Work-Study programmes.
- To encourage potential applicants (food manufacturers and/or individuals) for CET programmes, education institutions can collaborate with sectoral agencies and associations to:
  - Conduct talks to share the future of work within food manufacturing, emerging areas of work and skills that food manufacturing professionals should upskill in order to be future-ready
  - Highlight success stories of individuals who have completed CET programmes, enabling potential applicants to recognise the benefits of upskilling, such as the greater availability of progression pathways and career opportunities
- Similarly, Work-Study programmes can be further promoted to both students and food manufacturers as a key entry point into the sector and a source of talent respectively.
- Possible initiatives to support education institutions' promotion of Work-Study programmes include:
  - Partner with agencies and associations to organise sharing sessions on Work-Study programmes available. During these sessions, food manufacturers and/or individuals who have benefited from the programmes could be showcased as success stories to encourage uptake of these programmes by both individuals and companies
  - Design a diverse and engaging learning experience such as simulation-based, or experiential learning as part of the Work-Study curriculum that demonstrates practicality to food manufacturers, and bolster the programme's image as an effective training platform for future employees of food manufacturing companies. For example, Work-Study modules on Food Operations Management or Sustainable Food Manufacturing could include case studies involving similar operations or machinery used by programme participants' employers.

Recommendations for the way forward

EDUCATION INSTITUTIONS

RECOMMENDATIONS IN THIS SECTION

2 Drive awareness of career opportunities and pathways in the Food Manufacturing sector

Advocate for the Food Manufacturing sector a career of choice

- As students explore career opportunities, Career Services Centres in education institutions are a major platform that can help raise awareness of the different career pathways within the food manufacturing sector.
- Through a mix of career advisory, coaching, and counselling sessions, Career Services Centre can help students visualise and identify career goals in line with student's personal aspirations. As such, Career Service Centre counsellors will need to be aware of the current and emerging developments within the food manufacturing sector in order to provide a fair view of the available career opportunities.
- Education institutions should also highlight to students that the food manufacturing sector comprises more than production, quality assurance and quality control, as well as research and development roles – our study found that food manufacturers are increasingly seeking talent in areas such as business development, engineering, and data analytics, thus presenting exciting career opportunities to students from non-food manufacturing-related disciplines as well.
- Career Services Centres could also expand their target audience to include graduated students and help them stay informed of the industry and hiring landscape. This could potentially capture talent at a career crossroads and channel them to food manufacturing, and potentially capture talent lost through "leakage" – students who graduated with food manufacturing related qualifications but did not eventually find employment within the sector.
- Finally, education institutions could drive awareness of career opportunities in the sector through the following means:
  - Conduct campus-wide recruitment initiatives, lunch-and-learn sessions as well as webinars on social media platforms. A diversified approach will generate a wider outreach to both existing students and alumni.
  - Partner with sectoral agencies or associations to organise campus talks and share emerging trends within the industry, technologies that are being adopted, and how jobs are changing to bring to life what working in the industry is like
  - Arrange career talks and invite representatives and/or alumni from both large and small food manufacturers to share about typical career progression pathways or development opportunities in various job roles
  - Invite students to share past internship experiences with their peers and provide a relatable perspective on employment and opportunities within the sector.

[1]

7 Appendix

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Job Dashboard | Production Operator (1/2)

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Trends impacting this role			Impact Assessment
Automated Manufacturing	Autonomous Robots	Digitalisation	 **MEDIUM** degree of change in tasks
Food Packaging & Processing	Internet of Things	Manufacturing Analytics	

Responsibilities of the role today

Today, this job role is responsible for handling the equipment within the plant to prepare ingredients, food products, and packaging. The job holder is expected to adhere to food production requirements, food safety parameters, and standard operating procedures (SOPs) to ensure that food products manufactured are free from contaminants and safe for consumption.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Prepare ingredients, containers, and other materials in the correct formats required for food production	**M**	• Automated manufacturing and autonomous robots will replace some manual, repetitive tasks while the job holder continues to perform other tasks that require human judgement/intervention • Time saved from reduction in manual effort will enable the job holder to perform basic line quality checks and simple troubleshooting of equipment and machines	• Short- to Medium-term
Operate and monitor equipment and machinery in food production lines under supervision and in compliance with food production standards	**M**	• Automated manufacturing, autonomous robots and digitisation of forms and records will replace some manual, repetitive tasks in food production • Manufacturing analytics and other technologies such as Internet of Things enable real-time monitoring of production processes while reducing human errors • Time saved from reduction in manual effort will result in an expansion of the job holder's scope to include a wider range of production lines and machinery • As food manufacturers adopt new food packaging and processing technologies, job holder will need to be familiar with operating and monitoring a variety of relevant equipment and machinery	• Medium-term
Apply safety- and hygiene-related SOPs to food production activities	**L**	• The job holder will continue to apply the required food safety, hygiene, and quality standards	• Short-term

Job Dashboard | Production Operator (2/2)

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Automated Manufacturing	Autonomous Robots	Digitalisation	 **MEDIUM** degree of change in tasks
Food Packaging & Processing	Internet of Things	Manufacturing Analytics	

Responsibilities of the role in the future

In the future, this job role is responsible for operating new or increasingly automated equipment within the plant for food production and is expected to adhere to evolving food production requirements, food safety parameters, and standard operating procedures (SOPs). As a result of reduced manual effort, his/her scope of work may be expanded to operate and monitor equipment across more production lines, and even perform basic quality checks and machine troubleshooting.

Technical Skills (TSC) Required

• Active and Smart Packaging	Level 2	• Food Safety Management	Level 1
• Advanced Processing Technology	Level 2	• Good Manufacturing Practices Implementation	Level 2
• Automated Food Manufacturing System Maintenance	Level 1	• Hazards and Risk Control, and Policy Management	Level 2
• Automated Operation Monitoring	Level 1	• Internet of Things Management	Level 2
• Continuous Process Improvement	Level 1	• Quality System Management	Level 2
• Emergency Response Management	Level 2	• WSH Performance Management	Level 2
• Food Production Management	Level 1		

Critical Core Skills (CCS) Required

• Teamwork	Basic	• Customer Orientation	Basic
• Communication	Basic	• Problem Solving	Basic

Job Dashboard | Section Head / Team Leader / Line Operator (1/2)

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Automated Manufacturing	Autonomous Robots	Digitalisation	Food Packaging & Processing	 **MEDIUM** degree of change in tasks
Internet of Things	Manufacturing Analytics	Virtual/ Augmented Reality		

Responsibilities of the role today

Today, this job role is responsible for ensuring production targets for the assigned production line are met and food products meet required production standards. The job holder monitors the set-up and cleanliness of work stations, schedules work activities and supervises the team on their preparation of ingredients and food products as well as packaging. The job holder also monitors equipment performance levels and conducts basic equipment troubleshooting.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Train and supervise line team on preparation of food and monitor production activities against production plans to ensure targets are met	**M**	• As digitalisation, automated manufacturing, autonomous robots, and other new food manufacturing technologies and equipment are increasingly adopted, the job holder will need to effectively train and supervise line team in incorporating new ways of working into daily tasks • Other technologies such as Internet of Things will enable real-time monitoring and tracking of production targets • The job holder may also need to use advanced technologies such as VR/AR to conduct training of production team members • Time saved from reduction in manual effort to collect production data will allow the job holder to focus on higher value-added tasks, such as issue resolution, identifying areas for improvement and performance coaching of production team	• Short- to Medium-term
Monitor equipment performance and conduct basic maintenance and troubleshooting	**M**	• Internet of Things will allow the job holder to monitor equipment performance in real-time, minimising manual effort required to physically monitor individual machine units across production lines • Time saved from reduction in manual effort to collect production data will allow job holders to focus on higher value-added tasks, such as collaboration with Engineering and Maintenance teams to identify areas for improvement • As food manufacturers adopt new food packaging and processing technologies, job holder will need to be familiar with basic maintenance and troubleshooting of relevant equipment and machinery	• Medium-term
Ensure that the line team complies with cleanliness, safety, and quality standards	**L**	• The job holder will continue to apply and ensure that the line team is compliant with the required food safety, hygiene, and quality standards • The job holder will also be required to develop and propagate a quality mindset across production teams, and collaborate with Quality Assurance and Quality Control teams to execute any new regulations or standards	• Short-term
Identify and suggest improvements for food production, taking corrective actions on own initiative	**M**	• The job holder may be required to possess a basic understanding of manufacturing analytics to interpret production data, and generate insights on production performance. He/she will be required to propose and drive improvements, collaborating with cross-functional teams as necessary	• Medium-term

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Trends impacting this role

Automated Manufacturing	Autonomous Robots	Digitalisation	Food Packaging & Processing
Internet of Things	Manufacturing Analytics	Virtual/ Augmented Reality	

Impact Assessment

MEDIUM degree of change in tasks

Responsibilities of the role in the future

In the future, this job role will leverage automation and other advanced technologies in ensuring production targets for the assigned production line(s) are met. An understanding of these technologies, as well as food manufacturing innovation and equipment will help the job holder effectively train and supervise the line team, monitor production performance, and ensure that production outputs satisfy quality and safety regulations.

Technical Skills (TSC) Required

• Active and Smart Packaging	Level 3	• Good Manufacturing Practices Implementation	Level 3
• Advanced Processing Technology	Level 3	• Hazards and Risk Control, and Policy Management	Level 2
• Automated Food Manufacturing System Maintenance	Level 1	• Internet of Things Management	Level 2
• Automated Operation Monitoring	Level 2	• Manufacturing Process Management	Level 2
• Automation Process Control	Level 3	• Production Performance Management	Level 3
• Conflict Resolution	Level 4	• Project Management	Level 3
• Continuous Process Improvement	Level 2	• Quality System Management	Level 3
• Document Control	Level 2	• Stakeholder Management	Level 3
• Emergency Response Management	Level 2	• Systems Thinking	Level 2
• Equipment Maintenance	Level 2	• Technical Report Writing	Level 2
• Food Production Management	Level 2	• WSH Performance Management	Level 3
• Food Safety Management	Level 1		

Critical Core Skills (CCS) Required

• Developing People	Basic	• Collaboration	Intermediate
• Problem Solving	Intermediate	• Decision Making	Basic
• Communication	Basic		

Job Dashboard | Process Technician / Maintenance Technician (1/2)

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Trends impacting this role			Impact Assessment
Automated manufacturing	Autonomous robots	Digitalisation	 **MEDIUM** degree of change in tasks
Internet of Things	Manufacturing analytics	Sustainable production	

Responsibilities of the role today

Today, this job role is responsible for supporting operations within the food production plant by setting up machinery for each production shift and by performing routine maintenance work on the equipment and/or facilities. The job holder is expected to follow instructions and schedules closely for conducting regular preventive maintenance work such as changing of lubrication oil, tuning machine speeds, and other calibration on the food production equipment.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Set up and perform routine maintenance and cleaning of manufacturing equipment for daily production operations	**L**	• With the introduction of new food manufacturing machines and equipment, and the increasing adoption of automation or autonomous robots, the job holder is expected to acquire the relevant skills and know-how associated with the set-up, routine maintenance, and cleaning of a growing range of manufacturing equipment	• Short-term
Operate, monitor, and troubleshoot automated manufacturing systems	**M**	• Internet of Things will allow the job holder to monitor equipment performance in real-time, minimising manual effort required to physically monitor individual machine units across production lines • Time saved from reduction in manual effort to collect data will allow the job holder to effectively focus on higher value-added tasks, such as collaboration with Production teams to identify areas for improvement, or overseeing a larger production area with more machine units	• Medium-term
Ensure compliance with cleanliness and safety standards during the set up and maintenance of Food Manufacturing equipment	**L**	• Job holder will need to be familiar with the cleanliness and safety standards of a growing range of food manufacturing equipment in order to ensure compliance during relevant activities	• Short-term
Identify and suggest improvements in equipment maintenance process	**M**	• The job holder may be required to possess a basic understanding of manufacturing analytics to interpret equipment data collected from Internet of Things solutions, and generate insights on overall equipment effectiveness. He/she will be required to propose and drive improvements, collaborating with cross-functional teams as necessary • With an increasing emphasis on sustainable production, the job holder may need to identify areas of improvement related to sustainability • The job holder may also be involved in executing on predictive or preventive maintenance schedules arising from the availability of machine performance data	• Medium-term

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Trends impacting this role

Automated manufacturing	Autonomous robots	Digitalisation
Internet of Things	Manufacturing analytics	Sustainable production

Impact Assessment

MEDIUM degree of change in tasks

Responsibilities of the role in the future

In the future, this job role is expected to support operations within the food production plant by setting up, maintaining and performing simple troubleshooting of a growing range of automated equipment and machines. As automation and digitalisation reduce reliance on manual effort in monitoring food manufacturing systems, the job holder may be required to oversee a larger production area and/or be upskilled to handle more complex equipment issues. Job holders in this role will also need to develop data analytics skills to better interpret and analyse available data.

Technical Skills (TSC) Required

• Active and Smart Packaging	Level 3	• Green Manufacturing Design and Implementation	Level 3
• Advanced Processing Technology	Level 3	• Hazards and Risk Control, and Policy Management	Level 2
• Automated Food Manufacturing System Maintenance	Level 2	• Internet of Things Management	Level 2
• Automated Operation Monitoring	Level 2	• Manufacturing Process Management	Level 3
• Automation Process Control	Level 3	• Process Validation	Level 2
• Continuous Process Improvement	Level 2	• Project Management	Level 3
• Document Control	Level 2	• Quality System Management	Level 2
• Emergency Response Management	Level 2	• Stakeholder Management	Level 3
• Equipment Maintenance	Level 2	• Systems Thinking	Level 2
• Food Manufacturing Facility Maintenance	Level 2	• Technical Report Writing	Level 2
• Food Safety Management	Level 2	• Utilities Management	Level 3
• Good Manufacturing Practices Implementation	Level 2	• WSH Performance Management	Level 2

Critical Core Skills (CCS) Required

• Problem Solving	Intermediate	• Service Orientation	Basic
• Collaboration	Basic	• Communication	Basic

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Job Dashboard | Supervisor / Production Planner (1/3)

Trends impacting this role				Impact Assessment
Automated Manufacturing	Autonomous Robots	Digitalisation	Food Packaging & Processing	 **MEDIUM** degree of change in tasks
Internet of Things	Manufacturing Analytics	Sustainable Production		

Responsibilities of the role today

Today, this job role is responsible for supervising the daily operations of the food production function to ensure that production targets are met and food products meet required production standards. The job holder is also responsible for smooth production operations within the plant, and ensures adequate inventories of raw materials, manpower and other resources required. The job holder is expected to oversee and make regular reports on production outputs, yields, equipment issues and downtown, and staff overtime, to update the management on production performance issues.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Oversee end-to-end production process, including the coordination of resources, planning, preparation and production activities	**M**	• With digitalisation and increased interconnectedness of automated manufacturing systems and autonomous robots enabled by enterprise networks, less manual effort and calculations are required during production planning and scheduling • In time to come, production planning and scheduling activities could also be substituted by intelligent planning software • In addition, technologies such as Internet of Things enable the job holder to monitor and track production activities and progress in real-time, freeing up the job holder to focus on higher-value add activities, such as executing continuous improvement initiatives, team performance management, and facilitating greater cross-functional collaboration	• Medium- to Long-term
Monitor production performance against planned production output, and assist in troubleshooting yield, quality, and machine issues	**M**	• Internet of Things will allow the job holder to monitor and analyse production and equipment performance, minimising manual effort required to physically monitor production activities across the shopfloor • Time saved from reducing manual effort to record and monitor production performance will allow the job holder to focus on value-added tasks, such as collaborating with cross-functional teams to resolve issues and identify areas for improvement • Manufacturing analytics requires the job holder to acquire intermediate data analytics skills to analyse, interpret, and present findings on production performance to appropriate stakeholders	• Short- to Mem-term
Assist in implementing new or modified manufacturing processes, disseminating instructions to teams and monitoring impact on yield	**L**	• Digitalisation allows the job holder to deploy and utilise digital tools and forms and ensure standardisation in manufacturing processes and documentation • The job holder will need to stay abreast of food packaging and processing technologies, and incorporate relevant technologies in the implementation of manufacturing processes where needed • With an increasing emphasis on sustainable production, the job holder may also need to consider sustainability goals and measures in the implementation of manufacturing processes	• Short-term
Enforce good manufacturing practices and work with teams to resolve quality and safety issues	**L**	• While manufacturing analytics can be leveraged to detect issues relating to production quality and yield, generate insights, and optimise decision making, human intervention and influence is still required to lead teams in resolving food quality and safety issues	• Short-term

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Trends impacting this role

Automated Manufacturing	Autonomous Robots	Digitalisation	Food Packaging & Processing
Internet of Things	Manufacturing Analytics	Sustainable Production	

Impact Assessment

MEDIUM degree of change in tasks

Responsibilities of the role in the future

In the future, this job role will leverage technology solutions such as enterprise resource planning systems and Internet of Things to monitor production operations and production targets for yield, quality, and safety are met. The job holder will also be required to identify opportunities for digitalisation and automation to manage resources and optimise production performance. With the reduction of manual effort in monitoring and tracking production activities, the focus of this role will shift to higher-value activities such as executing continuous improvement initiatives, team performance management, and facilitating greater cross-functional collaboration.

Technical Skills (TSC) Required

• Active and Smart Packaging	Level 3	• Green Manufacturing Design and Implementation	Level 3
• Advanced Processing Technology	Level 3	• Hazards and Risk Control, and Policy Management	Level 3
• Automated Operation Monitoring	Level 2	• Innovation Management	Level 3
• Automation Process Control	Level 4	• Internet of Things Management	Level 3
• Budgeting	Level 3	• Manufacturing Process Management	Level 3
• Change Management	Level 3	• New Product Introduction for Food	Level 3
• Conflict Resolution	Level 4	• Production Performance Management	Level 4
• Continuous Process Improvement	Level 3	• Project Management	Level 4
• Data Synthesis	Level 3	• Quality System Management	Level 3
• Document Control	Level 3	• Stakeholder Management	Level 3
• Emergency Response Management	Level 3	• Strategy Development	Level 4
• Equipment Maintenance	Level 2	• Systems Thinking	Level 3
• Food Production Management	Level 3	• Technical Presentation	Level 4
• Food Safety Management	Level 3	• Technical Report Writing	Level 2
• Good Manufacturing Practices Implementation	Level 3	• WSH Performance Management	Level 2

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Trends impacting this role

Automated Manufacturing	Autonomous Robots	Digitalisation	Food Packaging & Processing
Internet of Things	Manufacturing Analytics	Sustainable Production	

Impact Assessment

MEDIUM degree of change in tasks

Responsibilities of the role in the future

In the future, this job role will leverage technology solutions such as enterprise resource planning systems and Internet of Things to monitor production operations and production targets for yield, quality, and safety are met. The job holder will also be required to identify opportunities for digitalisation and automation to manage resources and optimise production performance. With the reduction of manual effort in monitoring and tracking production activities, the focus of this role will shift to higher-value activities such as executing continuous improvement initiatives, team performance management, and facilitating greater cross-functional collaboration.

Critical Core Skills (CCS) Required

- Problem Solving — Intermediate
- Decision Making — Intermediate
- Developing People — Intermediate
- Sense Making — Intermediate
- Communication — Intermediate

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Trends impacting this role			Impact Assessment
Automated manufacturing	Autonomous robots	Digitalisation	L **LOW** degree of change in tasks
Internet of Things	Manufacturing analytics		

Responsibilities of the role today

Today, this job role is responsible for maintaining smooth running of the food production plant's machinery and equipment, to ensure that key performance indicators (KPIs) for minimising downtime and production costs are met. The job holder is a technical expert, who is able to diagnose problems with the plant's equipment and determine whether repairs can be performed by the organisation's own maintenance team, or if respective equipment vendors must be engaged.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Assist in the development of manufacturing processes, including work instructions, control plans, and performing installation and commissioning of equipment	**L**	• In addition to existing job tasks, the job holder will need to stay abreast of new technologies that can be adopted to improve process efficiency and optimise production and propose suitable solutions that can be installed in the company's operations • As food manufacturers increasingly adopt automated manufacturing and autonomous robots in production, the job holder will also be required to work closely with machine vendors and solution providers to customise and adapt technology for use within the organisation's production operations	• Short-term
Assess the performance of food manufacturing equipment and facilities, and schedule repair and maintenance activities to perform corrective actions or troubleshooting where necessary	**M**	• Digitalisation and the adoption of Internet of Things and analytics tools will enhance the job holder's ability to assess and monitor machine and equipment effectiveness, as well as detect issues in real-time. The availability of such machine performance data will enable a shift to predictive and preventive maintenance, and maintenance works can be scheduled prior to unplanned downtime • Moreover, the reduction in manual effort to monitor and track equipment performance will allow for a shift in priorities towards generating insights, issue resolution, and identification of improvement areas to optimise facility use	• Medium-term
Maintain cleanliness and safety standards during the set up, maintenance, and operation of equipment and machines	**L**	• The job holder will need to be familiar with evolving regulations and standards to ensure compliance to updated requirements	• Short-term
Identify opportunities for continuous improvement and assist in implementation of improvement projects	**L**	• The availability of data arising from the adoption of Internet of Things and manufacturing analytics will facilitate the generation of insights to inform improvement projects	• Short- to Medium-term

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Trends impacting this role

Automated manufacturing	Autonomous robots	Digitalisation
Internet of Things	Manufacturing analytics	

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

In the future, this job role will not only need to demonstrate technical expertise in a range of food production equipment, but also leverage analytics and advanced technologies such as Internet of Things to improve predictive and preventive maintenance capabilities in the company. The job holder may also be required to perform more complex repairs, or work closely with machine providers and solution vendors to implement and troubleshoot more advanced technology within existing production processes.

Technical Skills (TSC) Required

Active and Smart Packaging	Level 4	Good Manufacturing Practices Implementation	Level 3
Advanced Processing Technology	Level 4	Green Manufacturing Design and Implementation	Level 4
Automated Food Manufacturing System Maintenance	Level 3	Hazards and Risk Control, and Policy Management	Level 3
Automated Operation Monitoring	Level 3	Innovation Management	Level 3
Automation Process Control	Level 4	Internet of Things Management	Level 3
Business Negotiation	Level 3	Manufacturing Process Management	Level 3
Change Management	Level 3	New Product Introduction for Food	Level 3
Conflict Resolution	Level 4	Process Validation	Level 3
Continuous Process Improvement	Level 3	Project Management	Level 4
Data Analytics System Design	Level 3	Quality System Management	Level 3
Data Synthesis	Level 4	Stakeholder Management	Level 3
Document Control	Level 3	Strategy Development	Level 4
Emergency Response Management	Level 3	Systems Thinking	Level 3
Equipment Maintenance	Level 3	Technical Presentation	Level 4
Food Manufacturing Facility Maintenance	Level 3	Technical Report Writing	Level 3
Food Manufacturing Process Design	Level 4	Utilities Management	Level 4
Food Safety Management	Level 3	WSH Performance Management	Level 3

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Automated manufacturing	Autonomous robots	Digitalisation	 **LOW** degree of change in tasks
Internet of Things	Manufacturing analytics		

Responsibilities of the role in the future

In the future, this job role will not only need to demonstrate technical expertise in a range of food production equipment, but also leverage analytics and advanced technologies such as Internet of Things to improve predictive and preventive maintenance capabilities in the company. The job holder may also be required to perform more complex repairs, or work closely with machine providers and solution vendors to implement and troubleshoot more advanced technology within existing production processes.

Critical Core Skills (CCS) Required

- Problem Solving — Intermediate
- Decision Making — Intermediate
- Developing People — Intermediate
- Communication — Intermediate
- Collaboration — Intermediate

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Automated manufacturing	Autonomous robots	Digitalisation	 **LOW** degree of change in tasks
Internet of Things	Manufacturing analytics		

Responsibilities of the role today

Today, this job role is responsible for maintaining smooth running of the production plant's machinery and equipment, to meet key performance indicators on minimising downtime and production costs. The job holder is a technical expert, who is able to diagnose problems with the plant's equipment and determine whether repairs can be performed by the inhouse maintenance team, or if third party vendors need to be engaged.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Source for and assess new machines and technologies, overseeing installation and commissioning activities, including managing vendors	**L**	• In addition to existing job tasks, the job holder will need to stay abreast of new technologies that can be adopted to improve process efficiency and optimise production and evaluate the suitability of solutions for the company's operational environment • As automated manufacturing and autonomous robots are increasingly adopted, the job holder will need to articulate business requirements for the customisation of technology for use within the organisation's production operations	• Short-term
Monitor and manage equipment and facility performance to ensure optimal levels of production efficiency	**M**	• Digitalisation and the availability of data arising from the adoption of Internet of Things and manufacturing analytics will enhance the job holder's ability to assess and monitor machine and equipment effectiveness, as well as detect issues in real-time. The availability of such machine performance data will enable a shift to predictive and preventive maintenance, and maintenance works can be scheduled prior to unplanned downtime • Moreover, the reduction in manual effort to monitor and track equipment performance will allow a shift in priorities towards driving continuous improvement to optimise production efficiency	• Medium-term
Design new or modified manufacturing processes and plan production capacity according to machine specifications and production demand	**L**	• In addition to existing job tasks, the job holder will need stay abreast of leading practices in the design or modification of manufacturing processes, and work closely with Production, Quality Assurance and Quality Control, as well as Research & Development teams to understand new products, production and quality requirements to determine the necessary machine specifications	• Short-term
Implement guidelines and SOPs relating to cleanliness and safety standards during engineering work	**L**	• The job holder will need to review, update and implement necessary guidelines and SOPs to ensure that the Engineering team is compliant with cleanliness and safety standards	• Short-term
Lead improvement projects and apply mechanical and electrical solutions to drive continuous improvement	**L**	• The job holder should continue to build technical expertise in mechanical and electrical solutions to drive and support cross-functional continuous improvement initiatives	• Short-term

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Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

In the future, this job role will not only need to demonstrate technical expertise in a range of food production equipment, but also leverage analytics and advanced technologies such as Internet of Things to drive predictive and preventive maintenance capabilities in the company. The job holder may also be required to work closely with both internal and external stakeholders to lead the implementation of mechanical and electrical solutions to optimise production efficiency.

Technical Skills (TSC) Required

- Active and Smart Packaging — Level 5
- Advanced Processing Technology — Level 5
- Automated Food Manufacturing System Maintenance — Level 4
- Automated Operation Monitoring — Level 4
- Automated System Design — Level 4
- Automation Process Control — Level 5
- Budgeting — Level 4
- Business Continuity Management — Level 4
- Business Negotiation — Level 4
- Business Networking — Level 5
- Business Performance Management — Level 4
- Change Management — Level 4
- Conflict Resolution — Level 4
- Continuous Process Improvement — Level 4
- Data Analytics System Design — Level 4
- Data Synthesis — Level 5
- Document Control — Level 4
- Embedded System Integration — Level 4
- Emergency Response Management — Level 4
- Equipment Maintenance — Level 4
- Food Manufacturing Facility Maintenance — Level 4
- Food Manufacturing Process Design — Level 5
- Food Safety Management — Level 3
- Good Manufacturing Practices Implementation — Level 3
- Green Manufacturing Design and Implementation — Level 5
- Hazards and Risk Control, and Policy Management — Level 4
- Innovation Management — Level 4
- Internet of Things Management — Level 4
- Manufacturing Process Management — Level 5
- New Product Introduction for Food — Level 4
- Process Validation — Level 4
- Project Management — Level 5
- Quality System Management — Level 4
- Risk Management — Level 4
- Stakeholder Management — Level 4
- Strategy Development — Level 5
- Systems Thinking — Level 4
- Technical Presentation — Level 5
- Technical Report Writing — Level 4
- Utilities Management — Level 5
- WSH Performance Management — Level 4

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Automated manufacturing	Autonomous robots	Digitalisation	 **LOW** degree of change in tasks
Internet of Things	Manufacturing analytics		

Responsibilities of the role in the future

In the future, this job role will not only need to demonstrate technical expertise in a range of food production equipment, but also leverage analytics and advanced technologies such as Internet of Things to drive predictive and preventive maintenance capabilities in the company. The job holder may also be required to work closely with both internal and external stakeholders to lead the implementation of mechanical and electrical solutions to optimise production efficiency.

Critical Core Skills (CCS) Required

- Problem Solving — Advanced
- Decision Making — Advanced
- Developing People — Advanced
- Sense Making — Advanced
- Communication — Advanced

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Job Dashboard | Production Manager (1/3)

Trends impacting this role				Impact Assessment
Automated Manufacturing	Autonomous Robots	Digitalisation	Internet of Things	 **LOW** degree of change in tasks
Food Packaging & Processing	Manufacturing Analytics	Sustainable Production		

Responsibilities of the role today

Today, this job role is responsible for overseeing all operations of the food production plant, with a focus on simplifying work processes, reducing costs and increasing production process efficiency. The job holder is also responsible for setting key performance indicators (KPIs) for the production plant, and formulating new food production standards and standard operating procedures (SOPs). The job holder is expected to monitor quality assurance on an overall level, investigate production and/or quality issues and recommend solutions.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Lead overall production processes by establishing food production strategies, developing SOPs, setting production KPIs, and managing resources to meet production objectives	**L**	• In addition to existing job tasks, the job holder will be required to oversee and manage the digitalisation of production processes and adoption of automated manufacturing, autonomous robots and other technologies into food manufacturing operations, and ensure that teams have necessary tools, documents, and support in place to adjust to new or evolving processes • A growing emphasis on sustainable production may also require the job holder to understand sustainability issues, and design relevant KPIs/metrics to support the company's sustainability goals	• Short-term
Implement new or modified production processes and evaluate the ability of these processes to meet production capacity sustainably	**L**	• In addition to existing job tasks, the job holder will need to stay abreast of new production processes and methods, as well as food packaging and processing technologies that could be incorporated into production operations to enhance production capacity, yield, and quality • Cross-functional collaboration, especially with Quality Assurance and Quality Control as well as Research and Development teams remains important as the job holder implements new and modified processes	• Short- to Medium-term
Ensure that necessary processes are in place to produce finished products that meet regulatory standards	**L**	• In addition to existing job tasks, the job holder will be required to stay abreast of any changing regulatory standards, and ensure such requirements are translated into internal processes and complied with	• Short-term
Review production performance and investigate yield or quality issues and recommend solutions	**L**	• Advanced technologies such as Internet of Things, and enhanced manufacturing analytics capabilities will enable the job holder to better identify production yield and quality issues • Technical expertise, understanding of the business, in-depth domain knowledge, and human judgement will remain critical in recommending solutions to resolve production issues	• Medium-term
Lead working level communities in exploring and executing continuous improvement projects	**L**	• Personal influence and leadership qualities remain critical in leading working level communities to execute continuous improvement projects	• Short-term

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LOW degree of change in tasks

Responsibilities of the role in the future

In the future, this job role will be continue to be responsible for overseeing all operations in the food production plant, including automated and digital manufacturing systems. While advanced technologies such as Internet of Things and enhanced manufacturing analytics will enable faster and more accurate insights to production performance and issues, the job holder will need to retain and build his technical expertise, understanding of the business, domain knowledge, and leadership skills.

Technical Skills (TSC) Required

- Active and Smart Packaging — Level 4
- Advanced Processing Technology — Level 4
- Budgeting — Level 4
- Business Continuity Management — Level 4
- Business Performance Management — Level 4
- Change Management — Level 4
- Conflict Resolution — Level 5
- Continuous Process Improvement — Level 4
- Data Analytics System Design — Level 3
- Data Synthesis — Level 4
- Document Control — Level 4
- Emergency Response Management — Level 3
- Food Manufacturing Process Design — Level 4
- Food Production Management — Level 4
- Food Safety Management — Level 3
- Good Manufacturing Practices Implementation — Level 3
- Green Manufacturing Design and Implementation — Level 4
- Hazards and Risk Control, and Policy Management — Level 4
- Innovation Management — Level 4
- Internet of Things Management — Level 4
- Manufacturing Process Management — Level 4
- New Product Introduction for Food — Level 4
- Production Performance Management — Level 5
- Project Management — Level 5
- Quality System Management — Level 4
- Risk Management — Level 4
- Stakeholder Management — Level 4
- Strategy Development — Level 5
- Systems Thinking — Level 4
- Technical Presentation — Level 5
- Technical Report Writing — Level 3
- WSH Performance Management — Level 4

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Job Dashboard | Production Manager (3/3)

Trends impacting this role				Impact Assessment
Automated Manufacturing	Autonomous Robots	Digitalisation	Internet of Things	 **LOW** degree of change in tasks
Food Packaging & Processing	Manufacturing Analytics	Sustainable Production		

Responsibilities of the role in the future

In the future, this job role will be continue to be responsible for overseeing all operations in the food production plant, including automated and digital manufacturing systems. While advanced technologies such as Internet of Things and enhanced manufacturing analytics will enable faster and more accurate insights to production performance and issues, the job holder will need to retain and build his technical expertise, understanding of the business, domain knowledge, and leadership skills.

Critical Core Skills (CCS) Required

- Developing People — Advanced
- Resource Management — Intermediate
- Problem Solving — Advanced
- Decision Making — Advanced
- Collaboration — Intermediate

Job Dashboard | Director of Operations / Plant Manager (1/3)

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Trends impacting this role				Impact Assessment
Automated Manufacturing	Autonomous Robots	Digitalisation	Internet of Things	L **LOW** degree of change in tasks
Food Packaging & Processing	Manufacturing Analytics	Sustainable Production		

Responsibilities of the role today

Today, this job role is responsible for overseeing food manufacturing functions of the organisation and ensuring objectives are achieved in a timely and cost-effective manner. The job holder is responsible for strategic planning and management of resources to sustain production capacity and capability. This job role also bears the overall responsibility for ensuring food quality and safety across the plant's entire food production process.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Manage overall performance, output levels, and quality of the production function, as well as plan production capacity for business growth	**L**	• In addition to existing job tasks, the job holder will be able to utilise insights available from enterprise systems to track key metrics of production performance and optimise the production capacity to support business growth plans • As digitalisation and the adoption of automated systems, autonomous robots, and other advanced technologies become more widespread, the job holder will also be required to spearhead change management and technology integration within the production function, while managing and mitigating workforce challenges such as high attrition rates and low talent supply	• Short-term
Drive enhancements to manufacturing operations, processes, and equipment to improve productivity	**L**	• Advanced technologies such as Internet of Things, and enhanced manufacturing analytics capabilities will enable the job holder to better identify and drive improvements to manufacturing operations and activities • Technical expertise, understanding of the business, in-depth domain knowledge, and human judgement will remain critical in prioritising issues and uncovering enhancements to yield, quality, productivity and cost	• Short-term
Set food production standards, equipment cleanliness standards and standard operating procedures (SOPs)	**L**	• The job holder will be required to stay abreast of new or changing regulations on workplace health and safety, and determine the appropriate measures and procedures required	• Short-term
Direct the research, application, and design of new or modified manufacturing processes, evaluating their capability to meet product requirements	**L**	• In addition to existing job tasks, the job holder will need to stay abreast of new technologies and processes that can be adopted to suit the company's operational environment • With an increasing emphasis on sustainable production, the job holder may also need to consider sustainability goals and measures in the research, application and design of manufacturing processes	• Short-term

Job Dashboard | Director of Operations / Plant Manager (2/3)

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Trends impacting this role

Automated Manufacturing	Autonomous Robots	Digitalisation	Internet of Things
Food Packaging & Processing	Manufacturing Analytics	Sustainable Production	

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

In the future, this job role continues to be responsible for overseeing food manufacturing functions of the organisation and ensuring objectives are achieved in a timely and cost-effective manner as well as ensures food quality and safety across the plant's entire food production process. The job holder will also need to factor in emerging technologies and best practices for manufacturing into the strategic planning and management of resources to sustain production capacity and capability.

Technical Skills (TSC) Required

- Active and Smart Packaging — Level 6
- Advanced Processing Technology — Level 6
- Automated Food Manufacturing System Maintenance — Level 5
- Automated System Design — Level 5
- Automation Process Control — Level 6
- Budgeting — Level 5
- Business Continuity Management — Level 6
- Business Environment Analysis — Level 4
- Business Negotiation — Level 5
- Business Networking — Level 5
- Business Performance Management — Level 5
- Business Relationship Building — Level 6
- Change Management — Level 6
- Conflict Resolution — Level 5
- Continuous Process Improvement — Level 5
- Data Analytics System Design — Level 5
- Data Synthesis — Level 6
- Document Control — Level 4
- Embedded System Integration — Level 5
- Emergency Response Management — Level 5
- Equipment Maintenance — Level 5
- Food Manufacturing Facility Maintenance — Level 5
- Food Manufacturing Process Design — Level 6
- Food Production Management — Level 5
- Food Safety Management — Level 4
- Good Manufacturing Practices Implementation — Level 5
- Green Manufacturing Design and Implementation — Level 6
- Hazards and Risk Control, and Policy Management — Level 2
- Innovation Management — Level 6
- International Trade Legislation for Business — Level 3
- Internet of Things Management — Level 5
- Manufacturing Process Management — Level 5
- New Product Introduction for Food — Level 5
- Project Management — Level 6
- Quality System Management — Level 6
- Risk Management — Level 5
- Stakeholder Management — Level 5
- Strategy Development — Level 5
- Systems Thinking — Level 5
- Technical Presentation — Level 6
- WSH Performance Management — Level 5

Job Dashboard | Director of Operations / Plant Manager (3/3)

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Trends impacting this role				Impact Assessment
Automated Manufacturing	Autonomous Robots	Digitalisation	Internet of Things	 **LOW** degree of change in tasks
Food Packaging & Processing	Manufacturing Analytics	Sustainable Production		

Responsibilities of the role in the future

In the future, this job role will continue to leverage data and analytics to manage the daily operations of the Food Manufacturing plant. Knowledge of automation, digitalisation and advanced technologies is will be important for more efficient strategic planning on production capacity and capability. The job holder will continue to stay abreast of emerging food trends and technologies as well as changing consumer preferences to champion the organisational vision and mission.

Critical Core Skills (CCS) Required

- Developing People — Advanced
- Problem Solving — Advanced
- Transdisciplinary Thinking — Advanced
- Creative Thinking — Advanced
- Sense Making — Advanced

7 Appendix

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Job Dashboard | QC Technician / QC Assistant / Laboratory Technician (1/2)

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Section Top

Trends impacting this role

AI & Big Data	Autonomous Robots	Digitalisation	Food Packaging & Processing
Internationalisation	Internet of Things	Manufacturing Analytics	

Impact Assessment

MEDIUM degree of change in tasks

Responsibilities of the role today

Today, this job role supports process and product quality testing activities by preparing equipment and materials and assisting in the execution of tests to identify processes and products that do not meet specified requirements. The job holder conducts the laboratory tests to identify lapses in the production lines' conformance to food safety and hygiene standards and also assists in the management of the quality control (QC) laboratory by performing routine monitoring and maintenance of laboratory infrastructure and equipment, recording laboratory data and assisting in preparing the laboratory for audits.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Prepare samples and conduct tests on food quality and packaging for compliance with food safety and other requirements	**M**	• Intelligent automation, such as the use of autonomous robots, can be used to substitute manual tasks such as sample collection, freeing up time for the job holder to take on higher value-added tasks such as issue identification and resolution • In addition, other technologies such as Internet of Things and enable to real-time data collection and monitoring of test batch results • The rise of manufacturing analytics also requires the job holder to develop basic data analytics skills to generate insights from test results, and propose corrective actions to mitigate issues in food safety and quality • As food manufacturers adopt new food packaging and processing technologies, the job holder will need to understand relevant requirements and conduct checks to ensure compliance	• Medium-term
Inspect in-coming and out-going raw materials and products and conduct daily QC inspections at production lines	**M**	• Digitalisation of processes and echnology solutions such as Internet of Things sensors, smart cameras, and Artificial Intelligence could be used to substitute QC inspections at production lines, reducing the reliance on manual effort to conduct theses checks • This reduction in manual effort could allow job holders to supervise quality control issues for a larger production area and/or increased focus in issue resolution and identifying areas for improvement	• Medium- to Long-term
Assist in the inspection and monitoring of laboratory facility and perform routine maintenance of lab equipment	**L**	• Technology solutions such as Internet of Things sensors will allow for real-time monitoring of lab conditions and equipment, reducing manual effort required to conduct frequent physical checks of laboratory facilities	• Short-term
Assist to identify deviations in production quality and processes, and support the conduct of internal and external audits	**L**	• Technology solutions such as Internet of Things sensors, smart cameras, and Artificial Intelligence allow the job holder to better monitor production quality and processes • The job holder will be required to perform data analytics and generate insights on product hazard and/or defect occurrences	• Short-term

Job Dashboard | QC Technician / QC Assistant / Laboratory Technician (2/2)

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Trends impacting this role

AI & Big Data	Autonomous Robots	Digitalisation	Food Packaging & Processing
Internationalisation	Internet of Things	Manufacturing Analytics	

Impact Assessment

MEDIUM degree of change in tasks

Responsibilities of the role in the future

In the future, technologies such as autonomous robots, Internet of Things, and Artificial Intelligence will substitute manual tasks such as the collection of test samples and monitoring of facility conditions, enabling a greater efficiency in quality check processes and facility maintenance. The focus of this role will expand to overseeing quality checks across a larger production area, as well as analysing available data to derive insights on recurring issues, allowing the job holder to better identify necessary corrective actions.

Technical Skills (TSC) Required

• Chemical Risk Management	Level 2	• Food Safety Analysis	Level 2
• Cleanliness Testing	Level 3	• Food Safety Management	Level 1
• Continuous Process Improvement	Level 3	• Good Manufacturing Practices Implementation	Level 3
• Document Control	Level 2	• Hazards and Risk Control, and Policy Management	Level 2
• Emergency Response Management	Level 2	• Innovation Management	Level 3

Critical Core Skills (CCS) Required

• Collaboration	Basic	• Sense Making	Basic
• Problem Solving	Basic	• Communication	Basic

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Job Dashboard | QA&QC Supervisor / QA&QC Executive/ Laboratory Supervisor (1/2)

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Trends impacting this role

AI & Big Data	Autonomous Robots	Digitalisation	Food Innovation
Food Packaging & Processing	Internationalisation	Internet of Things	Manufacturing Analytics

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role today

Today, this job role monitors sampling and product quality testing activities, performs non-standard quality tests, and manages documentation of data and test results. The job holder implements the operating criteria for laboratory equipment and materials to ensure compliance with organisational standards in food safety and quality. In addition, the job holder implements SOPs and workflow improvements in the laboratory.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Guide sample collection and testing activities to ensure correct testing volumes, conditions and processes are employed	**L**	• In addition to existing job tasks, the job holder will be required to ensure that new technologies used, such as the use of autonomous robots, are being operated in line with established testing plans, and provide timely feedback and correction where required • While the underlying principles of testing procedures remain unchanged, the job holder will need to adapt approaches to cater to changing regulations on food safety and quality as well as food processing and packaging requirements, and QC Technicians in incorporating these new regulations into testing procedures	• Short- to Medium-term
Perform inspection of outgoing shipments, monitor critical control points in QC processes and prepare regular reports for submission to regulatory authorities	**M**	• Advanced technologies such as AI and Big Data, as well as Internet of Things increase the availability of real-time data, reducing the time and effort required for manual inspection and monitoring • As availability of real-time, accurate manufacturing data increases, the job holder will need to leverage data analytics to generate insights and prepare detailed reports, as well as contributing to on-the-ground process improvement	• Short- to Medium-term
Implement the operating standards for laboratory facility, as well as perform inspections and tests on laboratory equipment to ensure optimal performance	**L**	• The job holder is required to maintain and enhance knowledge of new laboratory equipment in order to perform calibration and maintenance of equipment, and ensure optimal performance of laboratory facilities	• Short-term
Develop and implement food quality and safety frameworks for production processes and investigations, performing corrective actions on any lapses	**L**	• As food manufacturers innovate new products and builds overseas presence, the job holder is required to ensure that food quality and safety frameworks are constantly updated to meet evolving requirements • This job holder will also be required to work closely with the Production team to develop and operationalise standards and guidelines to ensure production activities are carried out in line with predetermined QA&QC parameters	• Short-term

Job Dashboard | QA&QC Supervisor / QA&QC Executive/ Laboratory Supervisor (2/2)

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Trends impacting this role

AI & Big Data	Autonomous Robots	Digitalisation	Food Innovation
Food Packaging & Processing	Internationalisation	Internet of Things	Manufacturing Analytics

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

In the future, this job role will continue to monitor sampling and product quality testing activities, perform non-standard quality testing, and manage data and related documentation of test results. However, he/she will leverage advanced technologies to assist in testing to improve efficiency. Technical knowledge remains critical for job holder to implement suitable operating standards for laboratory infrastructure and equipment in response to food innovation trends and changing regulatory requirements.

Technical Skills (TSC) Required

• Change Management	Level 3	• Manufacturing Process Management	Level 4
• Chemical Risk Management	Level 3	• Packaging Testing	Level 4
• Cleanliness Testing	Level 4	• Process Validation	Level 3
• Conflict Resolution	Level 4	• Product Testing	Level 3
• Continuous Process Improvement	Level 4	• Project Management	Level 4
• Document Control	Level 3	• Quality Assurance Management	Level 3
• Emergency Response Management	Level 2	• Quality Control Management	Level 3
• Food Safety Analysis	Level 3	• Quality System Management	Level 3
• Food Safety Management	Level 2	• Stakeholder Management	Level 3
• Good Manufacturing Practices Implementation	Level 4	• Systems Thinking	Level 4
• Hazards and Risk Control, and Policy Management	Level 3	• Technical Presentation	Level 4
• Innovation Management	Level 4	• Technical Report Writing	Level 3
• Laboratory Data Analysis	Level 3	• WSH Performance Management	Level 3
• Laboratory Management	Level 3		

Critical Core Skills (CCS) Required

• Problem Solving	Intermediate	• Sense Making	Intermediate
• Communication	Intermediate	• Collaboration	Intermediate

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Job Dashboard | QA&QC Specialist / Food Safety Specialist / Laboratory Manager (1/3)

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Trends impacting this role

AI & Big Data	Autonomous Robots	Digitalisation	Food Innovation
Food Packaging & Processing	Internationalisation	Internet of Things	Manufacturing Analytics

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role today

Today, this job role develops sampling plans and procedures for testing product quality. The job holder maintains standards and quality processes by verifying test results and audits for compliance with food safety regulations and requirements. The job holder also determines the optimal operating conditions for the laboratory's infrastructure and equipment and develops SOPs in line with regulatory requirements and guidelines.

Job tasks today		Impact at task-level / Future view of job tasks	Time horizon
Establish SOPs and protocols for sampling and testing of materials, production and packaging, and verify the accuracy of related documentation	**L**	• In addition to existing job tasks, the job holder will need to factor in the use of autonomous robots and advanced technologies such as Internet of Things, AI and Big Data in establishing new or updating existing SOPs and sampling plans • As food manufacturers expand overseas, the job holder will also need to be aware of changing regulatory requirements in both local and target overseas markets to ensure SOPs and protocols are up-to-date and satisfy relevant regulations	• Short- to Medium-term
Develop methods and indicators of success for testing quality and conduct analyses for product defects and quality lapses detected during inspections	**L**	• The job holder will need to stay abreast of new food innovation as well as packaging and processing technologies in order to develop suitable testing methods and indicators of success • Communication skills and stakeholder management remain crucial as job holder provides other functions with directions ensure compliance to food safety regulations and requirements	• Short-term
Establish SOPs and infrastructure requirements for lab operations and investigate technical issues that impact laboratory operations functionality and performance	**L**	• In addition to existing job tasks, the job holder will be required to apply industry best practices in managing laboratory operations to ensure that lab activities achieve optimal levels of functionality and performance • It is critical for the job holder to adopt a forward-looking mindset and stay abreast of market trends and emerging technologies that will inform laboratory activities an procedures	• Short- to Medium-term
Lead internal and external audits, investigations, and corrective or preventative actions to minimise lapses in food quality and safety	**L**	• Job holder is expected to leverage advanced technologies to conduct quality reviews and generate automated process quality metric reports • Digitalisation allows job holder to use tools such as digital checklists that will improve the efficiency of conducting investigations and reduce manual effort required, allowing job holder to focus on value-added tasks such as using Big Data to drive on-the-ground process improvement • Job holder will need to stay abreast of the latest regulatory requirements both locally and globally to lead internal audits	• Short- to medium-term

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Job Dashboard | QA&QC Specialist / Food Safety Specialist / Laboratory Manager (2/3)

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Trends impacting this role

AI & Big Data	Autonomous Robots	Digitalisation	Food Innovation
Food Packaging & Processing	Internationalisation	Internet of Things	Manufacturing Analytics

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

In the future, this job role is responsible for overseeing a mix of manual and automated tests on food quality and processing. The job holder is also expected to stay abreast of emerging technologies to ensure appropriate QA&QC and laboratory procedures are in place. In addition to technical expertise, the job holder needs to collaborate closely with other functions to provide guidance and oversight to ensure compliance to food safety regulations and requirements.

Technical Skills (TSC) Required

• Budgeting	Level 3	• Laboratory Data Analysis	Level 4
• Business Continuity Management	Level 4	• Laboratory Management	Level 4
• Business Performance Management	Level 4	• Manufacturing Process Management	Level 4
• Change Management	Level 4	• Packaging Testing	Level 4
• Chemical Risk Management	Level 4	• Process Validation	Level 4
• Cleanliness Testing	Level 4	• Product Testing	Level 4
• Conflict Resolution	Level 4	• Project Management	Level 4
• Continuous Process Improvement	Level 4	• Quality Assurance Management	Level 4
• Document Control	Level 4	• Quality Control Management	Level 4
• Emergency Response Management	Level 2	• Quality System Management	Level 4
• Food Safety Analysis	Level 4	• Risk Management	Level 4
• Food Safety Management	Level 3	• Stakeholder Management	Level 3
• Good Manufacturing Practices Implementation	Level 4	• Strategy Development	Level 4
• Hazards and Risk Control, and Policy Management	Level 4	• Systems Thinking	Level 4
• Innovation Management	Level 4	• Technical Presentation	Level 4
• Technical Report Writing	Level 4	• WSH Performance Management	Level 3

Job Dashboard | QA&QC Specialist / Food Safety Specialist / Laboratory Manager (3/3)

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Trends impacting this role

AI & Big Data	Autonomous Robots	Digitalisation	Food Innovation
Food Packaging & Processing	Internationalisation	Internet of Things	Manufacturing Analytics

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

In the future, this job role is responsible for overseeing a mix of manual and automated tests on food quality and processing. The job holder is also expected to stay abreast of emerging technologies to ensure appropriate QA&QC and laboratory procedures are in place. In addition to technical expertise, the job holder needs to collaborate closely with other functions to provide guidance and oversight to ensure compliance to food safety regulations and requirements.

Critical Core Skills (CCS) Required

- Problem Solving — Intermediate
- Communication — Intermediate
- Sense Making — Intermediate
- Collaboration — Intermediate
- Decision Making — Intermediate

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Job Dashboard | QA&QC Manager (1/3)

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Trends impacting this role				Impact Assessment
AI & Big Data	Autonomous Robots	Digitalisation	Food Innovation	
Food Packaging & Processing	Internationalisation	Internet of Things	Manufacturing Analytics	**LOW** degree of change in tasks

Responsibilities of the role today

Today, this job role is responsible for the overall QA&QC strategies, objectives, policies and processes. The job holder reviews the quality testing policies and procedures for alignment with regulatory standards and best practices. The job holder also oversees internal and external audits, and leads investigations into major quality deviations in the organisation's products to determine their root causes and provides input into designing improved processes.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Establish organisational plans for product testing and review and make recommendations to address anomalies or issues identified	**L**	• Knowledge of new and emerging technologies such as autonomous robots, AI& Big Data, Internet of Things as well as developments in food innovation, packaging and processing, remain critical for the job holder to establish organisational plans	• Short-term
Apply industry best practices and regulatory requirements to the development of quality control policies and processes	**L**	• Communication and interpersonal skills, as well as change management skills, remain key as the job holder implements quality frameworks and testing across other functions • The job holder will also need to collaborate closely with regulatory bodies in both local and target overseas markets to gain insight on quality and safety regulations, thereafter developing testing procedures accordingly	• Short-term
Establish operational excellence model and good laboratory practices, as well as provide expertise on optimal standards for lab equipment	**L**	• The job holder will need to stay abreast of industry best practices in order to inform laboratory practices and standards for laboratory equipment	• Short-term
Design and review the organisation's QA policies based on regulatory requirements, industry guidelines and audit findings	**L**	• As food manufacturers expand overseas, the job holder is required to stay abreast of change regulatory requirements and industry guidelines in both local and target overseas markets, to ensure the organisation's QA policies are updated and compliant	• Short-term
Oversee investigations into major process deviations, evaluating the impact on production operations and communicating implications to relevant stakeholders	**L**	• While the job holder can leverage manufacturing analytics to generate insights on process deviations, strong communication skills continue to be crucial to the role as the job holder communicates results of investigations and impact on operations to key stakeholders	• Short- to Medium-term

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Job Dashboard | QA&QC Manager (2/3)

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Trends impacting this role				Impact Assessment
AI & Big Data	Autonomous Robots	Digitalisation	Food Innovation	
Food Packaging & Processing	Internationalisation	Internet of Things	Manufacturing Analytics	

LOW degree of change in tasks

Responsibilities of the role in the future

In the future, this job role is responsible for ensuring that both technology and human driven processes and operations are in line with good manufacturing practices and standards. The job holder is expected to leverage technologies in ensuring significant deviations are detected. ensure that all significant deviations are detected and leverage analytics and in-depth technical expertise to recommend ways to improve QA&QC processes.

Technical Skills (TSC) Required

• Budgeting	Level 4	• Laboratory Management	Level 5
• Business Continuity Management	Level 5	• Packaging Testing	Level 5
• Business Negotiation	Level 4	• Process Validation	Level 5
• Business Performance Management	Level 5	• Product Testing	Level 5
• Change Management	Level 5	• Project Management	Level 5
• Chemical Risk Management	Level 5	• Quality Assurance Management	Level 5
• Cleanliness Testing	Level 5	• Quality Control Management	Level 5
• Conflict Resolution	Level 5	• Quality System Management	Level 5
• Continuous Process Improvement	Level 4	• Risk Management	Level 5
• Document Control	Level 4	• Stakeholder Management	Level 4
• Emergency Response Management	Level 2	• Strategy Development	Level 5
• Food Safety Analysis	Level 5	• Systems Thinking	Level 5
• Food Safety Management	Level 4	• Technical Presentation	Level 5
• Good Manufacturing Practices Implementation	Level 5	• Technical Report Writing	Level 4
• Hazards and Risk Control, and Policy Management	Level 4	• WSH Performance Management	Level 4
• Innovation Management	Level 5		

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Job Dashboard | QA&QC Manager (3/3)

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Trends impacting this role				Impact Assessment
AI & Big Data	Autonomous Robots	Digitalisation	Food Innovation	 **LOW** degree of change in tasks
Food Packaging & Processing	Internationalisation	Internet of Things	Manufacturing Analytics	

Responsibilities of the role in the future

In the future, this job role is responsible for ensuring that both technology and human driven processes and operations are in line with good manufacturing practices and standards. The job holder is expected to leverage technologies in ensuring significant deviations are detected. ensure that all significant deviations are detected and leverage analytics and in-depth technical expertise to recommend ways to improve QA&QC processes.

Critical Core Skills (CCS) Required

- Problem Solving — Advanced
- Decision Making — Advanced
- Communication — Advanced
- Collaboration — Advanced
- Sense Making — Advanced

7 Appendix

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Job Dashboard | Assistant Food Technologist (1/2)

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Section Top

Trends impacting this role			Impact Assessment
AI & Big Data	Changing Consumer Preferences	Digitalisation	L **LOW** degree of change in tasks
Emerging Food Technology	Food Innovation	Food Packaging & Processing	

Responsibilities of the role today

Today, this role supports product, packaging and process development by preparing equipment and materials, and assisting in consolidating data and results of experiments for defining the specifications of products and/or processes. The job holder prepares samples and materials required for tests to characterise ingredients and determine product specifications. The job holder also supports the development and improvement of manufacturing processes by assisting in troubleshooting new and/or existing production processes to resolve production, quality and regulatory compliance issues.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Assist in the development of new products through experimentation, gathering of test and consumer data, and refinement of critical material attributes	**L**	• The job holder will be required to develop a broad understanding of trends in consumer preferences, food properties, food innovation, processing and packaging, as well as emerging food technologies such as alternative proteins in order to assist in food innovation • The job holder may also need to understand Artificial Intelligence and Big Data, which will be used to generate insights on changing consumer preferences and forecast product trends, as well as accelerate recipe formulation	• Short-term
Assist in the preparation and conduct of physical, chemical, and microbiological tests on new food products	**L**	• While digitalisation may improve the efficiency of preparing and conducting tests on food products, principles of physical, chemical, microbiological tests in laboratories are likely to remain, and the job holder will need to maintain and develop technical expertise in testing new food products	• Short-term
Assist in production trials, recipe formulation, and identifying modifications to food production processes and equipment to resolve compliance issues	**L**	• The job holder will continue to assist in production trials, recipe formulation, and identifying modifications to food production, processing and packaging, as well as equipment to resolve an compliance issues	• Short-term
Consolidate product formulations and other information to build product profiles for marketing	**L**	• The job holder will continue to support the development of product profiles for marketing by working closely with Business Development teams consolidate and share relevant information	• Short-term

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Job Dashboard | Assistant Food Technologist (2/2)

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Trends impacting this role

AI & Big Data	Changing Consumer Preferences	Digitalisation
Emerging Food Technology	Food Innovation	Food Packaging & Processing

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

Moving forward, while tasks and responsibilities performed by this job role remain largely unchanged, this role will likely be filled by part-time employees and interns, and serve as a window to the food manufacturing sector from which future talent can be recruited.

Technical Skills (TSC) Required

• Active and Smart Packaging	Level 3	• Laboratory Management	Level 2
• Advanced Processing Technology	Level 3	• New Product Introduction for Food	Level 3
• Change Management	Level 3	• Packaging Testing	Level 3
• Chemical Risk Management	Level 2	• Process Validation	Level 2
• Continuous Process Improvement	Level 3	• Product Improvement	Level 3
• Data Synthesis	Level 4	• Product Testing	Level 2
• Document Control	Level 2	• Project Management	Level 3
• Emergency Response Management	Level 2	• Quality Assurance Management	Level 3
• Food Product Marketing	Level 3	• Quality System Management	Level 2
• Food Safety Analysis	Level 3	• Recipe Formulation	Level 4
• Food Safety Management	Level 2	• Stakeholder Management	Level 3
• Good Manufacturing Practices Implementation	Level 3	• Systems Thinking	Level 3
• Green Manufacturing Design and Implementation	Level 3	• Technical Presentation	Level 4
• Hazards and Risk Control, and Policy Management	Level 2	• Technical Report Writing	Level 2
• Innovation Management	Level 3	• WSH Performance Management	Level 2
• Laboratory Data Analysis	Level 3		

Critical Core Skills (CCS) Required

• Communication	Intermediate	• Problem Solving	Basic
• Collaboration	Intermediate	• Creative Thinking	Intermediate

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Job Dashboard | Food Technologist (1/2)

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Trends impacting this role				Impact Assessment
AI & Big Data	Changing Consumer Preferences	Digitalisation	Emerging Food Technology	
Food Innovation	Food Packaging & Processing	Internationalisation		**LOW** degree of change in tasks

Responsibilities of the role today

Today, this role develops and improves products through experimentation, performs tests on food ingredients and product prototypes, and ensures that correct methodologies are used to generate information for the required food quality and consistency standards. The job holder also supports the production function by providing food science expertise in designing manufacturing processes and supports the business development function in profiling products for marketing purposes and meeting regulatory requirements for sales and export.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Create, evaluate, and refine food products suitable for mass production through experimentation and application of consumer knowledge	**M**	• The job holder will be required to stay abreast of advanced technologies and analytics tools, as well as trends in consumer preferences, food innovation, processing, and packaging, as well as emerging food technologies such as alternative proteins • Advanced technologies such as Artificial Intelligence and Big Data will be used to generate insights on changing consumer preferences and forecast product trends, as well as accelerate recipe formulation • The job holder will also be required to maintain close working relationships with Production teams in order to assess the feasibility of new products for mass production	• Medium- to Long-term
Guide physical, chemical, and microbiological testing activities on new or modified food products to ensure quality	**L**	• While digitalisation of processes may increase the efficiency and accuracy of testing activities, technical expertise, coaching, and supervisory skills remain critical to the job holder's task of overseeing testing activities and procedures on new or modified food products • The job holder may also be required to develop intermediate data analytics skills to perform analysis on test results and derive relevant insights to guide the innovation of food products	• Short-term
Develop or modify recipes, production methods, and processes to improve the quality of new food products and resolve compliance issues	**L**	• The job holder will continue to leverage understanding of trends and technological developments in food manufacturing, and work with cross-functional teams to develop and modify recipes, production methods, and processes to improve the quality of food products and resolve compliance issues	• Short-term
Conceptualise "product stories" from food preparation processes for marketing purposes	**L**	• As food manufacturers expand overseas, knowledge of consumer trends and target audiences, nutritional claims, food labelling, and marketing regulations remain critical to the development of product stories for successful marketing campaigns	• Short-term

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Job Dashboard | Food Technologist (2/2)

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Section Top

Trends impacting this role

AI & Big Data	Changing Consumer Preferences	Digitalisation	Emerging Food Technology
Food Innovation	Food Packaging & Processing	Internationalisation	

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

Moving forward, this role will continue to develop and improve products through experimentation, perform tests on food ingredients and product prototypes, and ensure that correct methodologies are used to generate information for the required food quality and consistency standards, while supporting Production and Business Development teams in providing food science expertise in designing manufacturing processes and profiling products for marketing purposes. The job holder will also leverage advanced technologies such as AI and Big Data to better gather consumer insights and formulate recipes.

Technical Skills (TSC) Required

• Active and Smart Packaging	Level 4	• Laboratory Data Analysis	Level 3
• Advanced Processing Technology	Level 4	• Laboratory Management	Level 3
• Change Management	Level 4	• New Product Introduction for Food	Level 3
• Chemical Risk Management	Level 3	• Packaging Testing	Level 3
• Conflict Resolution	Level 4	• Process Validation	Level 3
• Continuous Process Improvement	Level 4	• Product Improvement	Level 4
• Data Synthesis	Level 4	• Product Testing	Level 3
• Document Control	Level 3	• Project Management	Level 4
• Emergency Response Management	Level 2	• Quality Assurance Management	Level 3
• Food Manufacturing Process Design	Level 4	• Quality System Management	Level 3
• Food Product Marketing	Level 3	• Recipe Formulation	Level 4
• Food Safety Analysis	Level 4	• Stakeholder Management	Level 3
• Food Safety Management	Level 2	• Systems Thinking	Level 4
• Good Manufacturing Practices Implementation	Level 4	• Technical Presentation	Level 4
• Green Manufacturing Design and Implementation	Level 4	• Technical Report Writing	Level 3
• Hazards and Risk Control, and Policy Management	Level 2	• WSH Performance Management	Level 3
• Innovation Management	Level 4		

Critical Core Skills (CCS) Required

• Collaboration	Intermediate	• Creative Thinking	Intermediate
• Communication	Intermediate	• Problem Solving	Intermediate

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Job Dashboard | R&D Chef (1/2)

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Trends impacting this role				Impact Assessment
AI & Big Data	Changing Consumer Preferences	Digitalisation	Emerging Food Technology	
Food Innovation	Food Packaging & Processing	Internationalisation		**LOW** degree of change in tasks

Responsibilities of the role **today**

Today, this role is responsible for creating new recipes to expand the organisation's food product offerings. The job holder formulates new recipes in response to ideas and market signaling for new product demands and further refines recipes and preparation techniques to fulfil the requirements in mass production and regulatory needs. The job holder may also be consulted upon to help conceptualise marketing strategies, based on the job holder's approach and ideas in creating new products.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Create, modify, and refine recipes, ingredient selection, and taste profiles based on customer needs, nutrition, shelf-life, and regulatory requirements	**L**	• The job holder will be required to stay abreast of trends in consumer preferences, food and nutrition, food innovation, processing, and packaging, shelf-life, regulatory requirements as well as emerging food technologies in order to create and modify recipes, ingredient selection, and taste profiles in line with the company's product strategy • Advanced technologies such as Artificial Intelligence and Big Data will be used to generate insights on changing consumer preferences and forecast product trends, as well as accelerate recipe formulation	• Short- to medium-term
Recommend new or modified manufacturing processes and equipment to improve quality of food products and comply with regulations during mass production	**L**	• While digitalisation improves the efficiency of manufacturing processes, technical expertise, expertise, and human judgement remain crucial to recommending new or modified manufacturing processes and equipment to improve the quality of food products and ensure compliance with regulations	• Medium term
Support sales and marketing activities by preparing product information for marketing purposes and food samples for customer showcases	**L**	• As food manufacturers expand overseas, the job holder is expected to continue leveraging strong culinary skills and understanding of local and overseas customer palates to support Food Technologists and Business Development teams in developing "product stories" and launching marketing campaigns	• Short term

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Job Dashboard | R&D Chef (2/2)

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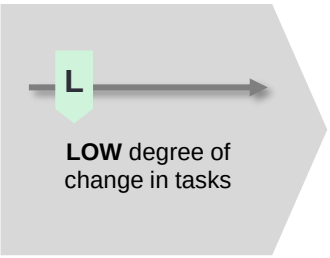
Trends impacting this role

AI & Big Data	Changing Consumer Preferences	Digitalisation	Emerging Food Technology
Food Innovation	Food Packaging & Processing	Internationalisation	

Impact Assessment



Responsibilities of the role **in the future**

Moving forward, this job role will continue to innovating new and creative food products in response to consumer trends, while considering developments in food manufacturing technologies. The job roles is expected to leverage deep knowledge and expertise in culinary skills, food and nutrition, and knowledge of customer palates to ensure that new recipes are developed in line with the company's product strategy and target audiences.

Technical Skills (TSC) Required

• Change Management	Level 4	• Innovation Management	Level 4
• Conflict Resolution	Level 4	• Process Validation	Level 3
• Continuous Process Improvement	Level 4	• Product Improvement	Level 4
• Document Control	Level 3	• Project Management	Level 4
• Emergency Response Management	Level 2	• Quality Assurance Management	Level 4
• Food Manufacturing Process Design	Level 4	• Quality System Management	Level 3
• Food Product Marketing	Level 3	• Recipe Formulation	Level 5
• Food Safety Management	Level 2	• Stakeholder Management	Level 3
• Good Manufacturing Practices Implementation	Level 4	• Technical Presentation	Level 4
• Green Manufacturing Design and Implementation	Level 3	• WSH Performance Management	Level 3
• Hazards and Risk Control and Policy Management	Level 2		

Critical Core Skills (CCS) Required

• Creative Thinking	Intermediate	• Communication	Intermediate
• Collaboration	Intermediate	• Global Perspective	Intermediate

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Job Dashboard | Product Technologist / Innovation Manager (1/3)

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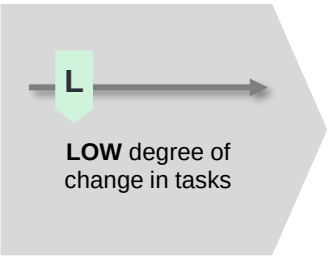
Trends impacting this role

AI & Big Data	Changing Consumer Preferences	Digitalisation	Emerging Food Technology
Food Innovation	Food Packaging & Processing	Internationalisation	Sustainable Production

Impact Assessment



LOW degree of change in tasks

Responsibilities of the role **today**

Today, this role supports the development of products and processes by preparing equipment and materials, and assisting in consolidating data and results of experiments for defining the specifications of products and/or processes. The job holder prepares samples and materials required for tests to characterise ingredients and determine product specifications. The job holder also supports the development and improvement of manufacturing processes by assisting in troubleshooting new and/or existing production processes to resolve production, quality and regulatory compliance issues.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Oversee the development of new products from conceptualisation to final production, while ensuring target product quality profiles are met	**M**	• AI and Big Data increases the availability of market and consumer insights, enabling the job holder to better understand prevailing market trends and consumer preferences. At the same time, the job holder will need to stay abreast of emerging food technology and trends in food innovation, packaging and processing • The job holder will also need to stay abreast of sustainability trends and support R&D activities in line with the company's strategy (e.g., propose ways to repurpose food waste) • As food manufacturers continuously develop new products, the job holder is also expected to possess knowledge of Intellectual Property management to protect the organisation's proprietary products and recipes	• Medium- to Long-term
Develop sampling plans and testing protocols for materials, products, and packaging to ensure product safety and quality	**L**	• The job holder will need to stay abreast of industry best practices in order to inform sampling plans and testing protocols, as well as factor in the use of digitalisation and new and emerging technologies to substitute sampling activities • As food manufacturers expand overseas, the job holder will need to incorporate the latest local and overseas food regulations into the testing protocols to ensure compliance with requirements of target markets	• Short- to Medium-term
Lead the conceptualisation of "product stories" for marketing purposes and contribute product formulations to create accurate pricing data	**M**	• The job holder is expected to work closely with Business Development teams in developing "product stories" for marketing purposes • Artificial Intelligence and Big Data will enable to job holder to understand the external competitive environment to better determine pricing for new or modified products	• Medium- to Long-term
Test and scale new and emerging food and business solutions, and refine the application of these solutions to improve product properties	**L**	• The job holder will continue to hone an innovative approach to developing and scaling new business and food ideas, working closely with cross-functional teams to execute on these plans	• Short-term

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Job Dashboard | Product Technologist / Innovation Manager (2/3)

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Trends impacting this role

AI & Big Data	Changing Consumer Preferences	Digitalisation	Emerging Food Technology
Food Innovation	Food Packaging & Processing	Internationalisation	Sustainable Production

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role **in the future**

Moving forward, this job role will continue to lead and oversee new product developments to drive business growth. The job holder will be expected to utilise advanced technologies such as AI and Big Data ensure product development is aligned to prevailing market needs and consumer preferences. With increased process efficiency through digitalisation tools and other technologies, the job holder may also be required to apply knowledge of Intellectual Property management to secure the company's intellectual assets, such as recipes.

Technical Skills (TSC) Required

• Active and Smart Packaging	Level 5	• Innovation Management	Level 5
• Advanced Processing Technology	Level 5	• Laboratory Data Analysis	Level 4
• Budgeting	Level 4	• Laboratory Management	Level 4
• Business Continuity Management	Level 4	• New Product Introduction for Food	Level 4
• Business Performance Management	Level 5	• Packaging Testing	Level 4
• Change Management	Level 5	• Process Validation	Level 4
• Chemical Risk Management	Level 4	• Product Improvement	Level 5
• Conflict Resolution	Level 5	• Product Testing	Level 4
• Continuous Process Improvement	Level 5	• Project Management	Level 5
• Data Analytics System Design	Level 4	• Quality Assurance Management	Level 4
• Data Synthesis	Level 5	• Quality System Management	Level 4
• Document Control	Level 4	• Risk Management	Level 4
• Emergency Response Management	Level 2	• Stakeholder Management	Level 4
• Food Manufacturing Process Design	Level 5	• Strategy Development	Level 4
• Food Safety Analysis	Level 4	• Systems Thinking	Level 5
• Food Safety Management	Level 3	• Technical Presentation	Level 5
• Good Manufacturing Practices Implementation	Level 4	• Technical Report Writing	Level 4
• Green Manufacturing Design and Implementation	Level 5	• WSH Performance Management	Level 4
• Hazards and Risk Control, and Policy Management	Level 3		

3 Job Dashboard | Product Technologist / Innovation Manager (3/3)

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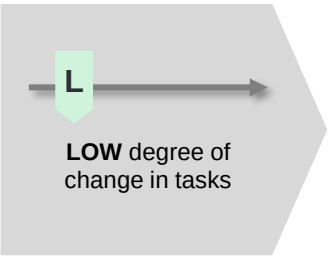
Trends impacting this role

AI & Big Data	Changing Consumer Preferences	Digitalisation	Emerging Food Technology
Food Innovation	Food Packaging & Processing	Internationalisation	Sustainable Production

Impact Assessment



LOW degree of change in tasks

Responsibilities of the role **in the future**

Moving forward, this job role will continue to lead and oversee new product developments to drive business growth. The job holder will be expected to utilise advanced technologies such as AI and Big Data ensure product development is aligned to prevailing market needs and consumer preferences. With increased process efficiency through digitalisation tools and other technologies, the job holder may also be required to apply knowledge of Intellectual Property management to secure the company's intellectual assets, such as recipes.

Critical Core Skills (CCS) Required

- Communication — Advanced
- Creative Thinking — Advanced
- Decision Making — Intermediate
- Problem Solving — Advanced
- Collaboration — Advanced

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Job Dashboard | Chief R&D Officer (1/3)

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Section Top

Trends impacting this role				Impact Assessment
AI & Big Data	Changing Consumer Preferences	Digitalisation	Emerging Food Technology	L **LOW** degree of change in tasks
Food Innovation	Food Packaging & Processing	Internationalisation	Sustainable Production	

Responsibilities of the role today

Today, this role leads research for the adoption of new technology and equipment to enhance the organisation's operational excellence and business competitiveness. The job role includes advising on advanced methods and techniques to design new food projects and / or enhance processes to meet the required technical, quality and regulatory standards. At the organisation level, the job holder acts as a changemaker by designing the innovation roadmap and driving continuous improvement strategies.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Lead both technical and technological innovations in product, packaging, and processes to differentiate food products	**L**	• The job holder will continue to be required to drive improvements in food innovation, processing and packaging in response to meet the changing demands of consumers and differentiate themselves within the external competitive environment • The job holder will also need to stay abreast of sustainability trends and drive sustainability initiatives in line with the company's strategy	• Medium- to Long-term
Establish and implement manufacturing processes for new products and evaluate outcomes to deliver improved business results	**L**	• Knowledge of food manufacturing processes and close collaboration with Production and Quality Assurance and Quality Control teams remain crucial to the implementation of processes for new products	• Short-term
Drive improvements in the conceptualisation of "product stories" to enhance business competitiveness and capture new markets	**M**	• The rise of AI and Big Data, coupled with the increased availability of large volumes of consumer data and insights allows the job holder to drive improvements to "product stories" and deliver targeted messages to key markets and audiences	• Medium- to Long-term
Develop business cases for the adoption of new technologies and execute innovation initiatives aligned to the organisation's vision, mission, and values	**L**	• The job holder will be required to stay abreast of sectoral trends and technological developments in both local and overseas markets and evaluate the suitability of relevant solutions, initiatives, as well as partnerships for the business's operational environment • Entrepreneurship mindset, strong professional judgement and critical thinking skills remain essential in assessing the viability of innovation initiatives and executing them in support of the organisation's overarching strategy	• Short-term

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Job Dashboard | Chief R&D Officer (2/3)

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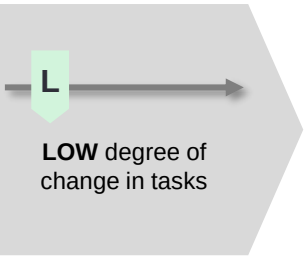
Trends impacting this role

AI & Big Data	Changing Consumer Preferences	Digitalisation	Emerging Food Technology
Food Innovation	Food Packaging & Processing	Internationalisation	Sustainable Production

Impact Assessment



LOW degree of change in tasks

Responsibilities of the role in the future

Moving forward, most of the tasks and responsibilities will remain largely unchanged for this job role. The job holder is expected to identify and implement improvement initiatives, adopt technologies, and establish partnerhsips that will affor the company a strong advantage in target markets. Additionally, the job holder will need to possess a visionary mindset and a strong background in strategy development to spearhead the organisation's innovation activities to satisfy changing market demands and consumer expectations.

Technical Skills (TSC) Required

- Active and Smart Packaging — Level 6
- Advanced Processing Technology — Level 6
- Budgeting — Level 5
- Business Continuity Management — Level 5
- Business Performance Management — Level 6
- Change Management — Level 6
- Chemical Risk Management — Level 5
- Conflict Resolution — Level 5
- Continuous Process Improvement — Level 5
- Data Analytics System Design — Level 5
- Data Synthesis — Level 6
- Document Control — Level 4
- Emergency Response Management — Level 2
- Food Manufacturing Process Design — Level 6
- Food Safety Management — Level 4
- Good Manufacturing Practices Implementation — Level 5
- Green Manufacturing Design and Implementation — Level 5
- Hazards and Risk Control, and Policy Management — Level 3
- Innovation Management — Level 6
- International Trade Legislation for Business — Level 2
- Laboratory Management — Level 5
- New Product Introduction for Food — Level 5
- Packaging Testing — Level 5
- Process Validation — Level 5
- Product Testing — Level 5
- Production Performance Management — Level 5
- Project Management — Level 6
- Quality Assurance Management — Level 5
- Quality Control Management — Level 5
- Quality System Management — Level 5
- Risk Management — Level 6
- Stakeholder Management — Level 5
- Strategy Development — Level 6
- Systems Thinking — Level 5
- Technical Presentation — Level 6
- Technical Report Writing — Level 4
- WSH Performance Management — Level 2

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Job Dashboard | Chief R&D Officer (3/3)

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Trends impacting this role

AI & Big Data	Changing Consumer Preferences	Digitalisation	Emerging Food Technology
Food Innovation	Food Packaging & Processing	Internationalisation	Sustainable Production

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

Moving forward, most of the tasks and responsibilities will remain largely unchanged for this job role. The job holder is expected to identify and implement improvement initiatives, adopt technologies, and establish partnerhsips that will affor the company a strong advantage in target markets. Additionally, the job holder will need to possess a visionary mindset and a strong background in strategy development to spearhead the organisation's innovation activities to satisfy changing market demands and consumer expectations.

Critical Core Skills (CCS) Required

- Decision Making — Advanced
- Global Perspective — Advanced
- Developing People — Advanced
- Interpersonal Skills — Advanced
- Communication — Advanced

7 Appendix

4 Job Dashboard | Assistant Market Development Manager / Market Development Executive (1/2)

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Trends impacting this role			Impact Assessment
AI & Big Data	Changing Consumer Preferences	Digitalisation	L **LOW** degree of change in tasks
E-Commerce	Internationalisation	Virtual/ Augmented Reality	

Responsibilities of the role today

Today, this job role is responsible for implementing marketing programmes and communications plans to support the development of new markets and customer bases. The job holder manages the relationships with the organisation's business partners to facilitate the promotion of food products and maintaining of distribution channels. The job holder also gathers market data and the tests the effectiveness of implemented campaigns.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Conduct market research on trends and developments to identify potential business opportunities	**M**	• AI will be used to gather and synthesise information from multiple sources for quicker reviewing to better understand market trends and changing consumer preferences • Focus will shift from manual, time-intensive research efforts to utilising data storytelling and visualisation techniques to make sense of the trends in the context of business needs	• Medium- to Long-term
Plan and implement activities to support marketing and communications campaigns	**L**	• While principles underlying customer engagement remain largely unchanged, the job holder will need to adjust their approaches and content to provide a tailored and seamless customer experience across multiple markets and channels, including e-commerce channels • Technical expertise and industry experience, as well as an understanding of target overseas markets remain critical for implementing marketing and communications campaigns • In time, the job holder may also need to consider utilising other up-and-coming means to augment marketing activities, such as digital platforms enabled by AR and VR	• Short-term
Monitor and assess the effectiveness of campaigns and programmes through analysing data related to past performance	**L**	• The use of advanced analytics tools will enhance the tracking and monitoring of campaign performance to improve marketing effectiveness • Data storytelling and visualisation techniques will enable the job holder to derive trends and patterns to drive specific outcomes with target customers	• Short-term
Maintain good relationships with key established and new business partners	**L**	• While advanced analytics will provide insights on customer needs and profiles, stakeholder management skills and personal influence remain critical for maintaining good relationships with business partners • Digitalisation, through the use of digital platforms may augment client conversations, and enable real-time information sharing	• Short-term

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Job Dashboard | Assistant Market Development Manager / Market Development Executive (2/2)

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Trends impacting this role

AI & Big Data	Changing Consumer Preferences	Digitalisation
E-Commerce	Internationalisation	Virtual/ Augmented Reality

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

Moving forward, this role will leverage analytics coupled with human judgment, experience and foresight to steer the direction and basis of analysis as efficiency in the data gathering improves and analysis is strengthened by the ability to incorporate alternative data sources.

Technical Skills (TSC) Required

• Brand Portfolio Management	Level 3	• International Marketing Programmes Management	Level 3
• Business Environment Analysis	Level 2	• International Trade Legislation for Business	Level 2
• Business Negotiation	Level 3	• Market Research	Level 2
• Business Opportunities Development	Level 3	• Marketing Communications Plan Development	Level 2
• Business Relationship Building	Level 3	• New Export Market Entry Strategy Formulation	Level 4
• Communications Channel Management	Level 3	• Product Improvement	Level 2
• Consumer Intelligence Analysis	Level 2	• Project Management	Level 3
• Customer Acquisition Management	Level 2	• Social Media Marketing	Level 2
• Customer Behaviour Analysis	Level 2	• Stakeholder Management	Level 3
• Customer Loyalty and Retention Strategy Formulation	Level 4	• Strategy Development	Level 4
• E-commerce Campaign Management	Level 2	• Systems Thinking	Level 4
• Emergency Response Management	Level 2	• Technical Presentation	Level 4
• Food Product Marketing	Level 2	• WSH Performance Management	Level 2

Critical Core Skills (CCS) Required

• Customer Orientation	Intermediate	• Creative Thinking	Basic
• Collaboration	Intermediate	• Communication	Basic

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Job Dashboard | Market Development Manager (1/3)

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Section Top

Trends impacting this role			Impact Assessment
AI & Big Data	Changing Consumer Preferences	Digitalisation	L **LOW** degree of change in tasks
E-Commerce	Internationalisation	Virtual/ Augmented Reality	

Responsibilities of the role today

Today, this job role is responsible for building a customer base for the food products within the job holder's assigned market or country. The job holder works with business partners in the assigned market to promote products, maintain distribution channels or even set up overseas production plants. The job holder also conducts studies to identify potential growth areas and strategises new campaigns to expand the customer base within the assigned market.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Refine findings from market research to assess the viability of potential business opportunities, as well as identify and profile target customers	**M**	• AI and advanced analytics will generate and synthesise specific insights on customer profiles, consumer preferences, trends and market dynamics to uncover potential business development opportunities • The job holder will be tasked with interpreting these findings and building a deep understanding of human behaviour driving decision-making about brands and products to identify and recommend potential solutions to grow the business	• Medium- to Long-term
Develop and manage strategies and operational plans for marketing and communications campaigns	**L**	• The use of advanced analytics tools to enhance consumer intelligence analysis will help to identify target customer profiles and appropriate strategies to engage them • This will augment the job holder's ability to create robust strategies for marketing and communication campaigns across various channels, including e-commerce channels • In time, the job holder may also need to consider utilising other up-and-coming means to augment marketing activities, such as digital platforms enabled by AR and VR	• Short-term
Define marketing performance measures and assess marketing effectiveness to identify areas for improvement	**L**	• The use of advanced analytics and data visualisation tools will enhance the evaluation of campaign performance by identifying gaps and improvement opportunities to improve marketing effectiveness	• Short-term
Manage service agreements with key business partners and negotiate with domestic partners on new and on-going collaborations	**L**	• Focus will shift to utilising data and analytical insights to have targeted conversations with partners • Strategic thinking, business acumen and personal influence skills remain critical for commercialising opportunities through collaborating with suitable partners	• Short-term

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Job Dashboard | Market Development Manager (2/3)

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Trends impacting this role			Impact Assessment
AI & Big Data	Changing Consumer Preferences	Digitalisation	L **LOW** degree of change in tasks
E-Commerce	Internationalisation	Virtual/ Augmented Reality	

Responsibilities of the role in the future

Moving forward, this role will continue to be responsible for the ideation, creation and execution of strategic marketing campaigns. Advanced Analytics will be incorporated to improve marketing campaigns approaches. With the rise of digital platforms, this role will likely transform to be more similar to a Digital Marketer.

Technical Skills (TSC) Required

- Brand Portfolio Management — Level 3
- Budgeting — Level 3
- Business Environment Analysis — Level 3
- Business Negotiation — Level 3
- Business Networking — Level 5
- Business Opportunities Development — Level 4
- Business Performance Management — Level 4
- Business Relationship Building — Level 4
- Communications Channel Management — Level 3
- Conflict Resolution — Level 4
- Consumer Intelligence Analysis — Level 3
- Customer Acquisition Management — Level 3
- Customer Behaviour Analysis — Level 3
- Customer Loyalty and Retention Strategy Formulation — Level 4
- E-commerce Campaign Management — Level 3
- Emergency Response Management — Level 2
- Food Product Marketing — Level 3
- International Marketing Programmes Management — Level 3
- International Trade Legislation for Business — Level 3
- Market Research — Level 3
- Marketing Communications Plan Development — Level 3
- New Export Market Entry Strategy Formulation — Level 4
- Product Improvement — Level 2
- Project Management — Level 4
- Social Media Marketing — Level 3
- Stakeholder Management — Level 3
- Strategy Development — Level 4
- Systems Thinking — Level 4
- Technical Presentation — Level 4
- WSH Performance Management — Level 3

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Job Dashboard | Market Development Manager (3/3)

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Trends impacting this role			Impact Assessment
AI & Big Data	Changing Consumer Preferences	Digitalisation	L **LOW** degree of change in tasks
E-Commerce	Internationalisation	Virtual/ Augmented Reality	

Responsibilities of the role in the future

Moving forward, this role will continue to be responsible for the ideation, creation and execution of strategic marketing campaigns. Advanced Analytics will be incorporated to improve marketing campaigns approaches. With the rise of digital platforms, this role will likely transform to be more similar to a Digital Marketer.

Critical Core Skills (CCS) Required

- Communication — Intermediate
- Collaboration — Intermediate
- Customer Orientation — Intermediate
- Decision Making — Intermediate
- Creative Thinking — Intermediate

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Job Dashboard | Regional Manager / Export Manager (1/2)

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Section Top

Trends impacting this role				Impact Assessment
AI & Big Data	Changing Consumer Preferences	Digitalisation	E-Commerce	L **LOW** degree of change in tasks
Food Innovation	Internationalisation	Virtual/ Augmented Reality		

Responsibilities of the role today

Today, this job role is responsible for managing the organisation's product sales within a geographical area, typically divided into multiple markets. The job holder conceives marketing and market development strategies for the team and facilitates their execution by negotiating long-term business partnership arrangements and arranging for relevant certifications, regulatory, and other, obligations required for product export.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Define the scope and approach to market research and evaluate team's findings to determine business opportunities in domestic and global markets	**M**	• AI and advanced analytics increase the availability of market and consumer insights from a vast array of data sets, enabling the job holder to better understand prevalent trends and market movements to determine business opportunities • Industry experience, global perspectives, as well as an awareness of emerging technology and its application to business development activities remain critical for directing the team's research and evaluating the viability of opportunities	• Medium- to Long-term
Develop and manage strategies and operational plans for marketing and communications campaigns in international markets	**L**	• The use of advanced analytics tools to enhance consumer intelligence analysis will help to identify target customer profiles in international markets and appropriate strategies to engage them • This will augment the job holder's ability to create robust and creative strategies for marketing and communication campaigns across various markets and platforms, both digital and physical • Cross-cultural knowledge remains critical to this role as the organisation expands into international markets and caters to different consumers • In time, the job holder may also need to consider utilising other up-and-coming means to augment marketing activities, such as digital platforms enabled by AR and VR	• Short-term
Establish marketing performance goals and evaluate the effectiveness of campaigns on both a domestic and international scale	**L**	• Customer behaviour analysis, sentiment analysis and other advanced analytics techniques will be used to evaluate the effectiveness of customer treatment strategies • In addition, real-time tracking of product performance will enable the acceleration of market research and competitor benchmarking, and insights obtained can be used to inform opportunities for existing products or food innovation	• Short- to Medium-term
Advise and negotiate with both domestic and international partners, as well as ensure requirements are fulfilled to support product export activities	**L**	• knowledge of regulations and requirements remain key support the execution of such partnerships, especially where cross-border transfer and sale of existing and new products is involved • Industry expertise, strategic thinking, business acumen, and personal influence skills remain critical in fostering the close collaboration with different partners to ensure that mutual benefit is derived from the partnerships	• Short-term

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Job Dashboard | Regional Manager / Export Manager (2/2)

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Trends impacting this role

AI & Big Data	Changing Consumer Preferences	Digitalisation	E-Commerce
Food Innovation	Internationalisation	Virtual/ Augmented Reality	

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

Moving forward, this job role will leverage digital and other advanced technology tools to replace the routine tracking tasks, allowing them to spend more time on higher value tasks — i.e., extracting business-relevant insights from data to support robust recommendations and decision making.

Technical Skills (TSC) Required

• Brand Portfolio Management	Level 4	• Emergency Response Management	Level 2
• Budgeting	Level 4	• Food Product Marketing	Level 4
• Business Continuity Management	Level 4	• International Marketing Programmes Management	Level 4
• Business Environment Analysis	Level 4	• International Trade Legislation for Business	Level 4
• Business Negotiation	Level 4	• Market Research	Level 4
• Business Networking	Level 5	• Marketing Communications Plan Development	Level 4
• Business Opportunities Development	Level 5	• New Export Market Entry Strategy Formulation	Level 5
• Business Performance Management	Level 5	• Risk Management	Level 4
• Business Relationship Building	Level 5	• Product Improvement	Level 2
• Communications Channel Management	Level 4	• Project Management	Level 4
• Conflict Resolution	Level 4	• Social Media Marketing	Level 4
• Consumer Intelligence Analysis	Level 4	• Stakeholder Management	Level 4
• Customer Acquisition Management	Level 4	• Strategy Development	Level 4
• Customer Behaviour Analysis	Level 4	• Systems Thinking	Level 4
• Customer Loyalty and Retention Strategy Formulation	Level 5	• Technical Presentation	Level 5
• E-Commerce Campaign Management	Level 4	• WSH Performance Management	Level 4

Critical Core Skills (CCS) Required

• Communication	Advanced	• Developing People	Advanced
• Decision Making	Intermediate	• Global Perspective	Intermediate
• Problem Solving	Intermediate		

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Job Dashboard | General Manager (1/2)

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Trends impacting this role				Impact Assessment
AI & Big Data	Business Innovation	Changing Consumer Preferences	Digitalisation	L **LOW** degree of change in tasks
E-Commerce	Food Innovation	Internationalisation		

Responsibilities of the role today

Today, this job role is responsible for setting the strategic direction and goals for the organisation's international business growth. The job holder leverages international food regulations and other trade-related knowledge, as well as strong technical product knowledge and cultural awareness to make business decisions, such as selecting viable strategies for new market entries, which the job holder facilitates by building a network of international business partners for the organisation.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Incorporate findings and related analyses from market research into business forecasts, strategy development, and plans	**L**	• Advanced analytics will leverage data from past business performance to inform the critical parameters and inputs for business forecasts. Coupled with a strong understanding of industry trends and developments, as well as changing consumer preferences, business decisions will become more holistic and targeted • The job holder will also be required to explore e-commerce and other innovative means of growing the business beyond its core revenue streams	• Medium- to Long-term
Manage resources, logistics and manpower requirements for implementation of business plans	**L**	• Digitalisation of processes and systems will enable higher efficiency in managing resources, logistics, and manpower as manual ways of working decrease and real-time tracking and monitoring become possible	• Short-term
Leverage data analytics to measure and evaluate business impacts arising from business development activities	**L**	• Advanced analytics on multiple data sets from disparate data sources will support swift measurement and evaluation of business impacts, enabling the job holder to respond quickly to changes in the market by adjusting business development activities accordingly	• Short-term
Develop business networks and direct business negotiations with key customer accounts and strategic partners	**L**	• While advanced technologies such as AI and Big Data will provide insights on strategies for business development, stakeholder management skills and personal influence remain critical for building strong networks with customers and partners, that will in turn increase the brand equity of the organisation	• Short-term

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Job Dashboard | General Manager (2/2)

Contents
Section Top

Trends impacting this role

AI & Big Data	Business Innovation	Changing Consumer Preferences	Digitalisation
E-Commerce	Food Innovation	Internationalisation	

Impact Assessment

LOW degree of change in tasks

Responsibilities of the role in the future

Moving forward, this role will use digital and other advanced technology tools to obtain real-time tracking of product performance and accelerate market research. They will leverage the insights obtained to inform opportunities for new products and improve existing products and offerings.

Technical Skills (TSC) Required

• Brand Portfolio Management	Level 5	• Emergency Response Management	Level 2
• Budgeting	Level 5	• Food Product Marketing	Level 5
• Business Continuity Management	Level 5	• International Marketing Programmes Management	Level 5
• Business Environment Analysis	Level 5	• International Trade Legislation for Business	Level 5
• Business Negotiation	Level 5	• Market Research	Level 5
• Business Networking	Level 6	• Marketing Communications Plan Development	Level 5
• Business Opportunities Development	Level 6	• New Export Market Entry Strategy Formulation	Level 6
• Business Performance Management	Level 6	• Project Management	Level 5
• Business Relationship Building	Level 6	• Risk Management	Level 5
• Communications Channel Management	Level 5	• Social Media Marketing	Level 5
• Conflict Resolution	Level 5	• Stakeholder Management	Level 5
• Consumer Intelligence Analysis	Level 5	• Strategy Development	Level 5
• Customer Acquisition Management	Level 5	• Systems Thinking	Level 4
• Customer Behaviour Analysis	Level 5	• Technical Presentation	Level 6
• Customer Loyalty and Retention Strategy Formulation	Level 6	• WSH Performance Management	Level 4
• E-commerce Campaign Management	Level 5		

Critical Core Skills (CCS) Required

• Decision Making	Advanced	• Developing People	Advanced
• Global Perspective	Intermediate	• Communication	Intermediate
• Collaboration	Intermediate		

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Job Dashboard | Chief Executive / Managing Director (1/2)

Contents
Section Top

Trends impacting this role			Impact Assessment
Business Innovation	Changing Consumer Preferences	E-Commerce	 **LOW** degree of change in tasks
Food Innovation	Internationalisation	Sustainable Production	

Responsibilities of the role today

Today, this job role is responsible for steering the organisation to achieve excellence and business sustainability in a globalised environment. The job holder develops business and professional networks with diverse external stakeholders and the global business community. The job holder also directs plant operations and provides leadership to departmental managers to ensure that the organisational objectives are accomplished in a timely and cost-effective manner, while driving a culture of innovation to explore new business ideas.

Job tasks today	Impact at task-level / Future view of job tasks		Time horizon
Drive value-creation and business excellence to support long-term business objectives	**L**	• While the job holder's role in driving value-creation and busines excellence for the entire organisation will not change, he/she is require to understand developments in both global and local sector trends and technologies, and incorporate these insights into the business vision and overarching organisation strategy • The job holder should also understand emerging markets and platforms to make strategic decisions on which business segments to develop for long-term business sustainability	• Short-term
Champion a culture of innovation by encouraging and challenging new ideas while balancing risks and opportunities	**L**	• Identify opportunities and develop innovative ideas through an in-depth understanding of changing Food Manufacturing landscapes, competitors' offerings and evolving customer expectations and preferences • Familiar with changing consumer preferences, food technologies and new food production methods to make strategic investments in food innovation • Drive adoption of advanced technologies that can yield greater business productivity and insights	• Short- to Medium-term
Develop and mentor a strong talent pipeline within the organisation	**L**	• Transform workforce strategy to mitigate challenges such as high attrition rates and low talent supply • Improve employee engagement and equipping to build sufficient bench strength to support the organisation's long-term aspirations	• Medium- to Long-term
Establish business networks with diverse external stakeholders and the global business community	**L**	• Stakeholder management and business acumen remains key to establish strategic networks and partnerships through collaboration with other companies throughout the Food Manufacturing sector and food production value chain, such as new food-tech start-ups, E-commerce platforms, or logistics providers	• Short-term

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Job Dashboard | Chief Executive / Managing Director (2/2)

Contents
Section Top

Trends impacting this role			Impact Assessment
Business Innovation	Changing Consumer Preferences	E-Commerce	 **LOW** degree of change in tasks
Food Innovation	Internationalisation	Sustainable Production	

Responsibilities of the role in the future

Moving forward, this job role will continue to be in charge of steering the organisation to achieve its business goals by establishing strategic directions to drive innovation, build capabilities, and remain competitive. The job holder will also have to spearhead the adoption of new technologies to boost food production and organisational efficiency. The complexity and rapid changes across the sector require job holders to possess more agility in tasks performed.

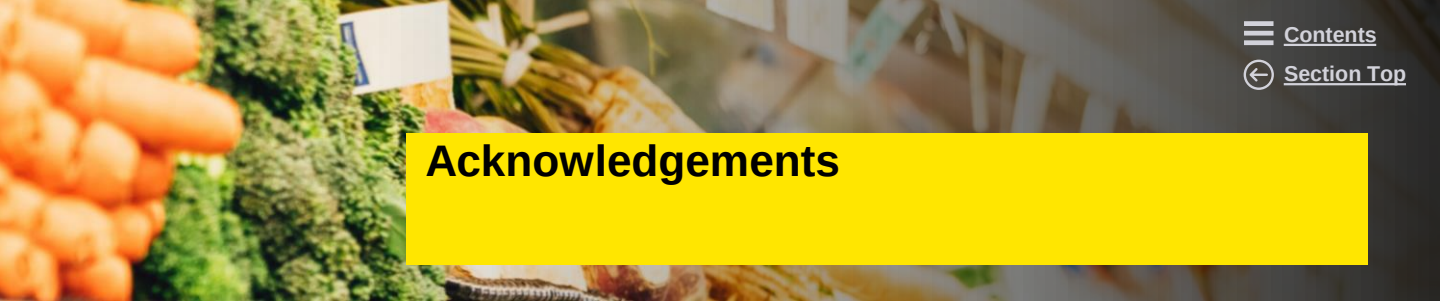
Technical Skills (TSC) Required

- Budgeting — Level 5
- Business Continuity Management — Level 6
- Business Environment Analysis — Level 6
- Business Negotiation — Level 5
- Business Networking — Level 6
- Business Opportunities Development — Level 6
- Business Performance Management — Level 6
- Change Management — Level 6
- Conflict Resolution — Level 6
- Emergency Response Management — Level 2
- Green Manufacturing Design and Implementation — Level 6
- Innovation Management — Level 6
- Project Management — Level 6
- Risk Management — Level 6
- Stakeholder Management — Level 5
- Strategy Development — Level 6
- Systems Thinking — Level 5
- Technical Presentation — Level 6
- WSH Performance Management — Level 2

Critical Core Skills (CCS) Required

- Decision Making — Advanced
- Global Perspective — Advanced
- Developing People — Advanced
- Collaboration — Advanced
- Communication — Intermediate

7 Appendix



Acknowledgements

Companies

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Boncafe International Pte Ltd

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Coca-Cola Singapore Beverages Pte Ltd

Cocoba Pte Ltd

De Tai Food Supply Pte Ltd

Eng Soon Dry Bean Curd

Extra Excellence Manufacturing (S) Pte Ltd

Fame Seafood Dealer

FoodPride Pte Ltd

French Food Factory

Garden Picks Food Manufacturing Llp

Ho Lee Food (S) Pte Ltd

Hock Lian Huat Foodstuff Industry Pte Ltd

Huber's Pte Ltd

Kee Song Food Corporation (S) Pte Ltd

Kwong Cheong Thye Pte Ltd

Lek Lim Nonya Cake Trading Pte Ltd

Leong Guan Food Manufacturer Pte Ltd

Long Wei Holdings Pte Ltd

Mirana Foodstuff & Supplier Pte Ltd

People Bee Hoon Factory Pte Ltd

Polar Puffs & Cakes Pte Ltd

Rudi'S Fine Food Pte Ltd

S M C Food 21 Pte Ltd

Saga Foodstuffs Manufacturing Pte Ltd

Sej Cai Pte Ltd

Shiok Meats

Sin Mui Heng Food Industries Pte Ltd

Sophie's Bionutrients

Swee Heng Bakery Pte Ltd

Tc Import & Export Pte Ltd

Tee Yih Jia Food Manufacturing Pte Ltd

The Seafood Company

Thong Siek Food Industry Pte Ltd

Tiong Lian Food

Vaner Investment Pte Ltd

Vismark Food Industries Pte Ltd

Wanin Industries Pte Ltd

Yeo Hiap Seng Ltd

Institutions

ITE College East

Nanyang Technological University

Republic Polytechnic

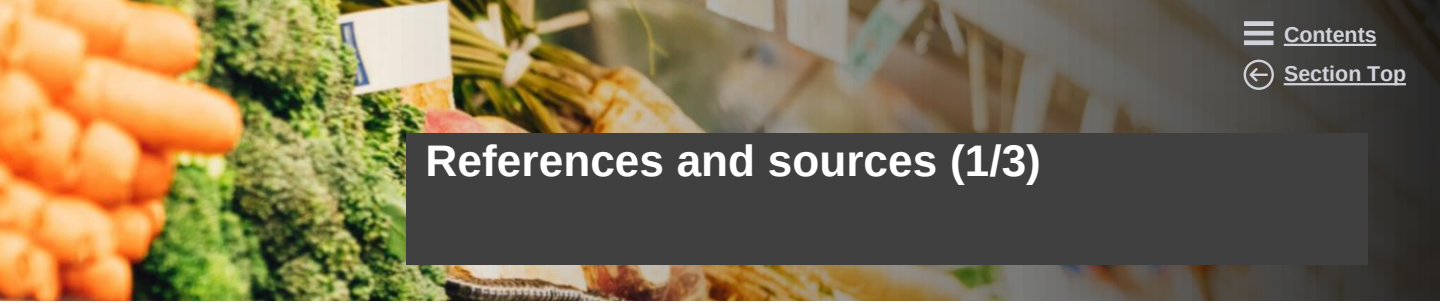
Singapore Institute of Technology

Singapore Polytechnic

Singapore University of Technology and Design

Temasek Polytechnic

Appendix



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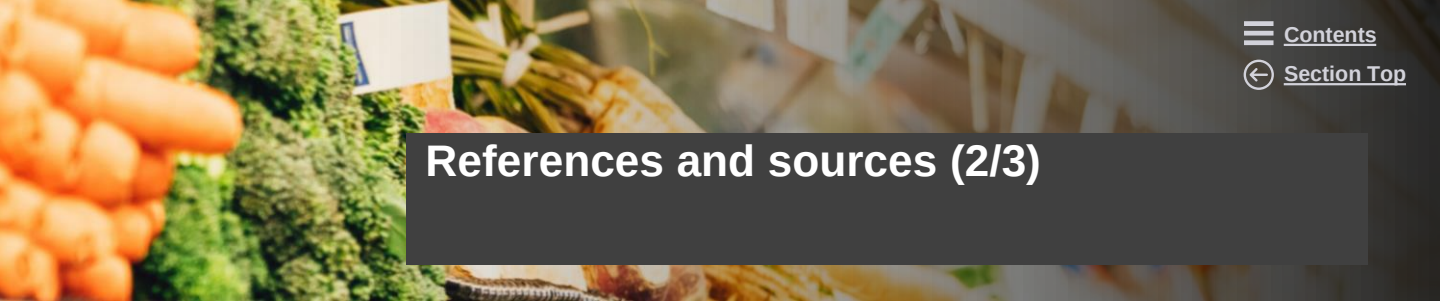

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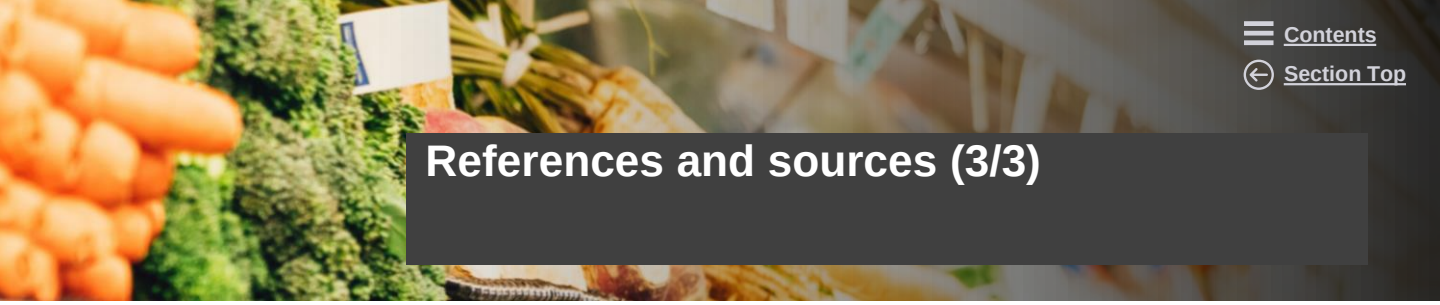

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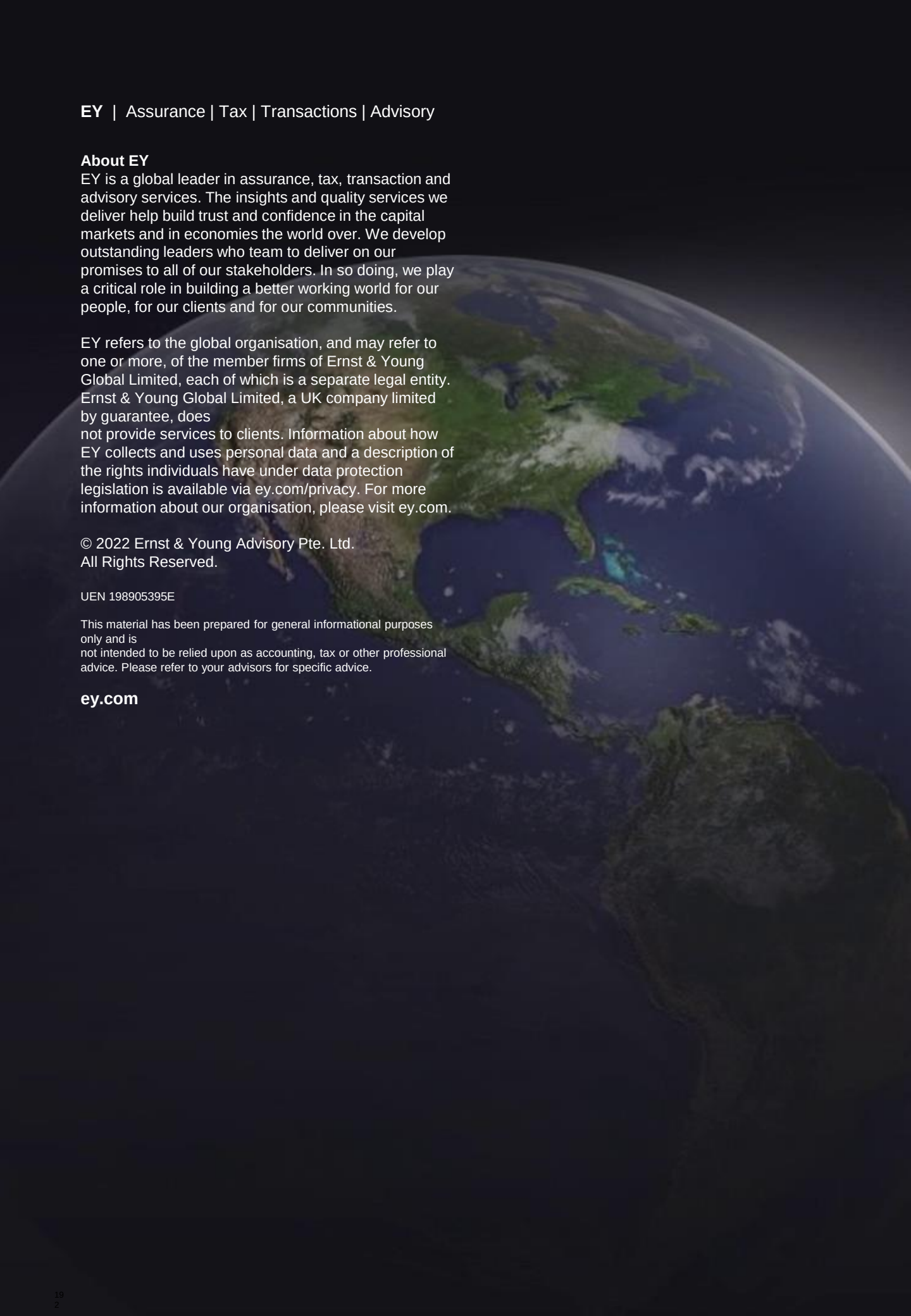

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