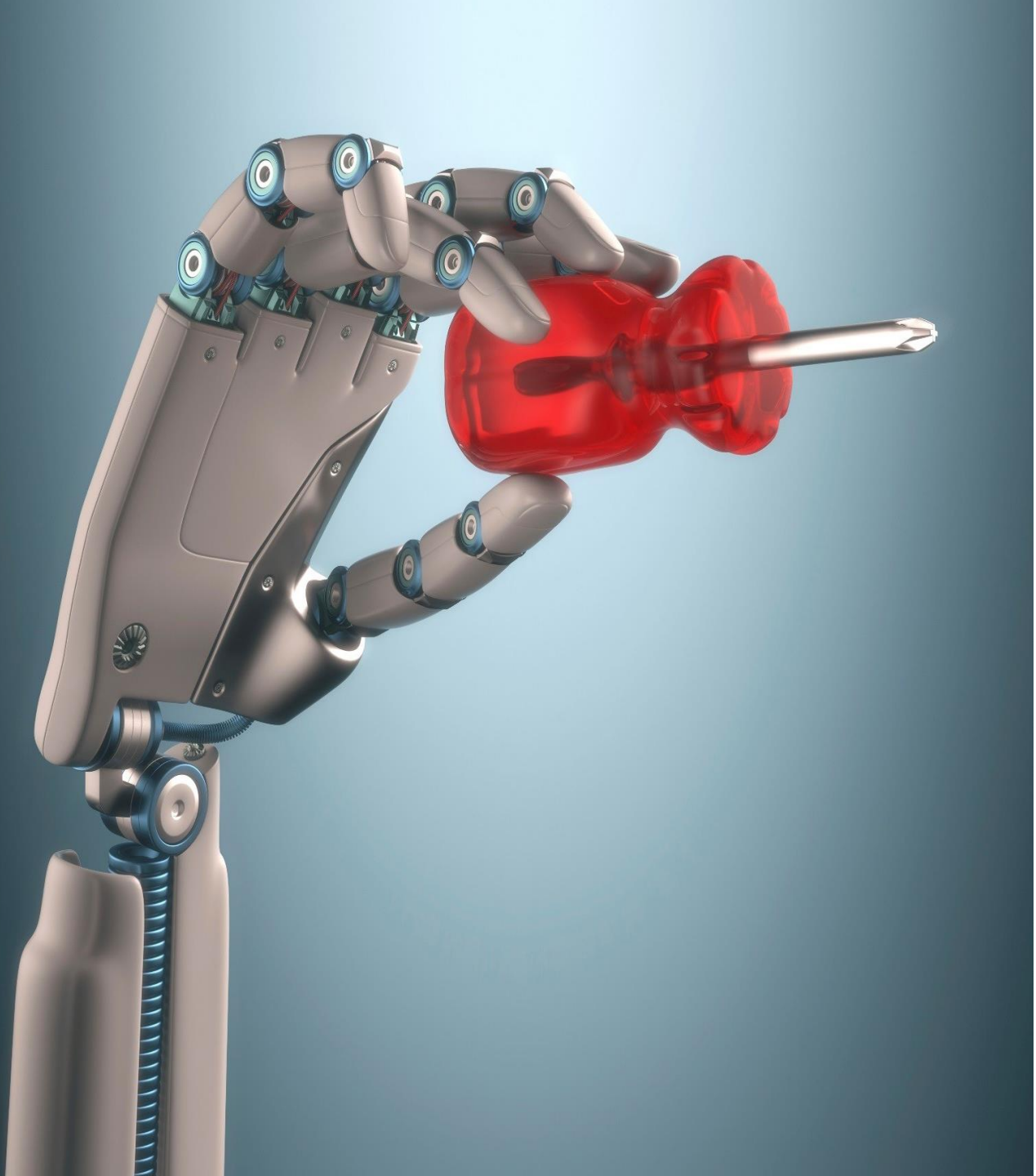




Study of the Impact of Industry 4.0 on Singapore's Logistics Workforce

Company Report
June 2020



Preface

Ernst & Young Singapore (EY) was commissioned by the Singapore Economic Development Board (EDB), in collaboration with Enterprise Singapore (ESG), SkillsFuture Singapore (SSG) and Workforce Singapore (WSG) to conduct a Study on the Impact of Industry 4.0 on Singapore's Logistics Workforce.

Globally, the logistics sector is evolving rapidly amidst economic, regulatory and technological advancements. These global disruptions have a cascading effect on the logistics sector in Singapore. This study focused on one such major driver of change i.e. industry 4.0 (I4.0). Specifically, the study aimed to assess the impact of industry 4.0 adoption on the logistics workforce. Using the Skills Framework for Logistics as a starting point, the study sought to gain a better understanding of the extent to which job roles will be impacted and how job tasks and skills will change. We also identified new employment opportunities being created in the sector as a result of I4.0 adoption. An analysis of the manpower capability-building ecosystem helped us to provide a holistic view of interventions available today to build the required talent capability to ensure workforce competitiveness and future-readiness amidst the constantly evolving sector landscape.

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A note on the methodology and findings

In this study, **a company's adoption of industry I4.0 is considered to be the primary source of impact on job roles and skills**. While companies that adopt the thirteen I4.0 technology solutions defined in section 2 may expect the impact on job roles and skills to be as outlined in this report, there are certain factors which may overstate or understate this impact assessment.

This study, however, has been calibrated to provide a sector-wide view of technology trends and impact on job roles and skills by aggregating insights from multiple stakeholders with diverse profiles and perspectives. The findings need to be interpreted by individual companies and contextualised to their business operations.

Firstly, this study acknowledges that the **journey and timeline to full technology adoption may be affected by a number of factors**.

- Factors within the control of companies include operating models, business plans, legacy processes, system infrastructure etc. The extent and pace of technology adoption will vary across companies depending on their technology strategies, size and scale of operations. Certain

companies may choose to move at par with or even beyond sector pace, some may choose to be fast followers, while others may adopt a wait-and-see approach.

- Other factors beyond the control of companies include, but are not limited to, customer preferences, technology commercialisation, technical feasibility, availability of proof of concepts, regulatory hurdles or other unforeseen circumstances.

Secondly, this study also acknowledges that **the actual impact on job roles and skills as experienced by existing staff may be attenuated or amplified depending on various factors**.

- Some companies, especially small, medium enterprises, may choose not to build the I4.0 capabilities in-house. As such the I4.0 job roles and talent capabilities may be outsourced or hired on contract-basis, thus minimising the impact on existing staff.
- Depending on their people and talent strategies, the potential outcomes for impacted job roles e.g. displacement, redesign, redeployment or relocation, and thus the impact on skills may be different across different companies.

Abbreviations

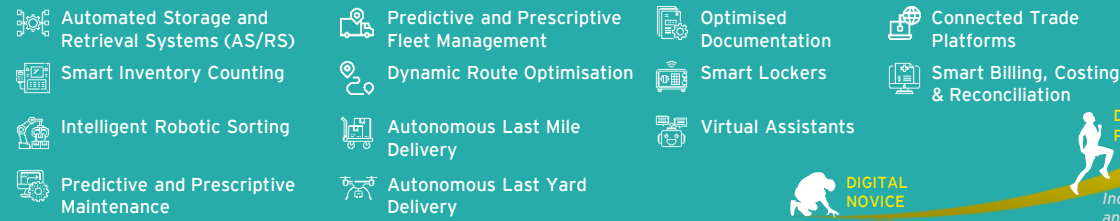
Abbreviation	Term	Abbreviation	Term	Abbreviation	Term
AI	Artificial Intelligence	ICR	Intelligent Character Recognition	PME	Professionals, Managers and Executives
AS/RS	Automated Storage and Retrieval System	ICT	Information and Communication Technology	RFID	Radio Frequency Identification
AV	Autonomous Vehicles	IHCI	Industry 4.0 Human Capital Initiative	ROE	Return on Equity
CAGR	Compound Annual Growth Rate	IMDA	Infocomm Media Development Authority	ROI	Return on Investment
CCN	Cargo Community Network	IoT	Internet of Things	RPA	Robotic Process Automation
CTP	Connected Trade Platform	IP	Intellectual Property	SCALA	Supply Chain and Logistics Academy
DRC	Dependency Ratio Ceiling	L&D	Learning and Development	SCT	Sector Coordination Team
e2i	Employment and Employability Institute	LLE	Large Local Enterprise	SFw	Skills Framework
EDB	Economic Development Board	MHE	Material Handling Equipment	SME	Small and Medium Enterprise
ESG	Enterprise Singapore	ML	Machine Learning	SNEF	Singapore National Employers Federation
ETA	Estimated Time of Arrival	MNC	Multinational Corporation	SSG	SkillsFuture Singapore
EY	Ernst & Young Singapore	MOE	Ministry of Education	TAC	Trade Associations & Chambers
FTE	Full Time Employee	MOM	Ministry of Manpower	UAV	Unmanned Aerial Vehicles
HMIS	Hazardous Materials Identification System	NLP	Neuro-Linguistic Programming	UI/UX	User Interface/ User Experience
HSE	Health, Safety and Environment	OCR	Optical Character Recognition	WMS	Warehouse Management System
I4.0	Industry 4.0	OJT	On-the-job Training	WSG	Workforce Singapore

INDUSTRY 4.0 LOGISTICS WORKFORCE

impact on the

I4.0 has the potential to create a vibrant logistics sector for Singapore. A two-fold approach to build I4.0 and workforce capabilities simultaneously will be the most effective way forward to prepare the sector for the future of work.

I4.0 TECHNOLOGY SOLUTIONS STACK



- Drives productivity gains and higher business outputs
- Creates new, high-paying employment opportunities
- Transforms job roles from laborious to high value-adding
- Attracts and retains new and diverse demographics

I4.0 brings the promise of an attractive logistics sector

NEW I4.0 job roles

Data analysis and management roles



- Data Analyst
- Data Scientist
- Data Architect/Engineer

Software development roles



- Software Developer
- Mobile Developer
- Software Engineer
- Solution/Application Architect
- UI/UX Designer

Digitalisation and automation roles



- Digital Innovation Lead
- Machine Learning Engineer
- Automation Engineer
- I4.0 Maintenance Specialist; ASRS/Drone/AGV Operator; Automation Technician

I4.0 adoption will create new, high-paying I4.0 job roles, typically in PME job roles, although the demand is still emerging

IMPACT OF I4.0 on existing job roles

With I4.0 adoption, ALL job roles will undergo change

Within 3 to 5 years, out of the 56 job roles...



11 job roles will experience a **HIGH** degree of change in job tasks
7 will undergo **displacement**
4 will require **major redesign**



19 job roles will experience a **MEDIUM** degree of change in job tasks, and will require **redesign**



26 job roles will experience a **LOW** degree of change in job tasks and will **change incrementally**. 11 of these are already I4.0 in nature

7 job roles that will UNDERGO DISPLACEMENT

- MHE Operator / Forklift Operator / Warehouse/Inventory Assistant
- Warehouse Storekeeper / Inventory Coordinator / Logistics Coordinator
- Traffic/Dispatch Coordinator
- Import Export Administrative Assistant / Shipping Assistant
- Permit/Shipping/Custom Clearance Coordinator
- Order Fulfilment/Sales Operations/ Customer Service Assistant
- Order Fulfilment/Sales Operations/ Customer Service Coordinator

IMPACT OF I4.0 on job tasks

Job roles will evolve to focus on high value-adding tasks



I4.0 will **AUTOMATE** transactional tasks

- Manual, labour-intensive, repetitive, routine
- Administrative, scheduling, coordinating
- Inventory and order tracking, basic customer support, progress-tracking



I4.0 will **AUGMENT** job roles with new value-adding tasks

- Overseeing and managing I4.0 solutions
- Except handling and troubleshooting
- Data analytics, stakeholder management



I4.0 will **SUPPLEMENT** the performance of strategic or 'human' tasks

- Strategic planning and business advisory
- Logistics solutioning and innovation
- Risk, safety and compliance management

IMPACT OF I4.0 on skills

There will be a shift in the mix of technical, I4.0, business, and foundational skills



LOW-ORDER TECHNICAL SKILLS



Deep technical & cross-functional expertise

Demanding...

INDUSTRY 4.0 SKILLS



High data and technology quotient

BUSINESS SKILLS



Multi-disciplinary expertise for business advisory

FOUNDATIONAL SKILLS



Adaptability, agility and cultural sensitivity

SAFEGUARDING workers

Strategies to safeguard employment and employability

Job Redesign
to alter job tasks or the way work is performed

Redeployment
to different jobs in the same or different function

Relocation
to similar jobs at different locations or work sites

Upskilling and reskilling
to mitigate the shortened shelf-life of skills

4-STEP ROADMAP FOR COMPANIES

Step 1: EMBARK ON DIGITAL TRANSFORMATION

Adopt a purpose-led approach to digitalisation using I4.0 technologies

Step 2: ASSESS IMPACT ON JOB ROLES AND SKILLS

Assess the impact of I4.0 on your workforce based on technology solutions implemented and their maturity levels

Step 3: DEVISE TALENT MANAGEMENT STRATEGIES

Use innovative strategies to mitigate the impact of I4.0 on employees and prepare them to be future-ready

Step 4: GARNER ECOSYSTEM SUPPORT

Leverage the manpower capability-building ecosystem to prepare individuals to adapt and thrive in an evolving sector

IN BRIEF: Impact of Industry 4.0 on Singapore's Logistics Workforce

In this study, we assess the impact of industry 4.0 (I4.0) adoption on Singapore's logistics workforce. While it is hard to predict exactly how this will play out, our research provides insights into the likely workforce impact that may be expected and its implications for the sector. Our key findings:

- **I4.0 technologies** will generate tremendous benefits for users, businesses and the logistics sector, lifting productivity and economic growth. The business dynamism and sector growth that these technologies could bring are compelling. Hence, a two-fold approach to build I4.0 and workforce capabilities simultaneously is the most effective way forward for sector transformation.
- Companies have much to gain through early adoption of I4.0, from increased business performance to improved customer experience to enhanced competitive advantage. As businesses evolve and undergo digital transformations, they will be the first to experience the workforce impact. Companies can leverage a **four-step roadmap** to embrace I4.0, while simultaneously preparing their workforce for the future: (1) embark on digital transformation, (2) assess impact on job roles and skills, (3) devise talent management strategies, and (4) garner ecosystem support.

- In Singapore, while I4.0 technologies typically manifest as **13 I4.0 technology solutions** implemented across the different logistics functions, companies are at different stages in their digitalisation journeys.
- Technology adoption has spurred the **emergence of new job roles i.e. I4.0 job roles** in the logistics sector which include data analysis and data management job roles, software development job roles, and digitalisation and automation job roles. These new I4.0 job roles are typically PME roles with a high earning potential. However, the demand for these jobs in logistics companies is still emerging. As the I4.0 maturity levels increase, companies will start to build dedicated in-house teams and full-time I4.0 roles to drive tighter integration between technology and operations. This will lead to a higher future demand for the new I4.0 job roles, and hence new employment opportunities in the sector.
- Assuming steady-state adoption of I4.0 technology solutions, **all logistics job roles will undergo change**. The extent to which I4.0 will impact job roles depends on the pace of I4.0 adoption and the type of I4.0 technology solutions implemented. Our findings suggest that, out of the 56 job roles in the Skills

Framework for Logistics, ~20% of the job roles will experience a high degree of change in job tasks leading to their displacement or major redesign, ~34% will experience a medium degree of change in job tasks leading to their redesign, while other job roles will change incrementally.

- A bottom-up impact assessment reveals a rich mosaic of **potential shifts in job tasks**. I4.0 will automate transactional tasks, augment roles with new value-adding tasks, and supplement the performance of strategic tasks leading to productivity gains. Such higher value-adding job roles will provide new and enhanced employment opportunities for workers, enabling them to move up the company hierarchy.
- As job roles evolve, employees will need to build **new skills and capabilities** to maximise their contributions in a technologically-rich work environment. There will be a gradual shift in the mix of technical skills, industry 4.0 skills, business skills and foundational skills required from a talent perspective. The new and enhanced job roles will require upskilling on industry 4.0 skills i.e. data, digital and technology skills. The result is **higher-skilled, higher-paying jobs which are more attractive to the local talent**.


IN BRIEF: Impact of Industry 4.0 on Singapore's Logistics Workforce

- I4.0 adoption and its impact on job roles and skills will lead to a downstream impact on job holders. In such a dynamic environment, companies need to think about how they can meet their talent requirements to fulfill business goals. A **holistic talent management ecosystem** will enable companies to not only mitigate the impact of I4.0 on employees, but also prepare them to be future-ready.
- Companies will need to adopt **best practices in talent development** to establish a continuous, dynamic approach to learning to mitigate the shortened shelf-life of skills. This may be done by investing in building the right skills for the future, leveraging relevant interventions and training programmes, and using hybrid approaches for holistic talent development.
- While technology adoption has potential benefits in reducing labour cost for logistics companies, there are benefits to be gained by retaining existing employees. Companies can use various **talent retention strategies** such as job redesign, redeployment and relocation of staff to new jobs or work sites, and culture and change management. This will enable existing staff to continue to deliver greater value for the business.
- Furthermore, in response to the changing talent needs in light of I4.0 adoption, logistics companies can employ innovative **talent recruitment strategies** to address any talent gaps. Setting up strategic partnerships and recruiting alliances, using scientific approaches to recruitment, and tapping into non-traditional demographics such as older workers, women and gig workers will give companies an edge in recruiting the right talent.
- As companies examine the impact of I4.0 adoption on their workforce, **two workforce groups will require special attention**: (1) workers in job roles that will undergo displacement or be redesigned, and (2) older workers. Initiative such as job redesign, redeployment, and retraining will help companies to safeguard the employment and employability of these logistics workers, thus ensuring their longevity in the sector.
- In order to support these technology and workforce transitions, Singapore has an expansive **manpower capability-building ecosystem** of interventions, grants and training programmes. Companies can garner support from various ecosystem stakeholders, and leverage relevant interventions, grants and training programmes to build technology and workforce capabilities for the future.
- Each company's digital transformation journey is unique. Going forward, companies will need to first identify their current I4.0 maturity stage. The next steps and future focus will be determined based on whether the company is a **Digital Novice, a Digital Player or a Digital Leader**. The jobs and skills impact assessment, talent management strategies and ecosystem support will need to be tailored based on the company archetype.
- It is evident that a fair amount of time will be spent on assessing technology needs, future-proofing the workforce and garnering ecosystem support. Hence, it will be **critical for business leaders to quickly start assessing their needs**, as the technology and workforce transformation journey will take at least 18 to 24 months to see any results.

1 OVERVIEW



Introduction



*The objective of this study is to assess the impact of industry 4.0 (I4.0) on Singapore's logistics workforce, with a focus on **envisioning future jobs and skills**, so as to build an ecosystem that nurtures a **future-ready and competitive workforce** equipped with the **right skills** to thrive in a constantly evolving environment.*

Globally, companies are shifting focus to **'purpose-led' technology transformations** to address their strategic priorities and gain competitive advantage. Amidst global disruptions in the industry 4.0 (I4.0) technology landscape, logistics companies in Singapore are gradually leveraging the potential of technology to meet their strategic priorities.

As companies embark on their digitalisation journeys, there is a need to assess and manage the impact on jobs, skills and the workforce at large. In this study, we sought to understand the impact of I4.0 adoption on the logistics workforce, with a focus on envisioning future jobs and skills.

To meet this objective, we leveraged primary and secondary research sources, and worked closely with the sector over six months to examine the impact of the 13 I4.0 technology solutions on the logistics workforce, and specifically on the 56 job roles defined in the Skills Framework for Logistics¹.

In this report, we provide a view of the local I4.0 technology landscape and typical company archetypes based on I4.0 maturity in section 2. We further provide a roadmap for logistics companies to embrace I4.0 and prepare their workforce to be future-ready through a four-step approach. Section 3 describes the expected impact of I4.0 adoption on job roles and skills in the sector. In section 4, we describe typical talent management strategies and best practices that may be used by companies to prepare their employees to be future-ready. Finally, section 5 describes the manpower capability-building interventions, grants and training programmes which may be leveraged to build technology and workforce capabilities for the future.

The global and local logistics technology landscapes are evolving

Globally, the top **three strategic themes impacting markets** and driving the need for logistics companies to invest in emerging technologies include (1) customer-centricity, (2) the need to build agile and resilient supply chains, and (3) dynamic venturing to innovate and pivot continuously to sustain in a sector where non-traditional players are entering traditional markets. Technology investments have the potential to enhance business and process performance, improve customer experience and drive greater collaboration with partners across the logistics value chain.

Amidst global disruptions in the industry 4.0 (I4.0) technology landscape, logistics companies in Singapore are gradually leveraging the potential of technology to meet their strategic priorities. These I4.0 technologies typically manifest as **thirteen I4.0 technology solutions** implemented across warehousing, transportation, freight forwarding, and sales and customer service functions.

On taking a closer look, we see a **phased approach to I4.0 adoption locally, a large focus today being on human-machine collaboration** with a gradual move towards completely autonomous operations.

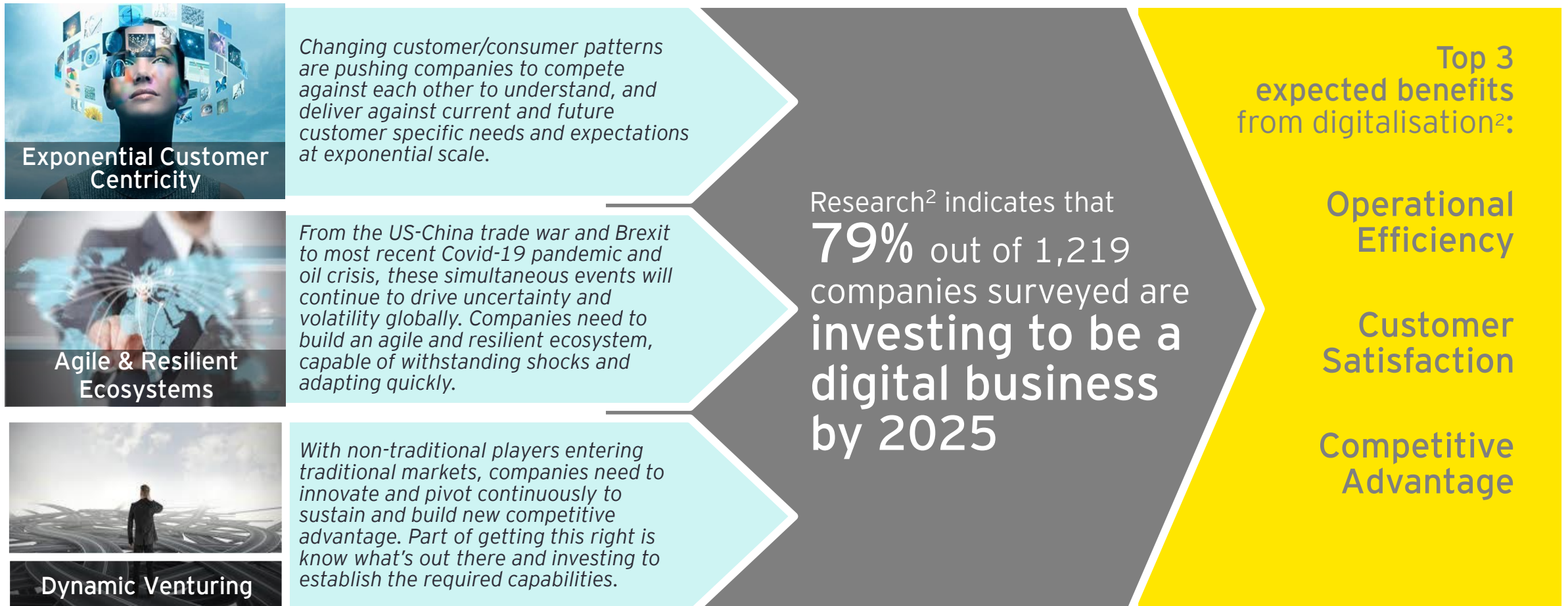
The typical digitalisation journey for companies is determined by their I4.0 technology investment decisions. Our findings suggest that typically, the small-medium enterprises (SMEs) in Singapore are currently at the initial stages of digitalisation, with a large focus being on preparation of the requisite data and systems infrastructure to enable them to deploy more advanced and sophisticated I4.0 solutions in the future. The large local enterprises (LLEs) and multinational corporations (MNCs) are typically at more advanced stages, but this stage of digital maturity may also vary for different I4.0 solutions. The technology investment decisions made by companies set the tone for the remaining narrative when it comes to assessing the impact on their workforce.

*Logistics is on the cusp of technological change. New solutions could transform nearly every sector, from **driverless trucks to automated warehouses to blockchain-enabled collaboration**, although some of these developments are years away.*

Source: Council of Supply Chain Management Professionals (CSCMP) 'Annual State of Logistics Report' - 2019

Three strategic themes are driving the need for companies to invest in digitalisation

There are three key strategic themes impacting markets and **driving the need for companies to embrace emerging technologies**¹. Embarking upon purpose-led digitalisation transformations will help companies to overcome global and local sector disruptions and maintain competitive advantage. These transformations and technology investments **create business value** such as enhanced business and process performance, improved customer experience and greater collaboration with partners across the logistics value chain.



14.0 technologies have tremendous benefits to offer to the logistics sector

14.0 technologies have tremendous benefits to offer to users, businesses and the logistics sector, and the business dynamism and sector growth that they could bring are compelling.

14.0 has tremendous potential to drive productivity improvements and higher outputs, thus enhancing the sector's **ability to accommodate increasingly higher demands** in the region. 14.0 has the potential to enhance business and process performance, improve customer experience and drive greater collaboration with partners across the logistics value chain.

In addition, 14.0 brings the **promise of an attractive logistics sector** for the current and future workforce. This not only ensures that fresh graduates and mid-careerists will be motivated to join the sector, but also helps to contain potential talent leakage from the sector.

- 14.0 adoption and subsequent job redesign efforts will **transform the laborious, dangerous and boring logistics jobs** into higher value-adding jobs, allowing current job holders to move up the logistics value chain. Increased job scopes, enhanced responsibilities and higher skill requirements could translate to **better wages** for these jobs.
- Increased 14.0 adoption will give rise to **new, higher-paying employment opportunities** in the form of 14.0 job roles. This results from the historical trend, that as the 14.0 maturity of companies increases, they build dedicated in-house teams and full-time roles to drive tighter integration between technology and operations.

- Additionally, 14.0 adoption has the potential to attract and retain **new and diverse demographics** such as women, older workers and gig workers. This provides leeway to employers to find and select the right people with the right skills, as well as diversify potential talent risks.

Faced with the impact of 14.0 adoption on job roles and skills, one reaction could be to try to slow down the pace and scope of adoption in an attempt to preserve the status quo. While this may limit the workforce transitions to some extent, it would also affect the contributions that 14.0 technologies make to sector growth, and hence limit efforts to uplift the logistics sector in Singapore. This may lead to a downstream impact on sector attractiveness, thus creating manpower supply challenges.

Hence, the recommendations in this report suggest embracing 14.0 technologies, while simultaneously addressing the workforce impact and talent challenges they bring, for overall sector transformation.

A two-fold approach to build industry 4.0 and workforce capabilities simultaneously will be the most effective way forward for the logistics sector.

Companies have much to gain through early adoption of I4.0, from increased business performance to improved customer experience to enhanced competitive advantage. As businesses evolve and undergo digital transformations, they will be the first to experience the workforce transitions. This will require them to closely assess the impact on their current ways of working and workforce needs. It is in their self-interest to re-evaluate their talent strategies, carefully considering how talent development, retention and recruitment is done to build the requisite people capability and also to prepare workers for a new world of work.

While embracing I4.0 and building best-in-class HR practices is in the self-interest of companies as it will help them to build strong employer brands, the combined effect will help to enhance sector attractiveness at the national level.

In this report, we present a four-step roadmap (see [Exhibit E1](#)) for logistics companies to embrace I4.0, while simultaneously preparing their workforce for the future.

STEP 1: EMBARK ON DIGITAL TRANSFORMATION: Adopt a purpose-led approach to digitalisation using I4.0 technologies. For progressing in your I4.0 journey, the first step will be to identify your current I4.0 maturity level. The next steps and future focus will be determined based on whether your company is a Digital Novice, a Digital Player or a Digital Leader.

[Click here](#) for more information on the logistics I4.0 landscape

STEP 2: ASSESS IMPACT ON JOB ROLES AND SKILLS: Assess the impact of I4.0 on job roles and skills in your company based on the I4.0 technology solutions implemented and their maturity levels.

- [Click here](#) for a sector-wide view of impact on job roles and skills
- [Click here](#) for reference to typical future views of job roles and skills

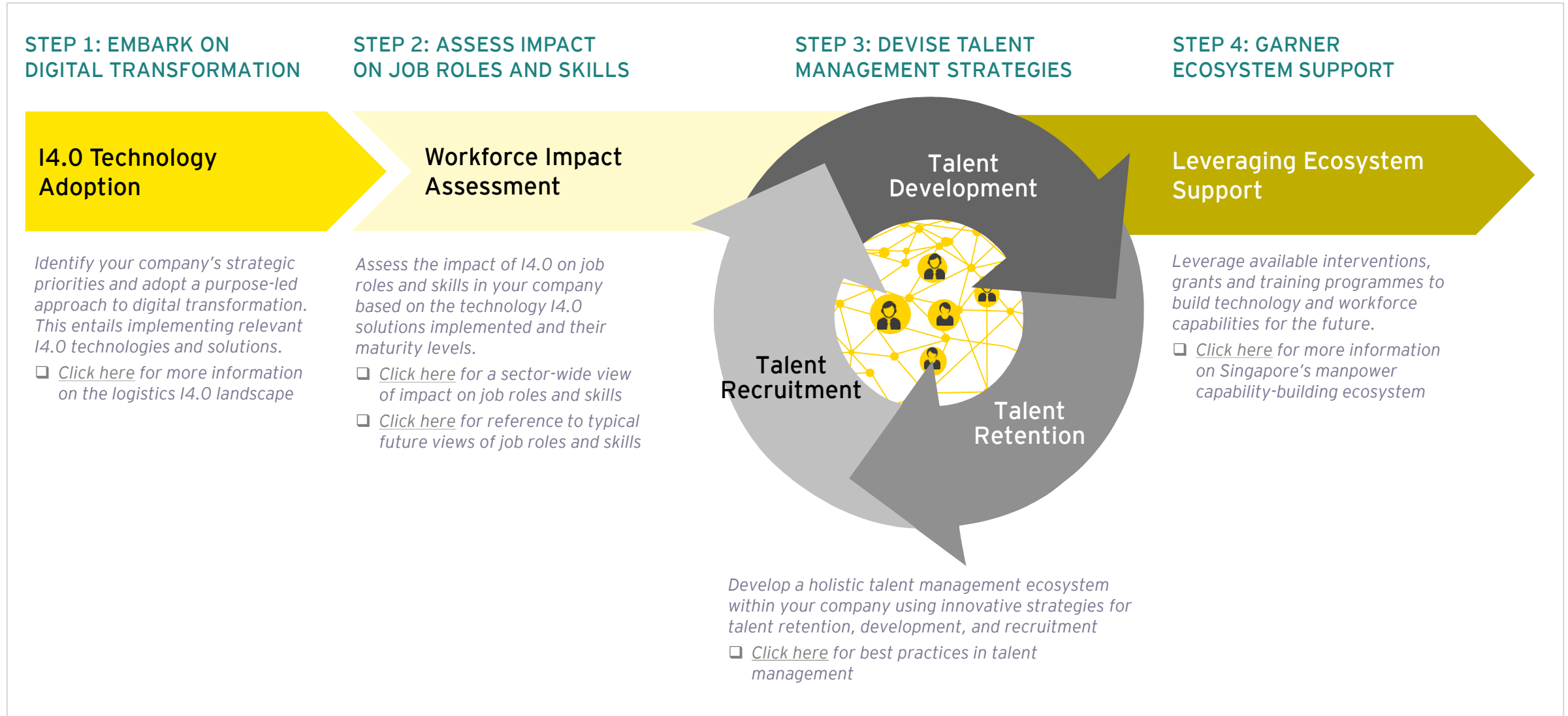
STEP 3: DEVISE TALENT MANAGEMENT STRATEGIES: Develop a holistic talent management ecosystem within your company using innovative strategies for talent retention, development, and recruitment. This will not only enable your company to mitigate the downstream impact of I4.0 on employees, but also to prepare employees to be future-ready.

[Click here](#) for best practices in talent management

STEP 4: GARNER ECOSYSTEM SUPPORT: Throughout the journey, it is important to remember that Singapore has an expansive technology and manpower capability-building ecosystem. It is useful to tap on the support from various ecosystem stakeholders, and leverage relevant interventions, grants and training programmes to build technology and workforce capabilities for the future.

[Click here](#) for more information on Singapore's manpower capability-building ecosystem

Exhibit E1: Roadmap for logistics companies to embrace i4.0 and prepare their workforce to be future-ready



LOGISTICS 4.0 LANDSCAPE



There are six I4.0 technology enablers underlying the digitalisation journey

Amidst global technological disruptions, **logistics companies are leveraging industry 4.0 (I4.0) technology solutions** to embark upon purpose-led digitalisation transformations. The I4.0 technology solutions are targeted business use cases which help companies to address specific business problems. A virtual assistant/chatbot is an example of such an I4.0 solution enabling companies to provide round-the-clock support to customers. Underlying these I4.0 solutions are six key, foundational **I4.0 technology enablers**. A chatbot, for instance, will be developed using AI/ML and robotics process automation technology enablers. Across most popular logistics I4.0 technology solutions available today, the foundational I4.0 technology enablers are as depicted below.



Artificial Intelligence (AI) / Machine Learning (ML)

AI/ML is a label given to computing systems that interact in ways that seem natural to humans and learn from those interactions. Other labels and technologies that are used synonymously include smart machines and cognitive computing.



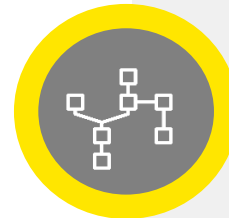
Augmented reality (AR) / Virtual Reality (VR)

AR superimposes a computer-generated image on a user's view of the real world and also allows them to interact with the virtual images. VR refers to a computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special equipment.



Big Data Analytics

Data analytics involves the autonomous or semi-autonomous examination of data or content using sophisticated techniques and tools, typically beyond those of traditional business intelligence, to discover deeper insights, make predictions, or generate recommendations.



Blockchain

Enables secure, tamper-proof digital records technology that will alter the architecture of workflows and ledger-based transactions, inspiring new models. Provides an innovative way to distribute, share and protect information that underlies the infrastructure for IoT networks and other market transactions.



Internet of Things (IoT) & Cloud

IoT allows objects to be sensed and controlled remotely across existing network infrastructure, allowing for direct integration of the physical world into computer-based systems. Cloud enhances this connectivity by providing a scaled, shared IT platform primarily for data storage and computing capabilities.



Robotics & Automation Technologies

The rules-based robotisation of manual tasks and processes is a frequent first step in the automation journey. It enables companies to automate laborious manual tasks and high-volume repetitive tasks or complex data handling actions.

Companies typically go through four stages in their I4.0 digitalisation journey

As companies decide to implement I4.0 technology solutions to drive specific business goals and outcomes, they need to ensure that they have the right processes, systems, and data, software and hardware infrastructures in place. This involves, as a first step, setting up and integrating legacy systems (non-I4.0 technologies) e.g. warehouse management systems, enterprise resource planning systems etc. Subsequently, companies need to implement and set up relevant I4.0 technology enablers to support future implementation of sophisticated I4.0 technology solutions. As companies look to leverage the full potential of advanced I4.0 solutions, they will typically go through four stages in the digitalisation journey (see Exhibit E2).

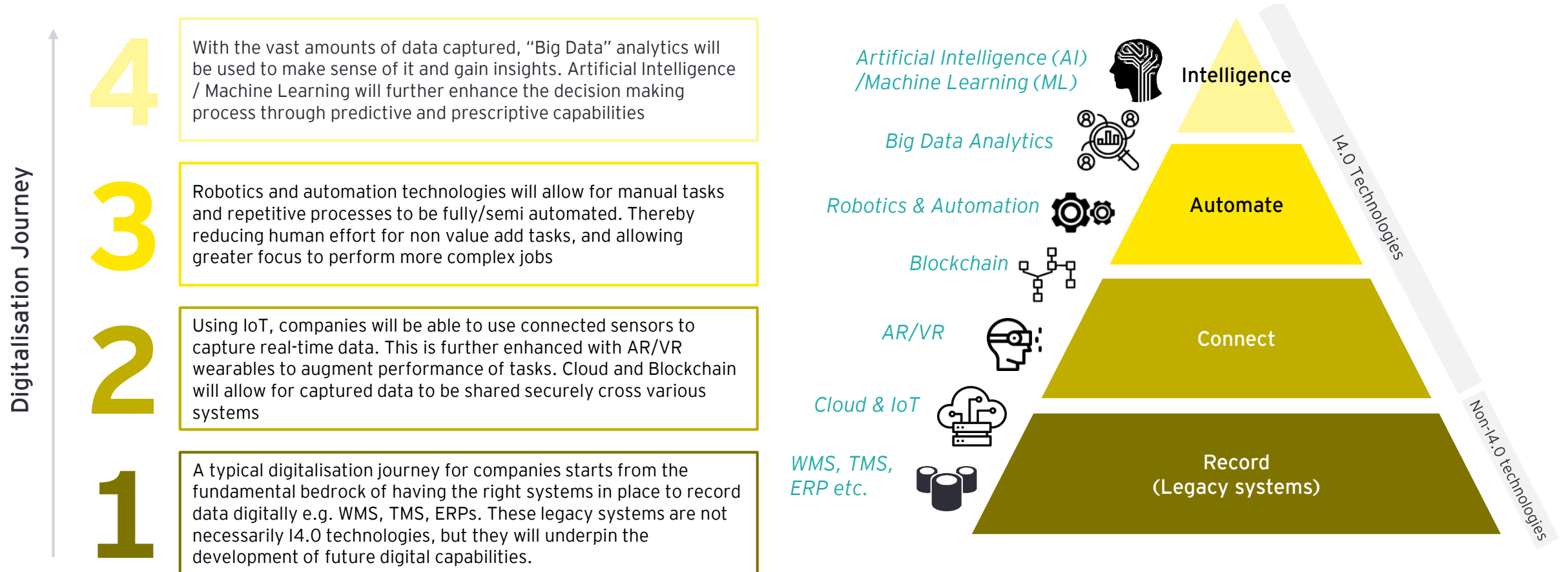
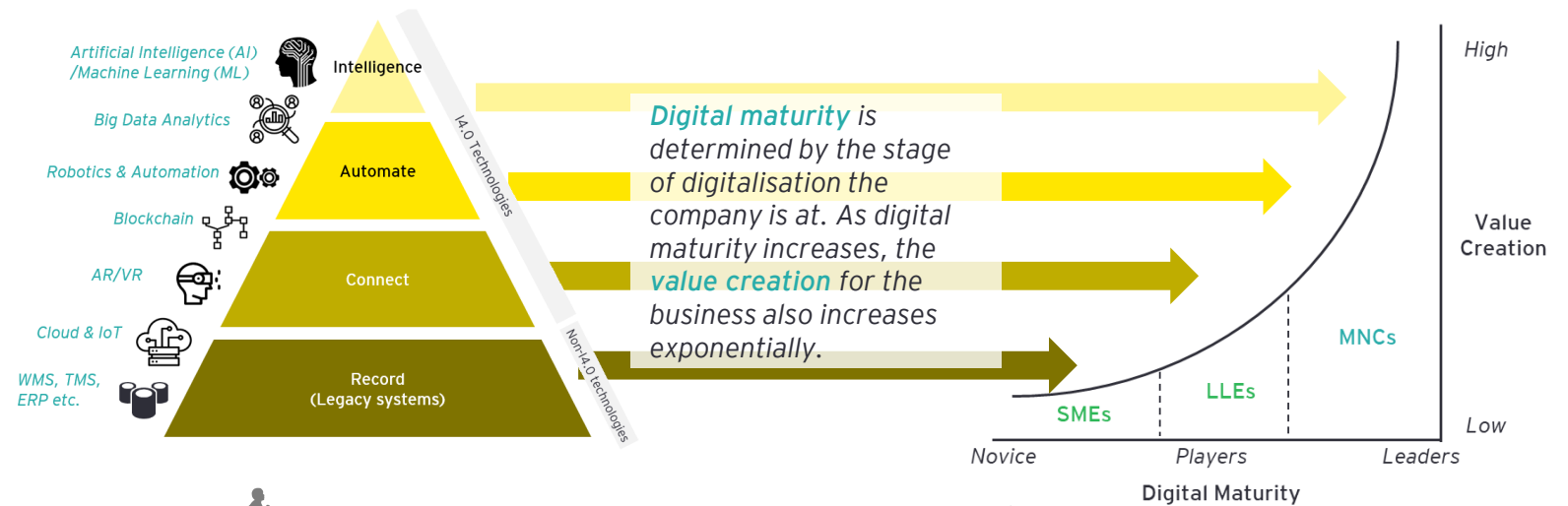




Exhibit E2: The industry 4.0 digitalisation journey

Higher I4.0 maturity will lead to better value creation for the business

Depending on the stage of digitalisation and digital maturity level, we identify three **company archetypes** i.e. Digital Novice, Digital Player and Digital Leader.

We define value creation in terms of business benefits derived from digitalisation. There is minimal value creation at the foundation or 'record' stage. The real value created is when real-time data and automation are leveraged to improve performance, productivity and drive proactive and timely decision making.



COMPANY ARCHETYPES	 Digital Novice	 Digital Player	 Digital Leader
	<p>The Digital Novice sets off at the 'record' stage where they seek to explore the value of technology to optimise their business. Generally, low economies of scale and limited resources do not justify return on investment (ROI) for sophisticated I4.0 solutions. Typically, their digital capabilities progress in pockets with focus on process re-engineering, legacy systems integration, and setting up data input mechanisms to capture data digitally. Operations at this stage are fairly manual and highly-dependent on human intervention.</p> <p>SMEs typically fall in this category due to limited availability of financial resources, technical expertise and/or digital leadership and vision. There is rarely a centralised function to plan and coordinate digital initiatives across the company.</p>	<p>The Digital Player is typically at the 'connect' or 'automate' stage and is actively leveraging point solutions and experimenting with proof of concept solutions for business value creation. I4.0 brings predefined business benefits and is justified by an attractive ROI on account of output, scale, financial resources, government support etc. The Digital Player has real-time data capture capabilities using IoT, cloud, blockchain etc., and uses automated processes and operations. There is still need for human oversight in the semi-autonomous processes and operations.</p> <p>LLEs and some MNCs fall in this category and usually have a centralised digital/technology function to plan and coordinate the deployment of I4.0 technology solutions across the company for better synergies.</p>	<p>The Digital Leader is typically at 'intelligence' or 'automate' stage, and has a strong technology strategy aligned and integrated with corporate vision and business strategy, and spearheaded by a strong leadership. Purpose-led I4.0 transformations drive exponential gains and competitive advantage. ROI is usually justified on account of large outputs, scale, government and global business support. Digital Leader has fully advanced I4.0 capabilities and integrated solutions leveraging big data and artificial intelligence for predictive and prescriptive capabilities. The focus is on research and development for future customised and innovative solutions to stay ahead of the curve.</p> <p>MNCs may fall in this category depending on their technology innovation capabilities. They generally have a centralised technology/digital function led by a CIO/CTO to strategise I4.0 investments globally.</p>

I4.0 technology solutions stack

As part of their I4.0 digitalisation journeys, logistics companies in Singapore are investing in specific technology solutions. We identified **13 industry 4.0 technology solutions defining the technology stack for this study - this forms the lens for us to assess the subsequent impact on job roles and skills**. These solutions are the business use cases or manifestations of underlying I4.0 technology enablers which help companies to address specific business problems.

These solutions were identified based on EY thought leadership and desktop research, insights from subject-matter-experts and interviews and focus group discussions (FGD) with sector practitioners. Defining the technology stack in terms of specific solutions enabled us to have targeted conversations with sector practitioners and understand the impact on job roles and skills in a more tangible manner.

For more details on the I4.0 technology solutions, see [Appendix I](#)

Our findings suggest that, logistics companies follow a **phased approach to implementing I4.0 technology solutions**. While current focus is largely on human-machine collaboration, there is a planned, gradual move towards completely autonomous operations. The companies are at different stages of this phased approach from:

- **proof of concept solutions** such as DHL's trailer & container unloading robot (Parcel Robot) to
- **point solutions** such as YCH's autonomous cycle-counting drone in warehouses, to
- **enterprise-wide integrated solutions** such as ParcelSanta's intelligent robotic sorting systems.



There are 13 logistics I4.0 technology solutions prevalent in Singapore

	14.0 technology solution	14.0 technology enablers	Description
Warehouse Management	Smart Inventory Counting	Unmanned Aerial Vehicles, Artificial Intelligence, Machine Learning, Big Data	Autonomous drones or robotics, coupled with advanced optical, RFID and barcoding sensor capabilities, that can automate inventory tracking, cycle-counting, stocktaking and inspections
	Picker to Parts & Parts to Picker Automated Storage and Retrieval Systems (AS/RS)	Advanced Robotics, Internet of Things	Intelligent robotics systems which can be configured to automate the storage and retrieval of products
	Intelligent Robotic Sorting	Artificial Intelligence, Machine Learning, Advanced Robotics, Big Data	Robots or autonomous guided vehicles, powered by computer vision, laser technology and machine learning, which can automate sorting operations for incoming or outgoing cargo
	Predictive & Prescriptive Maintenance	Internet of Things, Predictive Analytics, Machine Learning, Big Data	Application of artificial intelligence techniques to big data from IoT-enabled devices to predict impending failure of equipment, systems or facilities, and also prescribe recommended solutions
Transportation	Predictive Fleet Management	Internet of Things, Predictive Analytics, Machine Learning, Big Data	Application of artificial intelligence techniques to big data from IoT-enabled devices to predict impending failure of equipment or vehicles and, track and monitor fleet for efficient deployment and effective utilisation
	Dynamic Route Optimisation	Artificial Intelligence, Prescriptive Analytics, Machine Learning, Big Data	Application of artificial intelligence and prescriptive analytics for dynamic route planning and identifying the most optimal delivery route for cost effectiveness, timely delivery etc.
	Autonomous Last Mile Delivery	Autonomous Vehicles	Use of autonomous vehicles to perform last mile deliveries
	Autonomous Last Yard Delivery	Unmanned Aerial Vehicles	Use of drones to perform last yard and time critical deliveries
Freight Forwarding	Smart Billing, Costing & Reconciliation	Blockchain, Cybersecurity, Robotics Process Automation, Artificial Intelligence	Smart contracts or blockchain-based secure platforms which allow real-time access to shipment details, updates and bills to facilitate downstream billing, costing and reconciliation processes
	Connected Trade Platforms	Blockchain, Cloud Computing, Big Data, Cybersecurity	Blockchain-based secure systems which provide transparency and end-to-end visibility to all supply chain parties for better collaboration and improved sharing of information
Sales & Customer Service	Smart Lockers	Internet of Things	Storage solutions with technologies such as IoT, software robotics, computer vision, biometrics etc. allowing automated package notification and distribution for last-mile deliveries
	Round-the-clock customer service via Virtual Assistants	Artificial Intelligence, Machine Learning, Big Data	Chatbots equipped with self-learning algorithms that can address customers queries and offer templatised solutions
	Optimised Documentation	Artificial Intelligence, Machine Learning, Big Data, Computer Vision, Robotics Process Automation	Software robotics i.e. robotic process automation (RPA) and AI couple with OCR and computer vision which can automate data entry, data capture, data conversion and form processing tasks

The logistics I4.0 technology solutions drive better value creation for companies

Sector insights suggest that logistics companies are increasingly adopting these I4.0 technology solutions (see [Exhibit E3](#)) because they recognise that these solutions are instrumental in bringing about **countless value creation opportunities** as depicted below.

Enhanced business and process performance

I4.0 technology solutions have tremendous potential to drive performance and productivity enhancements. By 2025, AI is expected to create \$5 trillion of business value¹. **AS/RS, intelligent robotic sorting and optimised documentation** reduce both labour cost and time, thus improving the scalability of operations. **Smart inventory counting and dynamic route optimisation** lead to reduced human errors and operational bottlenecks.

Going forward, I4.0 solutions will play a critical role in throughput enhancement, resource allocation, cost optimisation and business continuity management.

Improved customer experience

With the rapid rise in e-commerce in Southeast Asia, I4.0 solutions, especially ones leveraging predictive analytics will play a key role in forecasting customer needs and delivering faster, on-demand and customised solutions. **Smart lockers** and **virtual assistants** provide flexibility and real-time visibility to customers.

Dynamic route optimisation and smart lockers not only improve order fulfillment processes, but also enhance customer experience. IoT-based solutions provide advanced track-and-trace capabilities and SKU-level monitoring for temperature-sensitive and dangerous goods.

Greater collaboration for value-adding partnerships

50 billion machines could be connected through technology by 2030². With rapid growth of the online B2B retail market, stakeholders value greater delivery speeds and transparency in the order process. **Smart billing, costing & reconciliation** and **connected trade platforms** enable end-to-end visibility, transparency and collaboration across the logistics value chain.

Logistics companies are exploring new business models and providing data-based value-added-services such as dynamic demand and capacity planning, risk mitigation, **predictive maintenance, predictive fleet management** etc. to upstream partners and customers.

Better environmental sustainability

By 2029, it will be unacceptable for a supply chain to create waste. This is being driven by consumer preferences but also by the investment community³. In the past two years, the logistics sector has made bold moves to reduce its carbon footprint for core activities like transportation and warehousing.

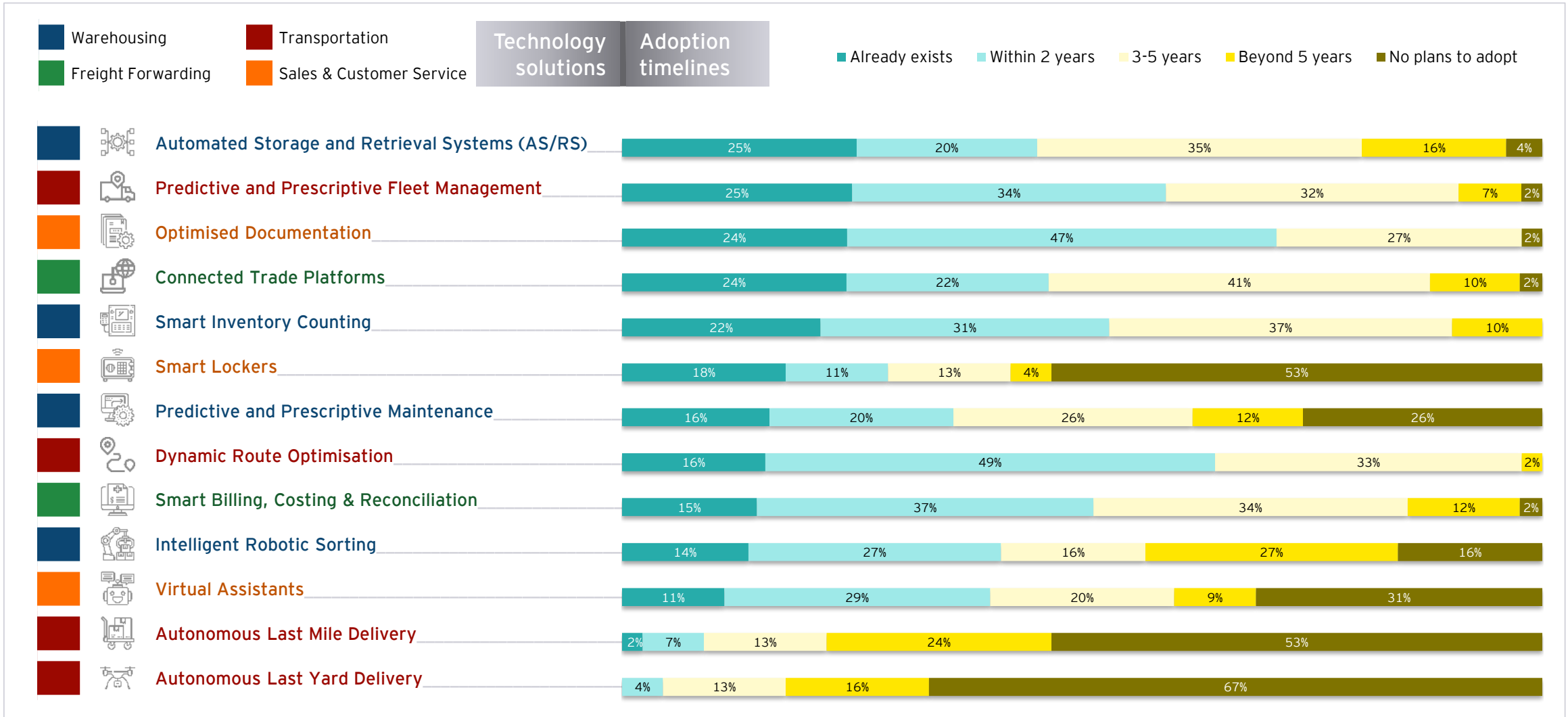
Predictive maintenance and fleet management and **dynamic route optimisation** allow for optimisation of sustainability parameters such as energy usage, vehicle fuel consumption and emissions. This enables businesses to minimise wastage and reduce carbon footprint of their operation.

Enhanced job and sector appeal for the workforce

Singapore's logistics sector is identified by sector experts as one that lacks appeal, especially for younger workers. This is partly attributed to the nature of work, which is predominantly manual labour intensive.

Increased utilisation of sophisticated technology solutions such as **AS/RS, smart inventory counting** and **intelligent robotic sorting** result in increased demand for a digitally-skilled workforce pursuing high-value-adding activities for higher-paying job roles. Going forward, this evolution in jobs and skills will enhance the overall value proposition for the Singaporean workforce

Exhibit E3: I4.0 technology solutions and their adoption timelines in Singapore

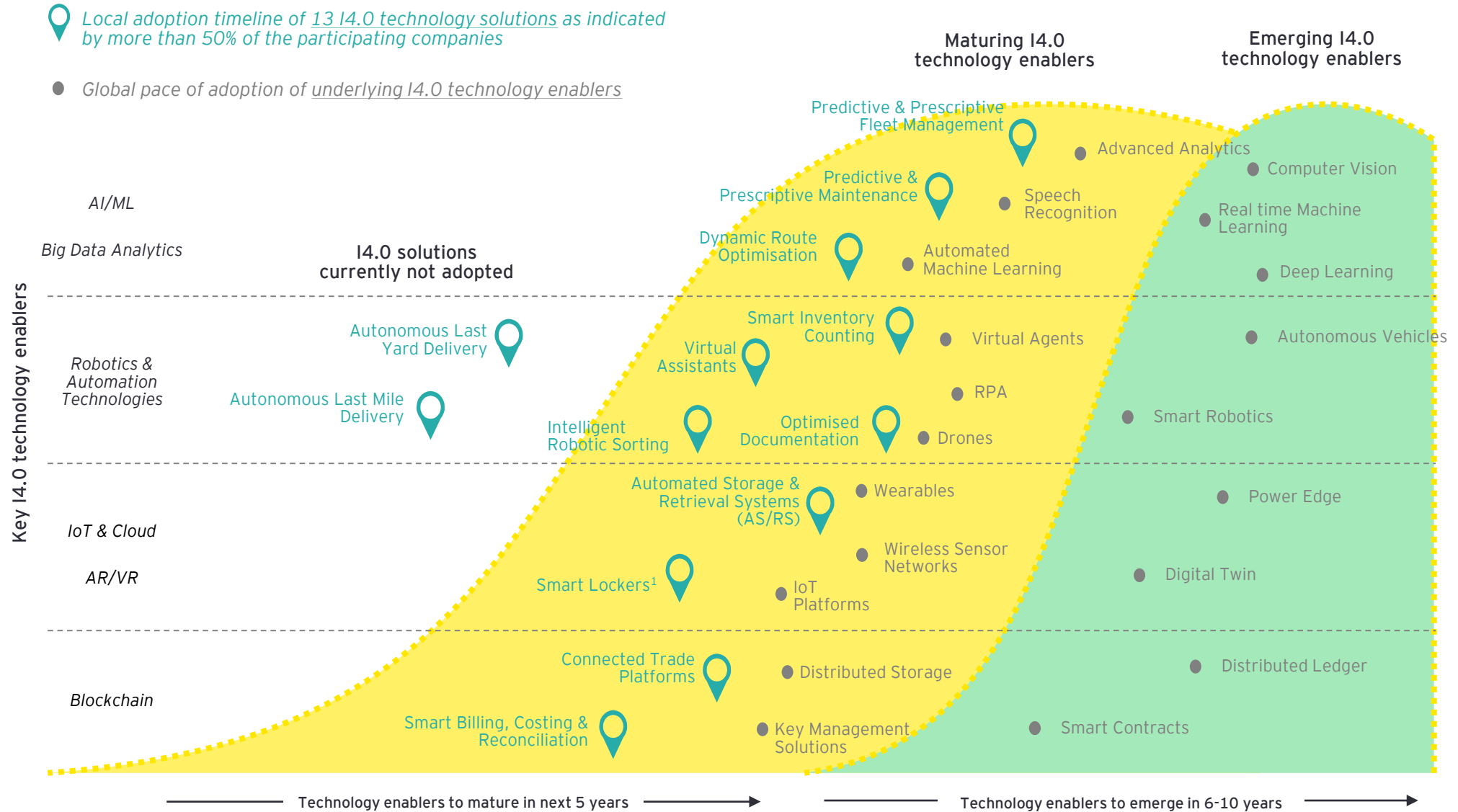


Source: Executive interviews and focus group discussions; number of respondents: 53

Local I4.0 adoption vis-à-vis global maturity levels of I4.0 technology enablers

Our analysis reveals that for logistics companies who have indicated their plans to adopt I4.0 technology solutions within the next 5 years, their pace of digitalisation is in line with the global pace of maturity of I4.0 technology enablers. As a next step, these companies may start to explore technology enablers expected to mature in the next 6-10 years.

For companies who are still in the initial stages of digitalisation, they may start by exploring the 13 logistics I4.0 technology solutions identified in this study.



JOBS AND SKILLS IMPACT

- 3.1 New I4.0 job roles in demand
- 3.2 Impact of I4.0 on job roles and skills



Overview of jobs and skills impact analysis

Globally, an estimated 49% of activities that people are paid to do today can potentially be automated by adapting current, demonstrated technologies¹. In order to holistically assess the impact of industry 4.0 technology solutions on job roles in the logistics sector in Singapore, the study utilised qualitative and quantitative techniques to answer three key questions.

1 What are the new employment opportunities in the logistics sector?

We interviewed employers in the logistics sector and mined data from online job postings locally and globally to understand hiring trends in the sector. This led to identification of **12 new industry 4.0 job roles which are rising in demand** as companies integrate industry 4.0 technology solutions with their operations. These industry 4.0 job roles in demand include:

- **Data analysis and data management roles**
- **Software development roles**
- **Digitalisation and automation roles**

Currently, these jobs constitute a small proportion of the workforce, but as companies implement I4.0 technologies, they are looking to hire more and more I4.0 talent in-house. Going forward, logistics companies can groom existing employees to take on these emerging employment opportunities, in addition to external hiring.

2 How will the job roles and skills evolve with adoption of I4.0 technology solutions?

The study used the Skills Framework for Logistics as a baseline for identifying 56 job roles across 6 functional tracks. Thereafter, insights from research, sector and subject-matter-experts were leveraged to form a robust view of the impact of I4.0 adoption on the workforce in terms of:

- **Potential outcomes for job roles i.e. undergo displacement, require redesign or change incrementally**
- **Degree of change in job tasks**
- **Future skills for evolving job roles**

Out of the 56 job roles, we identified 11 roles that will experience a high degree of change in job tasks - 7 of these roles will likely undergo displacement while 4 others will require major redesign. There is also a gradual shift in the mix of technical, industry 4.0, business and foundational skills required from a talent perspective.

New I4.0 job roles in demand

What are the new employment opportunities in the logistics sector?



The better the question. The better the answer.
The better the world works.

14.0 adoption has spurred the emergence of new 14.0 job roles

Technology adoption has spurred the emergence of 14.0 job roles in the logistics sector globally. We observe a similar trend in the logistics sector in Singapore - logistics companies that are implementing 14.0 technologies find the need to hire skills and talent capabilities that were not traditionally found in the logistics sector. **We refer to these new employment opportunities as industry 4.0 or 14.0 job roles.**

To identify these job roles, we tapped on insights from sector experts augmented by data from online job postings for 54 leading logistics companies across ~50 countries between Q1 2019 to Q1 2020. We present the 14.0 job roles under three categories depicting the natural job functions of these roles.

1. Data analysis and data management job roles

For digitalisation, companies need to ensure that they have a **robust data strategy and infrastructure** to build the requisite foundation for implementing more sophisticated 14.0 solutions. For example, solutions such as predictive and prescriptive maintenance, dynamic route optimisation, predictive fleet management, and virtual assistants depend on data-based learning algorithms to address specific business problems. As such, job roles such as Data Analyst, Data Scientist and Data Architect/Engineer are now sought after in the logistics sector (see [Exhibit E4](#) for a sample job dashboard). Typically, these job roles are responsible for preprocessing, modelling and analysing data, and application of data science methods, processes, algorithms and systems to extract knowledge and insights from structured and unstructured data.

From a skills perspective, individuals in existing job roles such as Logistics Data Specialist / Master Data Analyst / Master Data Executive have a higher potential to upgrade to data analysis and management job roles.

A global perspective...

Technology development and deployment will create additional employment

As technology development continues apace, the technology sector is expected to keep growing rapidly, and this in turn will create **incremental labour demand to develop and deploy technology.**

Higher global spending on technology products and services across sectors will create **demand for 20 to 46 million incremental workers globally by 2030.** They will be a mix of

- high-skill workers such as **software engineers, and electrical engineers** and
- medium-skill workers including **software developers and electronic technicians**

The demand for technology hardware and software will likely be served by China, Germany, India, the Netherlands, and the United States. More than half of all global technology jobs could be created in these five countries.

Source: 'Jobs Lost, Jobs Gained: Workforce Transitions In A Time Of Automation', McKinsey (2017)

I4.0 adoption has spurred the emergence of new I4.0 job roles

2. Software development job roles

Traditionally outsourced, these job roles are now being hired in-house by logistics companies, primarily to **drive tighter integration between technology, operations, and business and customer needs**. These job roles are typically responsible for developing bespoke software applications, integrating solutions with legacy systems, customising vendor products to meet business needs, and maintaining off-the-shelf software solutions. In addition to Software Developer, Software Engineer and Solution/ Application Architect, job roles such as UI/UX Designer and Mobile Developer are also gaining popularity with increased focus on end-user experience.

Individuals in existing job roles within the Logistics Information Systems functional track have greater chances of upgrading to these roles given the higher potential for skills transferability.

3. Digitalisation and automation job roles

As companies look to leverage technologies to enhance their operating models and tap on new revenue streams and value-producing opportunities, digitalisation and automation job roles are highly sought after. These job roles range from Digital Innovation Lead responsible for **strategising the company's technology roadmap** in line with business strategy, to Machine Learning Engineer and Automation Engineer responsible for **software and hardware automation solutions**, to I4.0 Maintenance Specialist responsible for troubleshooting and maintenance of I4.0 equipment and systems.

While traditionally, Automation Engineer and Maintenance Specialist have existed in some form in the sector, with the rise of I4.0 solutions, these job roles are now highly evolved to cater to the I4.0 needs of the company.

For an overview of the I4.0 job roles in demand, see next page.

While the new I4.0 job roles have a high earning potential, their demand is emerging

On account of the nature of I4.0 job roles as well as the skills, educational and professional qualifications required, they tend to have a higher earning potential. Typically, these are **professional, managerial and executive (PME) job roles**.

A closer analysis of the online job postings for the new I4.0 job roles¹ from logistics companies in Singapore reveals that the demand for these new I4.0 job roles is emerging and is still at a fairly nascent stage. While this may be attributed to some extent to the pace of I4.0 adoption for logistics companies, it is important to remember that these job roles will continue to constitute a relatively small proportion of the total workforce. We foresee that, as companies accelerate I4.0 adoption, the demand for the new I4.0 job roles will increase.

Snapshot of new I4.0 job roles in the logistics sector

Data analysis and management job roles

Typical job roles in demand:

- **Data Analyst**
- **Data Scientist**
- **Data Architect/Engineer**

Typical skills required:

- Data programming and scripting languages
- Database management and distribution systems
- Data infrastructure and migration
- Data modeling and machine learning
- Quantitative analysis and statistics
- Big data analysis
- Data visualisation and storytelling

Software development job roles

Typical job roles in demand:

- **Software Developer**
- **Mobile Developer**
- **Software Engineer**
- **Solution/Application Architect**
- **UI/UX Designer**

Typical skills required:

- Software development and implementation
- Front-end, back-end, mobile, API development
- Programming and coding
- Testing, integration and deployment of systems
- Software architecture and product roadmapping
- Agile software development practices
- UI/UX design
- Design and illustrative tools

Digitalisation and automation job roles

Typical job roles in demand:

- **Digital Innovation Lead**
- **Machine Learning Engineer**
- **Automation Engineer**
- **I4.0 Maintenance Specialist; ASRS/ Drone/AGV Operator; Automation Technician**

Typical skills required:

- Digital acumen and innovation
- Business intelligence tools
- Big data tools and data management
- AI and machine learning techniques
- Robotic process automation tools
- Programming and query languages
- Hardware automation and robotics
- Electrical, mechanical or maintenance skills

Hiring trends between Q1 2019 and Q2 2020¹



Total job postings: 138

108 global, 30 local postings

Top 5 hiring companies:

- | | |
|-----------|--------------------|
| 1. Amazon | 4. Bollore |
| 2. DHL | 5. Ninja Logistics |
| 3. FedEx | |



Total job postings: 303

206 global, 97 local postings

Top 5 hiring companies:

- | | |
|-----------|--------------|
| 1. Amazon | 4. Foodpanda |
| 2. UPS | 5. FedEx |
| 3. DHL | |



Total job postings: 36

20 global, 16 local postings

Top 5 hiring companies:

- | | |
|-----------------|----------------|
| 1. DHL | 4. DB Schenker |
| 2. Bollore | 5. YCH |
| 3. LF Logistics | |

Exhibit E4: Sample job dashboard for a new I4.0 job role *(For more job dashboards, see [Appendix II: Industry 4.0 job roles](#))*

Data Analyst

Job Description

Responsible for preprocessing, modelling and analysis of data from a wide variety of datasets to enable informed business and operational decisions

Key Responsibilities

- Work closely with stakeholders to understand business problems and opportunities to apply advanced data analysis
- Integrate and prepare datasets, organising data to a format that can be analysed and managed
- Build and evaluate data models using statistical, algorithmic, mining, and visualisation for data discovery and analysis
- Interpret data to synthesise meaningful insights, and propose recommendations for decision making, and development of strategies and action plans

SKILLS AND OTHER REQUIREMENTS

- **Data programming languages:** Python, R, SQL etc.
- **Data visualisation:** Well-versed with tools such as Tableau, Power BI, Python, JavaScript etc.
- **Data modeling:** Able to build predictive models using data modeling tools
- **Big data analysis:** Able to compute large set of data with tools like Hadoop
- **Machine learning:** Good understanding of self-learning algorithms to create new automated processes

COMPANIES HIRING FOR THIS JOB ROLE

- Agility
- Amazon
- Bollore
- DB Schenker
- DHL
- FedEx
- Foodpanda
- Ninja Logistics
- StorBest
- Toll Group
- UPS
- Yang Kee
- YCH

(The above list is not exhaustive)

Number of local job postings ¹	16
Number of global job postings ¹	50

Over **50% of the participating companies employ data analysts** to enhance business intelligence, and strengthen warehousing and transportation processes such as demand and capacity planning, route optimisation, warehouse space utilisation etc. While **SMEs typically find it difficult to attract talent** for these job roles, some are now offering competitive pay as a means to hire these roles in-house.

Typical education and experience requirements: Bachelor's degree in Mathematics, Economics, Computer Science, Information Management, Statistics or equivalent; Logistics sector experience preferred, but open for fresh graduates.

Key attributes: Research-oriented; innovative, resourceful and collaborative problem-solver; curious; detail-oriented.

Hiring for I4.0 job roles follows an evolutionary pattern

Hiring for the new I4.0 job roles follows an evolutionary pattern. In the initial stages of digitalisation, companies tend to outsource these jobs. As the I4.0 maturity increases, companies start to build dedicated in-house teams and full-time roles to drive tighter integration between technology and operations.

Stage 1: Outsourcing or contracting

Traditionally, in the initial stages of I4.0 technology adoption, companies tend to outsource or contract I4.0 job roles, e.g. Automation Engineer, while slowly beginning to build in-house talent through targeted hiring and development interventions.

Stage 2: Building a dedicated in-house team

Gradually, with a strong technology roadmap and proliferation of I4.0 solutions in operations, there is a shift towards building dedicated in-house teams to support I4.0 solution development, customisation, and maintenance. These teams are largely centralised and cater to different business functions and units within the company.

Stage 3: Embedding I4.0 capabilities within operations teams

As technology becomes an integral part of the business, I4.0 capabilities are embedded within operations teams to drive synergies in technology solutions and operations. This is done either by placing technology-trained personnel within operational units, or upskilling operations personnel to leverage advanced technologies.

The above stages are also largely influenced by the people and talent strategies and other considerations around cost, return on investment, operating scale, and customer demand and requirements.

The SME perspective...

Given the challenges faced by SMEs in attracting and hiring for such I4.0 job roles, they may benefit from centralised, government-led efforts such as shared resource centers, shared access to I4.0 vendors, and test labs or innovation centers to build technology proof-of-concepts and test solutions.

“

*For industry 4.0 roles, it is key that these capabilities are **developed internally** instead of outsourcing them, so that we can continue to remain flexible to respond to changing customer requirements.*

Impact of I4.0 on job roles and skills

How will the job roles and skills evolve with adoption of I4.0 technology solutions?



The better the question. The better the answer.
The better the world works.

“

Technology serves as a means to not only **increase efficiency** but also **create higher-value adding job roles**. The result is **higher-skilled jobs** which are more attractive to the local talent and have lower dependence on blue-collar labour.

How we defined the impact of I4.0 adoption on job roles

This study defines impact of industry 4.0 adoption on job roles through two key dimensions...

DEGREE OF CHANGE IN JOB TASKS...

HIGH



A **SIGNIFICANT** proportion of the job tasks will be substituted by technology, thus minimising or eliminating the need for human intervention.

MEDIUM



A **SMALL** proportion of the job tasks will be substituted by technology, with human intervention required for high value-adding tasks as against routine, repetitive tasks

LOW



The job tasks will change **INCREMENTALLY** to use more technology, but will continue to have a high dependence on human intervention

EXPECTED OUTCOMES

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. As such, there will be need to reskill job holders with **new skills** to maintain their employability.

THE JOB ROLE WILL REQUIRE REDESIGN

Job role will **transform to take on additional duties** over and beyond what is traditionally expected. This will require job holders to **upgrade existing skills** and/or acquire new skills to remain competitive.

THE JOB ROLE WILL CHANGE INCREMENTALLY

Job role will continue to deliver traditional outcomes with **increased efficiency** owing to technology. Current skills or **modest upskilling** will be sufficient for the job holders to remain up-to-date contributors.

Some key considerations...

For assessing the impact on job roles, this study did not assign percentage definitions for degree of change in tasks, because the overall impact depends not only on the number of job tasks impacted, but also a number of other variables such as:

- **Criticality of the impacted task;** e.g. for Inventory Controller role, "Stocktaking or cycle-counting" is crucial, and hence impact on such tasks may potentially lead to displacement/redesign of the role as compared to tasks such as "Reporting safety and health incidents" being impacted by technology
- **Level of the job role;** e.g. a 70% change in job tasks for Warehouse Manager role may not necessarily lead to the same outcome as a 70% change in job tasks for Warehouse Assistant

Hence, **qualitative insights and opinion polls** from sector experts and practitioners were used to determine the degree of change in tasks and expected outcomes as part of the task-based impact assessment.

As a result of I4.0 adoption, all job roles in the logistics sector will undergo change

While I4.0 technologies generate significant benefits for users, businesses, and economies, their use will substitute for some work activities that are currently performed manually, and modify or supplement the performance of many other activities. The extent to which these technologies will impact job roles, and more specifically, the job tasks and skills, depends on the pace of I4.0 adoption and the type of I4.0 solutions implemented.

Our findings suggest that, assuming steady-state adoption of I4.0 technology solutions, all job roles across the logistics value chain will experience a change in job tasks and skills. However, the degree of change in job tasks and skills and the nature of this change will vary across functions and job roles. This will lead to different outcomes for different job roles such as displacement, redesign or incremental change.

Some job roles will **potentially undergo displacement or become obsolete** on account of replacement by technology and/or new job roles or convergence with other job roles. For example, fully autonomous AS/RS, smart inventory counting and robotic sorting solutions pose a real threat to MHE Operator/Warehouse Assistant role as these I4.0 solutions eliminate the need for manually sorting, routing, loading and unloading cargo items. As such, this job role may be replaced by the I4.0 technology solutions and evolve into new job roles such as I4.0 Maintenance Specialist/ASRS Operator/ Drone Operator/AGV Operator/Automation Technician. This will require reskilling current job holders to enable them to transit to the new job roles or other job roles in the company (see [Exhibit E5](#)).

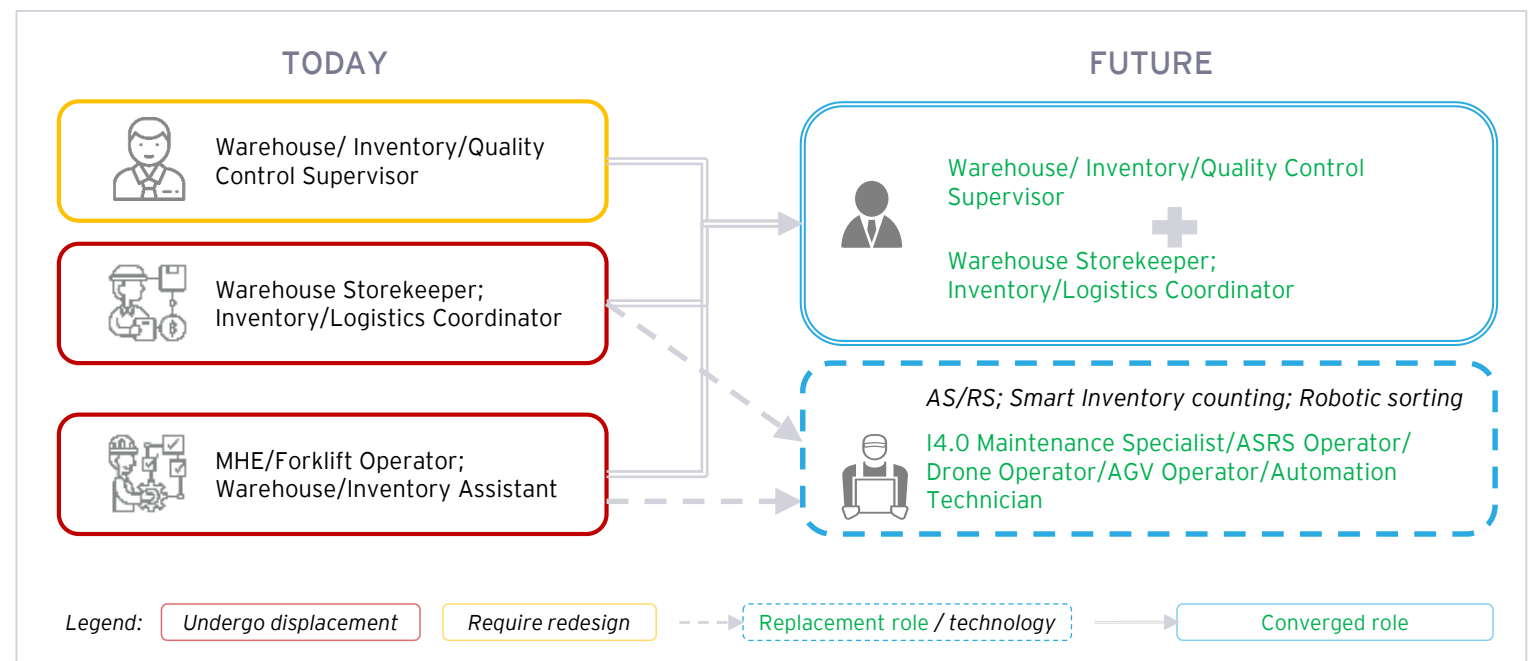


Exhibit E5: Example of role convergence and role replacement

As a result of I4.0 adoption, all job roles in the logistics sector will undergo change

With automation of manual, routine and repetitive job tasks, many other job roles will evolve to focus on high value-adding activities. These roles will **require varying degrees of job redesign** to alter the composition of job tasks or the way work is performed today. For example, the Warehouse/ Inventory Control Supervisor role will be redesigned drastically to utilise AS/RS and smart inventory counting solutions for monitoring inventory levels and warehouse performance, as well as to provide data-driven feedback to enhance operations. Whereas the Warehouse Assistant Manager role will require a lower degree of job redesign to incorporate more data-driven decision making and analytical insights for current tasks such as anticipatory planning, scheduling and performance monitoring. Such transformations in job roles will require job holders to upgrade existing skills or acquire new skills to remain future-ready.

Roles requiring human expertise e.g. Business Development Director or roles that are already I4.0 in nature e.g. Digital Services Manager will continue to require high human involvement. Technology will enable many other job roles to deliver traditional outcomes but with increased efficiency and productivity, and as such, these job roles will **change incrementally in terms of their task composition**. For example, the Warehouse Operations Manager can leverage predictive insights to complement their technical expertise and experience for anticipatory demand planning, proactive risk mitigation, strategic customer service and continuous process improvements. While modest upskilling may suffice to equip the job holder to manage I4.0 solutions and systems, building technology innovation and strategic business skills will lead to exponential gains for the individual and the business.

In this study, we sought to understand the impact of I4.0 adoption on the logistics workforce. To meet this objective, we leveraged primary and secondary research sources, and worked closely with the sector over six months to examine the impact of the 13 I4.0 technology solutions on 56 job roles defined in the Skills Framework for Logistics (see [Exhibit E6](#)).

Of the 56 job roles, 20% of the job roles will experience a high degree of change in job tasks leading to their displacement or major redesign, 34% will experience a medium degree of change in job tasks leading to their redesign, while other job roles will change incrementally

The **actual impact on the workforce may vary from one company to another** as the extent of impact depends on the pace of I4.0 adoption and the type of I4.0 solutions implemented. Technology adoption strategies and timelines for companies are, in turn, influenced by:

- factors within the control of company such as business strategy, operating models and scale, processes and systems, and
- other factors beyond the control of company such as customer preferences, technology commercialisation, technical feasibility, regulations and standards.

This study, however, has been calibrated to provide a sector-wide view of technology trends and impact on job roles and skills by aggregating insights from multiple stakeholders with diverse profiles and perspectives. The findings need to be interpreted by companies for their operating context.

Exhibit E6: Snapshot of the impact of I4.0 on job roles at sector level

While few job roles will remain unchanged on I4.0 adoption, within 3 to 5 years, out of the 56 job roles...

11 job roles i.e. ~20% of the job roles in the logistics sector will experience a **high degree of change** in job tasks

- 07 job roles will likely undergo displacement
- 04 job roles will require major redesign

19 job roles i.e. ~34% of the job roles in the logistics sector will experience a **medium degree of change** in job tasks, and will likely **require redesign**

11 out of 26 job roles that will **change incrementally** are already I4.0 in nature

07 out of 11 non-PME job roles in the sector will likely undergo **displacement or convergence** with another job role, with the exception of four:

- Rigger / Signalman
- Lifting Supervisor
- Dispatch Operator / Driver
- Incoming Quality Coordinator/ Tally Assistant



HIGH DEGREE OF CHANGE IN JOB TASKS

ROLES WILL UNDERGO DISPLACEMENT

1. MHE/Forklift Operator / Warehouse/Inventory Assistant
2. Warehouse Storekeeper / Inventory/Logistics Coordinator
3. Traffic/Dispatch Coordinator
4. Import Export Administrative/Shipping Assistant
5. Permit/Shipping/Custom Clearance Coordinator
6. Order Fulfilment/Sales Operations/ Customer Service Assistant
7. Order Fulfilment/Sales Operations/ Customer Service Coordinator

ROLES WILL REQUIRE MAJOR REDESIGN

8. Warehouse/Inventory Control/Quality Control Supervisor
9. Depot/Traffic/Supervisor/Hub Operations Supervisor
10. Brokerage/Freight Supervisor
11. Order Management/Quote Desk Executive / Order Fulfilment/Inside Sales Officer

★ Job roles that are already I4.0 in nature

Warehouse Management & Operations
Transportation Management & Operations
Freight Forwarding & Operations
Sales And Customer Service
Logistics Solutioning & Programme Management
Logistics Process Improvement & Information System



MEDIUM DEGREE OF CHANGE IN JOB TASKS

ROLES WILL REQUIRE REDESIGN

1. Warehouse Officer / Inventory Controller / Quality/Facilities Management Officer
2. Warehouse Operations/Inventory Management/Warehouse Assistant Manager
3. Health, Safety and Environmental Coordinator
4. Rigger / Signalman
5. Lifting Supervisor
6. Dispatch/Transport Operator / Last Mile Delivery Driver / Container Driver
7. Traffic Controller / Transport Officer / Line Haul Operations Officer
8. Incoming Quality Coordinator / Tally Assistant
9. Freight Officer
10. Field Sales/Key Account Executive / Sales Operations Management Specialist
11. Customer Service Officer / Service Quality Analyst
12. Senior Customer Service Officer / Customer Service Specialist
13. Logistics Solutions Analyst ★
14. Logistics Contracts Analyst / Logistics Operations Analyst
15. Logistics Contracts/Logistics Operations Executive/ Logistics Operations Specialist
16. Vertical Specialist
17. Logistics Data Management Coordinator / Logistics Data Entry Coordinator ★
18. Logistics Data Specialist / Master Data Analyst / Master Data Executive ★
19. Business Process Excellence Engineer / Operations Specialist / Industrial Operations Engineer



LOW DEGREE OF CHANGE IN JOB TASKS

ROLES WILL CHANGE INCREMENTALLY

1. Warehouse Operations/Inventory Management Manager / Capacity Management Manager
2. Health, Safety and Environmental Officer
3. Health, Safety and Environmental Manager
4. Project Engineer ★
5. Project Supervisor
6. Senior Project Engineer ★
7. Project Executive
8. Project Manager ★
9. Transport Assistant Manager / Transport Executive / Line Haul Operations Executive
10. Transportation Operations Manager
11. Freight Inspector / Incoming Quality Inspector
12. Shipping/Import Export Specialist / Freight Executive
13. Import Export/Freight Allocation/Freight Shipping/ Freight Documentation/ Freight Pricing Manager
14. Business Development/Sales & Marketing/Vertical Sales Account/Key Account/Project Cargo Sales/ Route Development/Trade Lane Manager
15. Customer Service Manager
16. Business Development/Country Route Development/Trade Lane/Freight Trade Director
17. Logistics Solutions Specialist/Engineer ★
18. Logistics Solutions Manager ★
19. Logistics Contracts/Logistics Programme Manager
20. Vertical Product Manager
21. Logistics Solutions and Implementation/Tailored Supply Chain/Channel Operations Director ★
22. Logistics Innovation and Process Improvement / Customer and Logistics Systems Manager ★
23. Logistics IT Executive / Digital Services Executive / Logistics System Analyst ★
24. Operations Integration Specialist / System Integration Engineer / Infrastructure Specialist ★
25. IT Business Solutions Project Specialist / Digital Services Project Specialist ★
26. IT Business Solutions/Digital Services Manager ★

A bottom-up impact assessment reveals a rich mosaic of potential shifts in job tasks

The potential impact of I4.0 adoption varies by function, job level and job role. A bottom-up task-based assessment reveals a rich mosaic of potential shifts in the nature of job roles, with important implications for skills and talent capabilities.

Job tasks most susceptible to I4.0 impact include physical ones in predictable environments, such as operating machinery and sorting and routing of goods. Scheduling, coordination and documentation are other examples of tasks that can be done better and faster with I4.0. This could potentially displace non-PME workers doing such tasks. It is important to note, however, that even when some job roles experience a high degree of change in tasks, the job roles may not necessarily become obsolete, but instead be redesigned as workers are expected to perform new tasks.

Introduction of technology will also augment existing job roles with new tasks such as overseeing, customising and managing I4.0 solutions, and making sense of data and analytical insights from these solutions.

Typically, I4.0 adoption will have a lesser impact on job roles that involve managing people, applying expertise, and those involving social interactions, where machines are unable to match human performance for now. Going forward, it will be critical for incumbents in these job roles to understand and manage human-machine collaborations and interactions for driving optimal outcomes.

The narrative for impact of I4.0 adoption on job tasks for logistics job roles is characterised by two themes.

1. Value creation through technology and people

A common insight shared by sector experts and practitioners is that, the primary intent of technology adoption is not to reduce dependence on manpower, although it may result in lower dependence on non-PME workers. Instead, technology serves as a means to enhance business performance and create higher-value adding jobs for employees. This provides opportunities for employees to shift their focus to higher-order cognitive and strategic activities, enabling them to move up the company's value chain. The result is **higher-skilled, higher-paying jobs which are more attractive to the local talent.**

2. Roll-up effect across job levels

The impact on job roles due to technology adoption follows a roll-up effect. As the job roles at lower levels are either displaced by technology or converge with higher-level job roles, they evolve to focus on new and enhanced tasks. This will lead to a **progressive increase in the job scopes** at subsequently higher levels.

Across the spectrum of logistics job roles, technology has the potential to automate transactional tasks, augment job roles with new value-adding tasks, and supplement the performance of strategic tasks (see [Exhibit E7](#))

Exhibit E7: Evolution of job tasks due to adoption of industry 4.0 technology solutions

<p>For roles with a</p> <p>HIGH DEGREE OF CHANGE IN TASKS</p>	<p>Technology will AUTOMATE transactional tasks such as...</p> <ul style="list-style-type: none"> • Manual, labour-intensive tasks • Goods sorting, routing and quality checks • Inventory tracking, stocktaking, cycle counting and inspection • Transportation and freight route planning • Scheduling and tracking of orders • Customer support and query resolution • Payment calculation and tracking • Order assignment and coordination • Communication of status updates • Documentation and administrative tasks
<p>For roles with a</p> <p>MEDIUM DEGREE OF CHANGE IN TASKS</p>	<p>Technology will AUGMENT the role with new tasks such as...</p> <ul style="list-style-type: none"> • Overseeing and configuring I4.0 solutions • Customisation of I4.0 solutions • Exception-handling and troubleshooting • Data-driven planning and forecasting • Simulation modelling • Trend analysis for process enhancement • Data visualisation and insights generation • Cross-functional integration • Advisory on operations and solutions • Stakeholder management
<p>For roles with a</p> <p>LOW DEGREE OF CHANGE IN TASKS</p>	<p>Technology will SUPPLEMENT the performance of tasks such as...</p> <ul style="list-style-type: none"> • Strategic planning and policy formulation • Business advisory and solutioning • Innovation management • Continuous process improvement • Business development • Customer needs analysis • Logistics solutions customisation • Business continuity planning • Proactive risk management • Safety, compliance and sustainability

“

Industry 4.0 technologies provide opportunities for employees to perform value added work, enabling them to move up the company's value chain.

“

We are constantly on the lookout for **digitally-savvy, process-oriented personnel with high business intelligence**. The company values employees who have an **agile mindset**, and can keep up with the rapid pace of change from Industry 4.0.

Snapshot of the impact of I4.0 on skills at sector level



As job roles evolve to perform higher-order, more value-adding tasks, employees will need to **build new skills and capabilities** to maximise their contributions in a technologically-rich work environment.

A key finding that emerged in the skills analysis is, as companies progress in their journey to I4.0 adoption, there is a **gradual shift in the mix of technical, industry 4.0, business and foundational skills required from a talent perspective** (see [Exhibit E8](#)).

▼ Declining skills

With automation of transactional tasks that require low decision-latitude, corresponding skills will become less relevant and decline in demand. Typically, these include lower-order skills for **manual, repetitive activities, documentation, data-entry, data-processing and back-end administrative skills.**

■ Prevalent skills

Even with increasing dependence on I4.0 technologies, logistics companies continue to require high technical expertise to remain competitive. Such skills related to **core operations, solutioning, compliance and systems** will continue to remain prevalent despite I4.0 adoption

▲ Emerging skills

Companies are increasingly looking for employees with balanced and holistic skillsets around **technology, business and human factors.** Going forward, these skills will become more prominent and increase in demand.

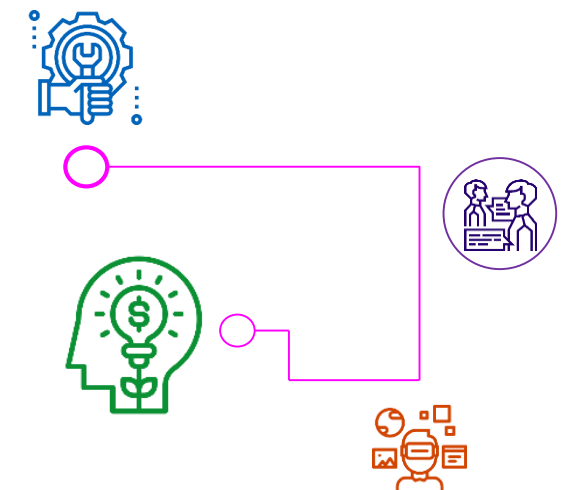


Exhibit E8: Evolution of skills due to adoption of industry 4.0 technology solutions (For more, see [Appendix IV: Skills Library](#))

TECHNICAL SKILLS Decline in demand for manual, administrative, documentation skills due to automation and cognitive technologies	INDUSTRY 4.0 SKILLS Increase in demand for data and industry 4.0 technology-related skills for design and implementation of I4.0 solutions	BUSINESS SKILLS Increase in demand for business and people management skills with focus shifting to high value-adding activities	FOUNDATIONAL SKILLS Increase in demand for soft skills required for personal excellence to adapt to the pace of change in the sector
<p>Cargo handling and administration</p> <ul style="list-style-type: none"> ▼ Cargo Issuance and Dispatch ▼ Cargo Lifting ▼ Cargo Receipt and Inspection ▼ Container Loading and Unloading Administration ▼ Livestock Cargo Administration <p>Documentation and claims processing</p> <ul style="list-style-type: none"> ▼ Freight and Cargo Claim Administration ▼ Import and Export Documentation Administration <p>Order processing and scheduling</p> <ul style="list-style-type: none"> ▼ Order Fulfilment Administration ▼ Transportation Route and Schedule Planning <p>Warehousing and housekeeping</p> <ul style="list-style-type: none"> ▼ Warehouse Administration ▼ Warehouse Maintenance and Housekeeping 	<p>Data skills</p> <ul style="list-style-type: none"> ▲ Big Data Analytics ▲ Data Interpretation and Analysis ▲ Data Storytelling and Visualisation ▲ Data Strategy <p>I4.0 technology application</p> <ul style="list-style-type: none"> ▲ Artificial Intelligence Application ▲ Augmented Reality Application ▲ Internet of Things Application <p>Software development</p> <ul style="list-style-type: none"> ▲ Applications Development ▲ User Experience Design <p>Automation design and management</p> <ul style="list-style-type: none"> ▲ Automation Management ▲ Robotic & Automation System Maintenance ▲ Technology Troubleshooting <p>Technology risk management</p> <ul style="list-style-type: none"> ▲ Cyber Risk Management ▲ Threat Intelligence and Detection <p>Technology usage and integration</p> <ul style="list-style-type: none"> ▲ Advanced Digital Acumen 	<p>Business performance enhancement</p> <ul style="list-style-type: none"> ▲ Business Advisory ▲ Business Process Re-engineering ▲ Knowledge Management ▲ Systems Thinking <p>Risk, safety and sustainability</p> <ul style="list-style-type: none"> ▲ Sustainability Management ▲ Workplace Safety and Health Audit System Management <p>Stakeholder and customer management</p> <ul style="list-style-type: none"> ▲ Customer Behaviour Analysis ▲ Social Media Management 	<p>Interpersonal and influencing skills</p> <ul style="list-style-type: none"> ▲ Collaboration ▲ Compliance Mindset Development ▲ Personal Influence <p>Higher cognitive skills</p> <ul style="list-style-type: none"> ▲ Critical Thinking ▲ Complex Problem Solving ▲ Decision Making ▲ Lateral Thinking <p>Adaptability and cultural sensitivity</p> <ul style="list-style-type: none"> ▲ Adaptability ▲ Global Perspective

There is a gradual shift in the type of skills required to perform the evolving job roles

While technical and functional expertise remain critical, individuals need to progressively build a high digital quotient to be able to apply and fully utilise I4.0 technologies and also play a larger, advisory role in strategic, tactical and operational aspects. Companies are looking for employees with holistic skillsets on technology, business and human factors. There is a rising demand for people who are adaptable, agile and can keep up with the rapid pace of change in the sector.

Deep technical and functional expertise

Strong technical foundation remains critical as the sector transforms. With automation of transactional tasks that require low decision-latitude, corresponding skills will become less relevant. Typically, these include lower-order skills such as physical motor skills, documentation, data-entry and basic data-processing, scheduling and back-end administrative tasks. At the same time, there is a higher pressure on employees and companies to build deep functional and sector expertise to deliver competitive services to customers. As such, the following technical skills are rising in demand:

- Logistics solutioning and process improvement skills to boost supply chain productivity and enhance customer experience
- Proactive risk, compliance and safety management to minimise service disruptions with greater visibility on impending risks
- Up-to-date technical expertise for optimising core operations and constantly keeping abreast of new developments
- Cross-functional skills to manage complex, large-scale projects spanning multiple functions across the logistics value chain
- Leveraging integrated management systems e.g. warehouse management systems (WMS), transport management systems and cargo tracking systems for end-to-end visibility

High technology quotient

A **spectrum of industry 4.0 skills** emerged through our analysis. These range from leveraging data and predictive insights for decision-making to usage and integration of I4.0 technologies. Going forward, companies will be more focused on technology risk management given the exposure

to newer data, cybersecurity and IT risks. Emerging I4.0 skills include:

- Technology-savviness which translates to skills for operating, troubleshooting and maintaining I4.0 technology solutions for operational staff, and technology leadership to champion I4.0 adoption for managerial staff and leaders
- Data interpretation and analysis for advanced processes e.g. anticipatory demand and capacity planning, data-driven shipment load optimisation and freight planning, predictive fleet management, dynamic route optimisation
- Industry 4.0 software and hardware capabilities for the design, customisation, integration, maintenance and post-implementation optimisation of I4.0 technologies
- Technology risk management to manage new threats and vulnerabilities e.g. cybersecurity, network security and other security loopholes

There is a gradual shift in the type of skills required to perform the evolving job roles

Multi-disciplinary expertise for business advisory

With the emergence of e-commerce in the region, evolving business and operating models, and newer revenue streams, companies expect employees to play a larger, **advisory role in strategic, tactical and operational aspects.**

Increasingly, companies are looking for:

- A blend of operational, technology and commercial skills for business advisory capability to be able to apply a strategic, long-range view on business issues and consult on optimal solutions in line with business goals
- Increased focus on enhancing customer experience by leveraging data and analytical insights to forecast customer needs, identify service improvement opportunities, and offer customised product and service offerings so as to gain competitive advantage
- Ability to manage sustainability and environmental impact of operations with better visibility and insights on sustainability parameters such as energy consumption, fuel emissions, carbon footprint etc.

Adaptability, agility and cultural sensitivity

As the sector landscape evolves, companies need people who are **adaptable, agile** and can keep up with the rapid pace of change in the sector. Foundational skills such as critical thinking, creative problem-solving and decision-making are more important than ever before. Additionally, as technology pervades our work lives and expands the boundaries of operation, there is more focus on collaboration and cultural sensitivity to foster meaningful relationships. Companies value employees with the following skills:

- Agility, adaptability and change-readiness to continuously augment one's skills to contribute effectively in the new knowledge economy. This is equally important for leaders to drive innovation in the company as well as for operational staff to quickly ramp up to working with new technologies
- 'Human' skills such as communication, collaboration, negotiation, personal influence, relationship management and cultural sensitivity
- Creativity and out-of-box-thinking to build innovative solutions

The aggregate impact of I4.0 adoption on each logistics job role and the future view of job tasks and skills are captured in **56 individual job dashboards**

- ❑ See [Exhibit E9](#) for a sample
- ❑ See [Appendix III: Job Dashboards](#) for future view of all job roles
- ❑ See [Appendix IV: Skills Library](#) for emerging skills



*We are constantly on the lookout for **digitally-savvy, process-oriented** personnel with **high business intelligence**. The company values employees who have an **agile mindset**, and can keep up with the rapid pace of change from Industry 4.0.*

Exhibit E9: Sample job dashboard depicting I4.0 impact, future job tasks and emerging skills (For more, see [Appendix III: Job Dashboards](#))


FUTURE VIEW: Material Handling Equipment (MHE) Operator/ Forklift Operator/ Warehouse Assistant/ Inventory Assistant

WAREHOUSE MANAGEMENT AND OPERATIONS

Technology solutions impacting this job...

- Smart Inventory Counting
- Intelligent Robotic Sorting
- Automated Storage and Retrieval Systems (AS/RS)
- Predictive & Prescriptive Maintenance

Impact assessment...



HIGH degree of change in tasks

A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within **3 to 5 years**, the role will potentially...

UNDERGO DISPLACEMENT

Today, this job role is responsible for manually sorting, routing, and loading and unloading cargo to and from various warehousing or storage locations, and identifying maintenance needs for the safe and efficient operation of material-handling equipment.

Job tasks today	Impact at task-level / Future view of job tasks
Perform loading, unloading, moving, arranging of warehouse cargo	<p>H</p> <ul style="list-style-type: none"> Tasks for stacking, moving and arranging of items on pallets will be automated through use of AGVs, AS/RS robotic systems. Focus will shift to operating computerised systems, and picking and packing from automated systems. These tasks will further be augmented by use of AR-powered vision-picking or voice-picking solutions.
Perform container stuffing / unstuffing, cargo and material handling	<p>H</p> <ul style="list-style-type: none"> Intelligent robotic sorting solutions will automate the sorting, routing and first level quality checks of standard-sized goods. Cargo-related documents will be digitalised with the use of RPA and optimised documentation solutions. The job holder will be tasked with operating loading and unloading robotic systems, cleaning and maintaining automated systems, electronic labelling, and manually sorting odd-sized items.
Assist in quality improvement activities	<p>H</p> <ul style="list-style-type: none"> Use of automated processes and robotics will ensure adherence to pre-configured quality control parameters and minimise human errors. The focus will shift to intermittent check-ins and oversight to ensure quality and accuracy.
Highlight safety and health risks, report incidents	<p>M</p> <ul style="list-style-type: none"> IoT sensors will provide visibility on impending failures of material handling equipment, forklifts etc., thus eliminating the need for this job role to identify maintenance needs or report incidents. AR will allow annotation of non-compliances and defects at site to provide clarity for rectification works.

In the next **3 - 5** years... As industry 4.0 technologies automate the manual, labour-intensive tasks, the focus will shift to monitoring operations of, troubleshooting and maintaining automated systems. This role will potentially **evolve to roles such as I4.0 Maintenance Specialist/ASRS Operator/ Drone Operator/AGV Operator/Automation Technician** or converge with Coordinator role.

Emerging skills

Going forward, the job holder will potentially take on new roles such as I4.0 Maintenance Specialist/ASRS Operator/ Drone Operator/AGV Operator/ Automation Technician. As such, the following skills will become critical:

- Advanced Digital Acumen
- Data Interpretation and Analysis
- Robotic and Automation System Maintenance
- Technology Troubleshooting
- Complex Problem Solving
- Decision Making

High potential for mobility to

- Project Supervisor
- Rigger/Signalman
- Lifting Supervisor
- Dispatch Operator / Transport Operator / Last Mile Delivery Driver
- Incoming Quality Coordinator / Tally Assistant



4 TALENT MANAGEMENT STRATEGIES

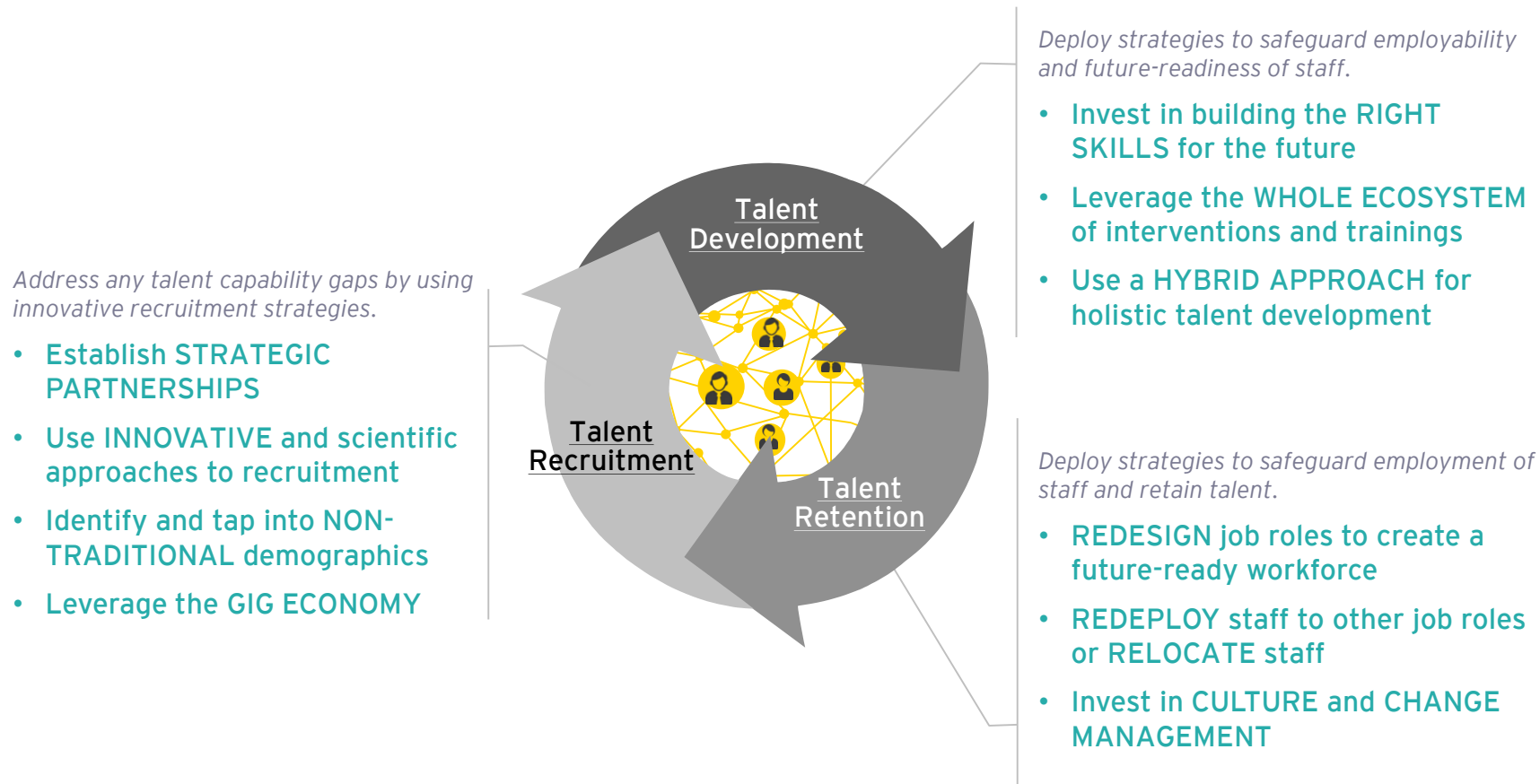
- 4.1 Best practices in talent development
- 4.2 Best practices in talent retention
- 4.3 Best practices in talent recruitment
- 4.4 Safeguarding employment & employability of logistics workers



“

Technology alone cannot solve our problems. Leaders and employees need to be exposed to a **new way of thinking about technology**. Companies need to **cultivate a new mindset**.

Companies have tremendous benefits to gain from I4.0 adoption. Once they embark on the digitalisation journey, they will need to closely assess their future talent requirements, and devise talent management strategies to bridge any talent capability gaps. In this section, we present some best practices in talent development, retention and attraction that will help companies to prepare employees to be future-ready.



Why should companies invest in developing and retaining existing employees?

Implementation of I4.0 technologies has the potential to reduce a company's dependence on manpower, especially for non-PME job roles, resulting in savings in labour costs and operating expenses. However, there is also value in retaining the existing employees by deploying various strategies to safeguard their employment & employability for the following reasons:

- Manpower supply challenges continue to persist in the sector as companies struggle to find the right talent
- There are many hidden costs involved in recruiting, hiring and training new staff to ensure accelerated time to productivity
- Existing staff have experience and tacit knowledge of business operations and the company's ways of working which is a valuable asset for companies
- People strategy and culture have a huge impact on employee motivation levels

Best practices in talent development



The better the question. The better the answer.
The better the world works.



In today's dynamic environment, leaders and HR personnel need to constantly think about how they can meet their talent requirements to fulfill business goals and priorities.

Invest in building the **RIGHT SKILLS** for the future

While **technical skills** will remain the top priority for imparting functional and domain knowledge and training to employees, it is critical for companies and other sector stakeholders to **invest in building industry 4.0 skills** as they are constantly changing and employees need to stay abreast with the latest developments. **Business and foundational skills** will largely evolve over time, but companies can use targeted experiential programmes to groom the necessary skillsets.

Leverage the **WHOLE ECOSYSTEM** of interventions and trainings

There are a host of **training interventions and grants** provided by the government, institutes of higher learning and other private training providers. To find out more, see [section 5: Manpower capability-building ecosystem](#). Companies can use this entire ecosystem for developing the skills required for their workforce to remain relevant and productive going forward.

Use a **HYBRID APPROACH** for holistic talent development

Industry best practices suggest that a **robust framework for holistic skills development** (see [Guidelines for skills development](#)) entails multiple development sources and diverse development interventions. This entails building the requisite knowledge, skills and abilities using a hybrid approach encompassing:

- Formal, structured learning through **Education**
- Informal learning through **Exposure**
- On-the-job learning through hands-on **Experience**

Building the right talent with the right competencies and skills will be one of the greatest looming challenges for companies to lead in a digital age. Companies will need to establish a **continuous, dynamic approach to learning** to mitigate the shortened shelf-life of skills. Additionally, HR needs to leverage **innovative delivery styles** to embed fit-for-purpose training within their talent development programs. This will not only facilitate re-skilling on a large scale, but will also mitigate the impact of millennials' tendency to change jobs frequently.

Source: EY publication, 'Building the talent of the future'



SKILLS DEVELOPMENT FRAMEWORK

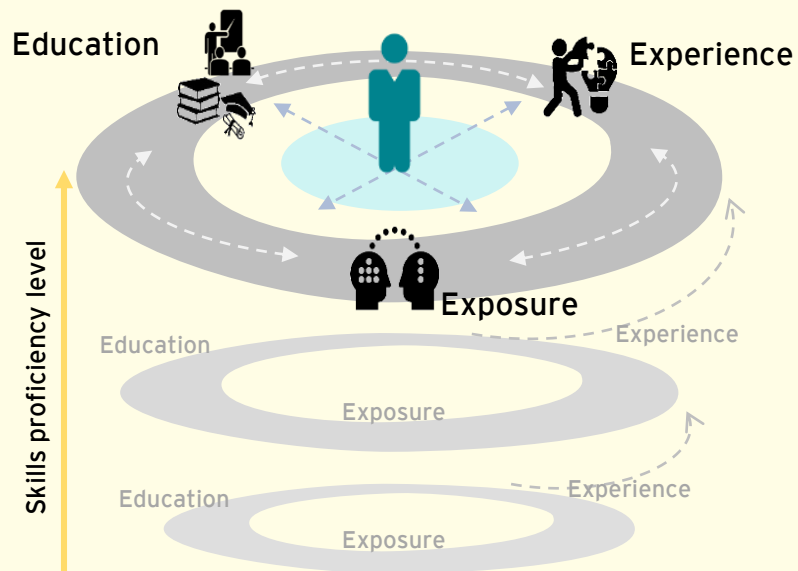


Exhibit E10: Skills development framework

This framework leverages a hybrid approach encompassing education, experience and exposure to progressively build higher proficiency levels for requisite skillsets as one moves up the company value chain

EDUCATION: *Learning that occurs in a formal, structured environment through studying theory and learning conceptual models of the subject at hand*

- Instructor-led trainings
- Vendor trainings and workshops
- Certification programs
- Online learning resources (e.g. Coursera)
- Train-the-trainer
- Short courses
- Leadership courses
- Management development programs

EXPERIENCE: *Learning that occurs through practicing the subject in a safe environment or from actual experience of the subject*

- On-the-job training (OJT)
- Job rotation
- Cross-functional teams
- Action learning projects
- Special stretch projects
- Short-term assignments

EXPOSURE: *Learning that occurs from reflection and through discussions and interactions with other individuals and groups*

- Knowledge sharing
- Coaching and mentoring
- Buddy system
- External forums

There are a host of training interventions and grants provided by the government, institutes of higher learning and other private training providers. To find out more, see section 5: Manpower capability-building ecosystem



Which type of skills should logistics companies prioritise for learning and development programmes?

1

TECHNICAL SKILLS
Functional or logistics sector-specific skills which are critical to perform the job role

Technical skills will remain the top priority for imparting **functional and domain knowledge** and training to employees. Built through:



- Structured trainings
- Certification courses
- Online resources



- On-the-job training
- Job rotation
- Assignments



- Knowledge sharing
- Coaching and mentoring

2

INDUSTRY 4.0 SKILLS
Data and industry 4.0 technology-related skills essential for design and implementation of I4.0 solutions

I4.0 skills are at second priority as they are **constantly changing** and employees need to stay abreast with the latest developments. Built through:



- Vendor trainings
- Train-the-trainer
- Online resources



- On-the-job training
- Cross-functional teams



- Knowledge sharing
- External forums

3

BUSINESS SKILLS
General business administration and people management skills

Business skills become more critical at higher job levels i.e. managers and above, and can be **developed through experience**. Built through:



- Leadership courses
- Management development programs



- Cross-functional teams
- Action learning projects



- Coaching and mentoring
- Buddy system

4

FOUNDATIONAL SKILLS
Generic or soft skills required for personal excellence regardless of the job role

Foundational skills are largely linked to **personality traits** and continue to **evolve over time**. Built through:



- Special stretch projects
- Assignments



- Coaching and mentoring



Best practices in talent retention



The better the question. The better the answer.
The better the world works.



Best practices in talent retention

While technology adoption has potential benefits in reducing labour cost for logistics companies, there are **benefits to be gained by retaining existing staff**. This is primarily attributed to the **tacit knowledge** of business operations held by existing staff and the increasing gap between manpower demand and supply. Hence, companies can use various talent retention strategies to ensure that existing staff can continue to deliver greater value for the business.

REDESIGN job roles to create a future-ready workforce

Job redesign and restructuring will help companies to **define value-adding job tasks** and augment job scopes, span of control, autonomy and authority so that job holders can contribute effectively and deliver greater value for the business.

- To know more see [‘Guidelines for job redesign’](#)
- For the future-view of job tasks for job redesign, see [Appendix III: Job Dashboards](#)

REDEPLOY staff to other job roles or RELOCATE staff

As technology adoption creates a potential redundancy in headcount for certain job roles, companies can reskill and **redeploy existing staff to different jobs in the same or different function**, or even different business segments. Furthermore, as companies adopt I4.0 technologies in a phased manner across different facilities, there is an opportunity to **relocate staff to similar jobs but at different locations or work sites** to ensure retention and mitigate talent supply challenges in the short-term.

- For more information on mobility, see [‘Redeployment opportunities’](#)

Invest in CULTURE and CHANGE MANAGEMENT

An essential element to manage the downstream impact of technology adoption on employees is culture and change management. Leaders, HR and managers play a critical role in creating a **culture of change, sensitising employees** to the changes to come and **communicating the right messages**. Employees need to be educated on the potential benefits of technology, equipped to adapt to the new work environment, and reassured that technology will not have a negative impact on them to minimise resistance to change and foster adaptability.

Additionally, companies can invest in building best-in-class HR practices to **minimise employee attrition** and thus **reduce talent leakage from the sector**. Companies can focus on building:

- *Strong employer brand*
- *Fair performance management practices*
- *Competitive salaries, benefits and incentives*
- *Enhanced career management and development opportunities*
- *Value-driven corporate culture*
- *Attractive working conditions*



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 your company to align available resources to internal and external pressures to maximise results and remain competitive and sustainable.

A classic scenario where job redesign can add value is **introduction of new technology** which changes the work processes and/or skills required.

Businesses need to **enable their workforce with the right capabilities** to reap the benefits of digital transformation, and to maximise the insights and productivity gains from technological advancements.

Why do companies need job redesign?

Following I4.0 adoption in logistics companies, certain job roles will experience high impact as they are:

- **REPLACED** by new job roles and/or technology
or
- **CONVERGED** with other job roles
or
- subjected to a **CHANGE IN WORK PROCESSES** and systems

Job redesign is one of the strategies that will **enable employees to keep pace with the capability demands** of evolving business needs and stay future-ready.

It will ensure that they have the necessary skills and resources to **contribute effectively to business** despite the changing nature of their job roles.

How will job redesign benefit...



EMPLOYEES

- Enhances future-readiness and contribution to business
- Improves productivity and efficiency
- Enhances job satisfaction with focus on value-adding tasks
- Decreases turnover, errors and absenteeism



COMPANIES

- Aligns employee capabilities with business strategy
- Improves performance through leaner work processes
- Reduces dependence on manual labour and streamlines jobs
- Enables mobility and rotation of employees across job roles



LOGISTICS SECTOR

- Enhances career prospects, especially for non-PME workers
- Improves the appeal of jobs, and sector as whole
- Enhances potential for attracting and hiring local talent
- Makes the jobs more age-friendly



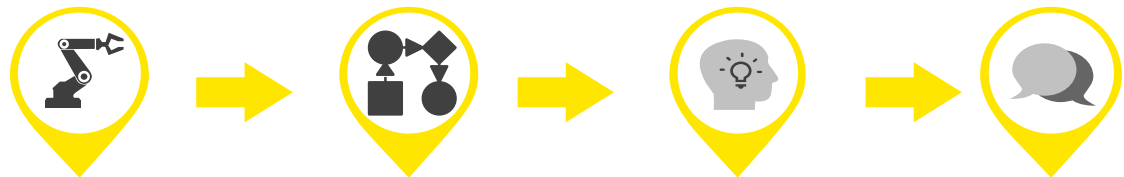
Step 1: Needs Analysis	Step 2: Job Analysis & Redesign		Step 3: Transition Planning & Implementation	
Assess impact of I4.0 adoption on job roles	Analyse and prioritise job roles for redesign	Select job redesign methods or external interventions	Plan and implement job redesign Interventions	Assess post-implementation effectiveness
<p>Understand strategic business goals, I4.0 adoption plans and subsequent impact on job roles</p> <ul style="list-style-type: none"> Identify I4.0 technology solutions implemented (see Appendix I: I4.0 technology solutions stack) Determine the job functions and job roles impacted by I4.0 adoption (see Impact of I4.0 on job roles and skills) Map the future job tasks of the impacted job roles (see Appendix III: Job dashboards) Develop a business case for the job redesign effort (see Appendix V(a): Guide to Analysing the Business Case for Job Redesign) 	<p>Analyse the job role(s) to undergo redesign, assess impact on business outcomes and prioritise key areas of improvement</p> <ul style="list-style-type: none"> Analyse and prioritise the job role(s) with the largest opportunity for job redesign Conduct job shadowing of selected job roles to identify inefficiencies and operational challenges (see Appendix V(b): Guide to Job Shadowing) Identify gaps between current and future job tasks (see Impact of I4.0 on job roles and skills) Perform prioritisation of proposed changes for initial stakeholder buy-in based on benefits and company goals 	<p>Select potential job redesign methods or external government interventions for job redesign</p> <ul style="list-style-type: none"> Identify possible job redesign methods, e.g. altering of job tasks, work processes, physical work environment, technology (see Job redesign methods) Analyse the investment required and impact of identified job redesign changes Scan and select external government interventions for job redesign (see Overview of the logistics ecosystem) 	<p>Plan and implement job redesign activities and change interventions to ensure smooth transition for employees to take on their redesigned job roles</p> <ul style="list-style-type: none"> Create detailed plans for the selected job redesign interventions Define the change agenda and chart out the transition planning required for the job redesign effort (see Appendix V(c): Guide to Change Management Plan and Approach) Roll out identified job redesign activities Consider downstream impacts on other HR processes (see Appendix V(d): Guide to Implications of Job Redesign on HR Processes) 	<p>Evaluate effectiveness of job redesign, and monitor and identify continuous improvement requirements</p> <ul style="list-style-type: none"> Perform post-job redesign implementation analysis to assess effectiveness of interventions through key metrics such as increase in productivity e.g. decrease in manning ratio, sales per employee, value-add per worker (see Appendix V(e): Post-job redesign analysis)



JOB REDESIGN METHODS: Job redesign will be driven by technology adoption, and subsequently followed by non-technology solutions

TECHNOLOGY

A common technology solution is **Intelligent Automation**, which has varying levels of maturity.



Robotic Process Automation (RPA)

Cognitive RPA
(Includes machine learning, natural language processing)

Artificial Intelligence (AI)

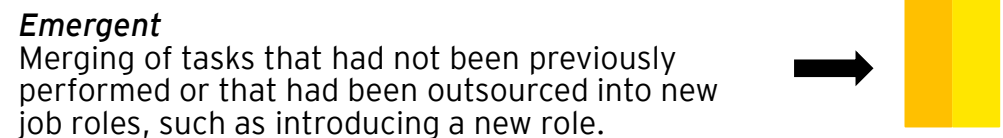
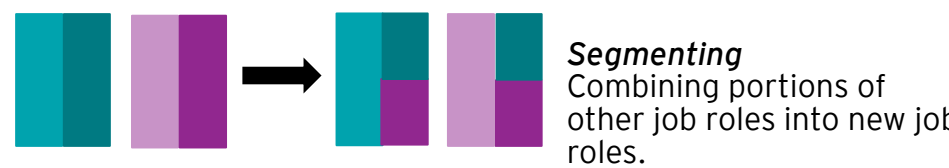
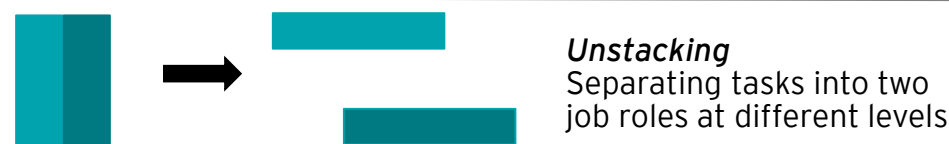
VIRTUAL ASSISTANTS

Other examples of I4.0 technology solutions that can be applied:

Smart Inventory Counting	Predictive Fleet Management	Smart Billing, Costing & Reconciliation
Picker to Parts & Parts to Picker AS/RS	Dynamic Route Optimisation	Connected Trade Platforms
Intelligent Robotic Sorting	Autonomous Last Mile Delivery	Smart Lockers
Predictive & Prescriptive Maintenance	Autonomous Last Yard Delivery	Optimised Documentation

NON-TECHNOLOGY

Non-technology solutions involve **changing the task requirements** of a job role, including adding or removing tasks.





Best practices in talent retention | Guidelines for job redesign

JOB REDESIGN METHODS: Job redesign entails **altering the task requirements of a job role, including adding, modifying or removing tasks** to include more value-adding components or increase productivity. This can be achieved using a combination of job redesign methods as shown below

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 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 (upskilling)
- Enabling of employee succession planning
- Improved job satisfaction from developmental challenges

JOB RECONFIGURATION

Job reconfiguration involves making an adjustment to an employee's existing job scope by **reshaping tasks to achieve new outcomes**, often to refocus the job role to meet changing ways of working and/or company strategy.

Outcomes:

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

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

REDEPLOYMENT

As technology adoption creates a potential redundancy in headcount for certain job roles, companies can reskill and redeploy existing staff to take on different jobs in the same or different function, or even different business segments.

A closer analysis of redeployment opportunities based on skills transferability within the sector reveals three types of mobility of workers:

- **Mobility to newly created job roles:** As technology adoption leads to creation of new job roles, existing workers can be upskilled and reskilled to take on such new positions
- **Vertical mobility:** With automation of manual, repetitive job tasks, workers can be upskilled to take on higher level job roles within the same job function
- **Horizontal / diagonal mobility:** Given the operational and company knowledge that existing workers hold, they can be redeployed to roles across different job functions at the same or higher job levels

RELOCATION

As companies adopt industry 4.0 technologies in a phased manner across different facilities, there is an opportunity to relocate staff to similar jobs but at different locations or work sites to ensure retention and mitigate talent supply challenges in the short-term.

The SME Perspective

Typically, small, medium enterprises in Singapore are more likely to leverage technology as a means to reduce dependence on labour, especially in job roles where the opportunities for value creation are limited. Whereas, large local enterprises and multinational corporations may use a combination of the above strategies to retrain and retain their existing workforce.

Critical success factors for redeployment

Business needs analysis

Business plans and priorities will determine the availability of jobs in the company. It is worthwhile to factor in potential vacancies and demand for additional staff headcount.

Upskilling and reskilling

Upskilling for higher proficiency levels on transferable skills and reskilling for new competencies will set the employee up for success in the new role.

Employee aspirations

The success of the employee in the new role will also be influenced by his/her personal motivations, learning appetite, and willingness to take on new challenges.

Case in point...

DHL: Innovative models of work for recruitment, development and retention of talent in logistics.



DHL believes that, as technology automates many logistics processes, it will also relieve increasing labour shortages, particularly in mature markets, and help boost the performance and retention of existing workers. This shift will **increase the number of technically skilled jobs in logistics** e.g. programmers and managers of robotics fleets. As such, innovative models of work are required to leverage the full potential of people and technology.

Flexible, on-demand workforce models in logistics are becoming commonplace as **sharing economy** principles gain adoption in the enterprise. These models appeal particularly to the younger generations with many Singaporeans today willing to work in a sharing economy model. To fulfil the workforce demand, DHL leverages multiple sources for bringing the requisite talent onboard. Key concepts include **crowd-sourced delivery** (e.g. Postmates) and **on-demand staffing** through gig workers, contract workers, and part-time workers to cover operational peaks with unprecedented speed (e.g. hiring platforms such as Jobdoh).

Innovative redeployment and relocation strategies to tackle natural attrition are becoming commonplace at DHL. Not only does the company **relocate staff** across their different warehouses and worksites, but also across business segments. The **GoGreen business segment** is one such example. Employees in jobs at risk at reassigned and retrained to take on new roles. By 2025, the firm's goal is to certify 80% of its employees as GoGreen specialists and involve them in environmental and climate protection activities. Creating certification programs not only sets standards for service quality, but also boosts employee engagement.

Training and upskilling takes on a novel approach at DHL to prepare existing logistics staff for changing tasks. Employees are **trained on areas of technology**, ensuring they understand and are capable of using physical and software robotics in logistics. Such investments help the company to retain the existing workforce while also extending **retention of older employees**. Through its global **Certified programme**, DHL is focused on cultural change to drive service excellence and quality. Furthermore, on-the-job training, divisional **leadership programs** and **functional training** curricula across all our business units cater to specific development needs.

“ *How companies shape their **people and change management strategies**, plays a key role in responding to external forces of change, and minimising the **downstream impact on staff**.* ”

Best practices in talent recruitment



The better the question. The better the answer.
The better the world works.





In response to the changing talent needs in light of I4.0 adoption, logistics companies can employ innovative means to hire talent.

Establish STRATEGIC PARTNERSHIPS

Strategic partnerships and recruiting alliances will enable logistics companies in Singapore to enhance their recruitment strategies and employer branding. Operational partnerships aimed delivering logistics services across countries can benefit companies, particularly SMEs to raise visibility and offer enhanced development opportunities to employees. Additionally, companies can drive partnerships with other ecosystem stakeholders such as **government agencies, TACs and unions, SME centers** as well as **educational institutes** for employer branding, disseminating information about job openings, offering internships and scholarships etc.

Use INNOVATIVE, scientific approaches to recruitment

With advances in **analytics and artificial intelligence**, hiring practices have also evolved to incorporate more scientific methods to attract, screen, select and place the right candidates into the right roles. Companies can leverage online job portals, social media and other virtual platforms to expedite hiring, and create **talent personas** (see [Guidelines for creating talent personas](#)). to effectively attract and engage potential candidates. **Staffing platforms such as Jobdoh** combine the power of gig economy and AI to match companies with quality freelance workers in minutes, using AI-based pre-screening and profiling exercises¹.

Identify and tap into NON-TRADITIONAL demographics

Research indicates that companies with age, gender, ethnic/cultural diversity are more likely to have above-average profitability. With I4.0 adoption, companies have the potential to target **older workers and other diversity demographics e.g. women** for jobs e.g. MHE operators, drivers, warehouse assistants, and others that were traditionally unattractive to these groups. With robotics and automation, these jobs will transform from being laborious to supervisory. As such, companies can market such new and enhanced employment opportunities to attract a diverse workforce. DHL, for example, is tapping into non-traditional demographics by reaching out to mothers looking to re-join the workforce.

Leverage the GIG ECONOMY

As of 2018, Singapore has 210,800 residents (9.3% of all employed residents) who are 'gig workers'². There is a **huge, untapped opportunity** for companies to leverage these gig workers for hard-to-fill jobs such as drivers, logistics assistants, field sales executives etc. The [Amazon Flex case study](#) is an excellent example of how companies can unlock the full potential of the gig economy for tackling the problem of constant churn among non-PME workers. Gig workers can not only fill non-PME jobs, but also take on niche roles such as UI/UX designer, and temporarily fulfill manpower requirements during peak periods through **on-demand staffing models**.



Creating TALENT PERSONAS and CANDIDATE PROFILES can help to hire the right person for the right job

As companies recruit employees for the evolved job roles, traditional job descriptions may be substituted by more **engaging talent personas to conceptualise the essence of an ideal candidate** and tailor the branding to the target candidate pool. Over time, these talent personas should reflect the key differentiators required for success in the job role, such as:

DRIVERS i.e. goals, motivations, values and interests

TRAITS i.e. personality attributes, strengths and weaknesses

CAPABILITIES i.e. aptitude, knowledge and skills,

PROFESSIONAL ACHIEVEMENTS i.e. recognition, certifications etc.

EXPERIENCES i.e. functional and sector exposure, and work history

Guidelines for defining suitable talent profiles for the various logistics job functions...

Drivers and Traits: Define these characteristic based on company values and culture. It is useful to define ideal personality types based on historical trends of candidates who have been successful in these job functions.

Capabilities and Professional achievements: Identify requisite capabilities and professional achievements based on the future view of job tasks and emerging skills required to perform the job roles. See [Appendix III: Job Dashboards](#) for more details.

Experiences: Define the functional and sector experiences based on company context and operations. The table below depicts typical experiences sought by logistics companies¹.

Warehouse Management & Operations	Transportation Management & Operations	Freight Forwarding & Operations
<ul style="list-style-type: none"> • Sector exposure: Low • Functional experience: Low for non-PME roles; Medium for PME roles 	<ul style="list-style-type: none"> • Sector exposure: Low • Functional experience: Low for non-PME roles; Medium for PME roles 	<ul style="list-style-type: none"> • Sector exposure: High • Functional experience: High
Sales And Customer Service	Logistics Solutioning & Programme Management	Logistics Process Improvement & Information System
<ul style="list-style-type: none"> • Sector exposure: Low • Functional experience: Low for order fulfilment and sales; Medium for business development and service quality analysis roles 	<ul style="list-style-type: none"> • Sector exposure: High • Functional experience: High 	<ul style="list-style-type: none"> • Sector exposure: Medium for process improvement; Low for data and IT roles • Functional experience: High



Creating **TALENT PERSONAS** and **CANDIDATE PROFILES** can help to hire the right person for the right job



Nat the Data Analyst



Capabilities

- Able to build predictive data models
- Able to conduct big data analysis
- Able to code in Python, R, and SQL
- Well-versed with data visualisation tools such as Tableau and Power BI
- Good understanding of machine learning algorithms to create new automated processes



Experiences

- Currently or recently employed in mathematical, statistical or analytical occupation
- Exposure a diverse team preferable



Professional achievements

- Qualification, accreditation or certification in mathematics, economics, computer science, information management, or statistics preferable



Drivers

- Looking to work in a fast-paced environment with accelerated career progression opportunities
- Excited by complex problems
- Believes in life-long learning



Traits

- Research-oriented and resourceful
- Collaborative problem-solver
- Curious and detail-oriented
- Innovative and creative

Exhibit E11: Illustrative talent persona for hiring a Data Analyst role

Case in point...

Amazon Flex: An innovative solution to leverage the potential of gig economy for tackling the problem of constant churn amongst drivers



Amazon recognises the need to tackle the problem of constant of constant churn amongst non-PME workers, especially in mature markets like Singapore, for rapid fulfillment and delivery of orders to meet the ecommerce demand. The company has developed its own **program, systems and processes that leverage workers in the gig economy**. This platform, called Amazon Flex, aims to solve the problem of lack of a sustained supply for the driver roles.

The issue: Given the ever increasing e-commerce market and rising customer demands, Amazon is constantly faced with a shortage of drivers to fulfill customer orders.

The root cause: In recent years, one of the key reasons for this shortage is the high attrition among drivers to ride-hailing platforms such as Grab and Gojek. This is primarily attributed to flexible hours, better wages and lucrative incentives.

The solution: Amazon Flex aims to leverage the potential of the gig economy to resolve this issue. By employing this strategy, Amazon has been able to **optimise its last mile delivery model** by being sensitive to changing worker needs and tapping into the burgeoning trend of the ‘gig economy’.

The execution: The key value propositions of Amazon Flex are **Great earnings, Flexible hours, Be your own boss**. The platform provides workers with flexibility and the

ability to earn between \$18-\$25 an hour delivering parcels for Amazon. Gig workers can use the Amazon Flex app to:

- Set their own schedule
- Scan and load parcels
- Reach their destination using suggested directions
- Check driver earnings for the day

Amazon Flex, also offers special incentives and schemes for driver partners to ensure that they are both accountable and rewarded for their work. These schemes are determined after considering what partners value in terms of ease of signing up, flexibility of hours, wages and technology to deliver products

“
The global gig economy trend has picked up in Singapore. This provides workers with the feeling of being self-employed and having flexible work hours. This has potential applications for last-mile delivery.

Safeguarding employment & employability of workers

How can logistics companies safeguard the employment and employability of logistics workers?



The better the question. The better the answer.
The better the world works.

Safeguarding employment & employability of logistics workers

Strategies such as job redesign, redeployment, relocation and retraining will expose workers to new ways of working, new processes, and new systems. Companies will need to accompany I4.0 adoption with **culture and change management programmes** to enable smooth workforce transitions.

Our findings suggest that, depending on their business and people strategies, logistics companies may adopt different approaches in implementing these strategies. **As companies have limited resources for human capability development, decisions regarding which strategies to implement, and which staff to invest in will depend on:**

- return on investment in enabling such workforce transitions *and*
- individual's performance, future potential and adaptability

Adoption of I4.0 technology solutions will transform the workplace into a technology-rich environment. Across companies, there may be sections of the workforce who are '**digitally naïve**' i.e. have not traditionally been exposed to working with sophisticated technology solutions, for example, drivers. While it is difficult to generalise which job roles these workers reside in today, going forward, it is critical for business leaders and HR to identify such 'digitally naïve' workers and roll out targeted programmes and initiatives to facilitate smooth transition for them. For example, training drivers to operate and read interfaces for dynamic route optimisation, AR-powered assisted driving tools, augmented dashboards etc.

In our analysis, two workforce groups emerged as requiring special attention going forward.

1. Workers in job roles that will undergo displacement or be redesigned

From the job impact analysis, it is evident that I4.0 adoption will impact some job roles more than others. High-impact job roles are those that will undergo displacement or be redesigned. Displaced job roles will either be replaced by new job roles and/or technology or converge with other job roles. Redesigned job roles will be subjected to a change in work processes and systems. Going forward, this will affect the employment capacity of such high-impact job roles. Workers currently performing these job roles will need to be re-trained, re-deployed or re-located to safeguard their employment and employability.

2. Older workers

As companies tend to have limited resources to invest in human capital development, they sometimes need to take tough decisions regarding which staff to invest in. Sector insights suggest that there are two preconceived notions regarding older workers (more than 55 years of age), which puts them at the bottom of the future capability-building pipeline.

- There is a perception, that all other things being equal, the return on investment in retraining and retaining older workers will be lower, as they will not continue to be a part of the workforce for long
- There is a perception that older workers will be slow in adapting to I4.0 and ramping up on skills needed in the future

Such perceptions, coupled with the fact that older workers currently constitute a significant proportion of the workforce, have encouraged us to take a closer look at the impact on this workforce group.

Safeguarding the employment & employability of workers in job roles that will potentially undergo displacement or be redesigned



Safeguarding employment & employability of logistics workers

Workers occupying job roles that will potentially undergo displacement or be redesigned

I4.0 adoption will have a significant impact on logistics workers in high-impact job roles i.e. job roles that will undergo displacement or be redesigned. Before we discuss the strategies to safeguard the employment and employability of these workers, it is important to understand how these high-impact job roles will evolve.

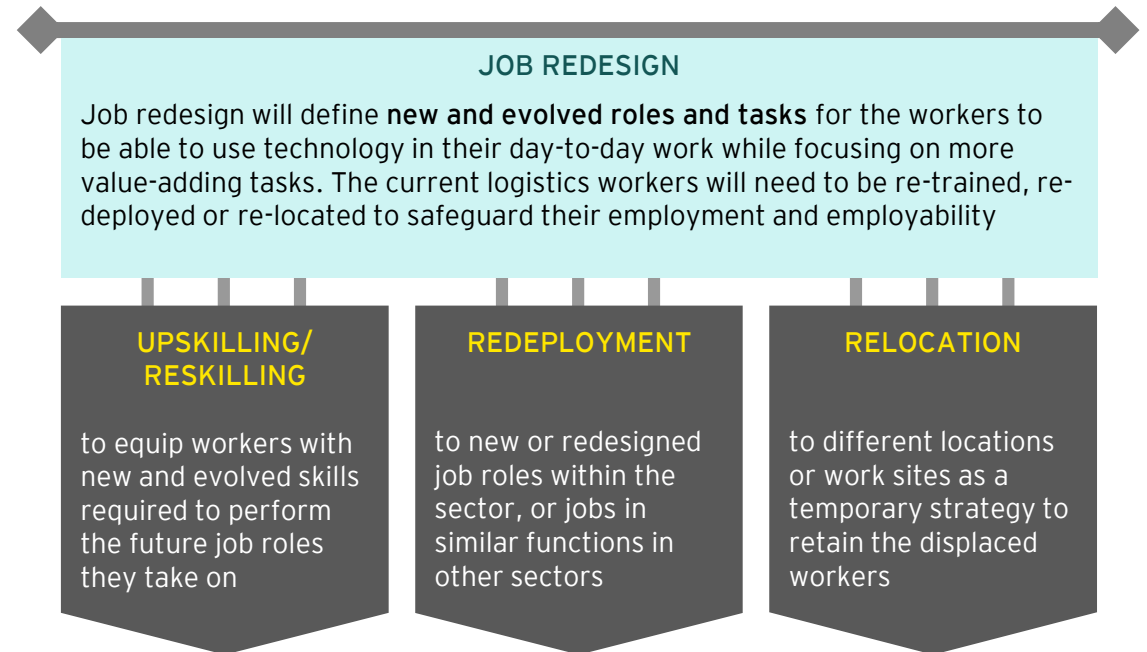
What will happen to the JOB ROLES that will undergo displacement or be redesigned?

Following I4.0 adoption, companies will need to re-assess their ways of working and organisation of jobs to achieve new and enhanced outcomes. A **function-wide or company-wide job redesign effort may be required to re-allocate tasks and responsibilities**. As such, the high-impact job roles will be:

- **REPLACED by technology:** For example, implementation of an automated storage and retrieval system (AS/RS) may replace the job of a traditional warehouse picker
- **REPLACED by new job roles:** For example, implementation of AS/RS may create a new role such as AS/RS operator or I4.0 maintenance specialist
- **CONVERGE with other job roles:** For example, implementation of smart inventory counting system and AS/RS will converge the job roles of the warehouse coordinator and supervisor, as some parts of these job roles are automated, and the oversight and supervision requires a single job role
- **Experience a CHANGE IN WORK PROCESSES AND SYSTEMS:** For example, implementation of smart inventory counting system and AS/RS will create a new work environment for a warehouse manager, who will now need to be familiar with the operation and management of these systems

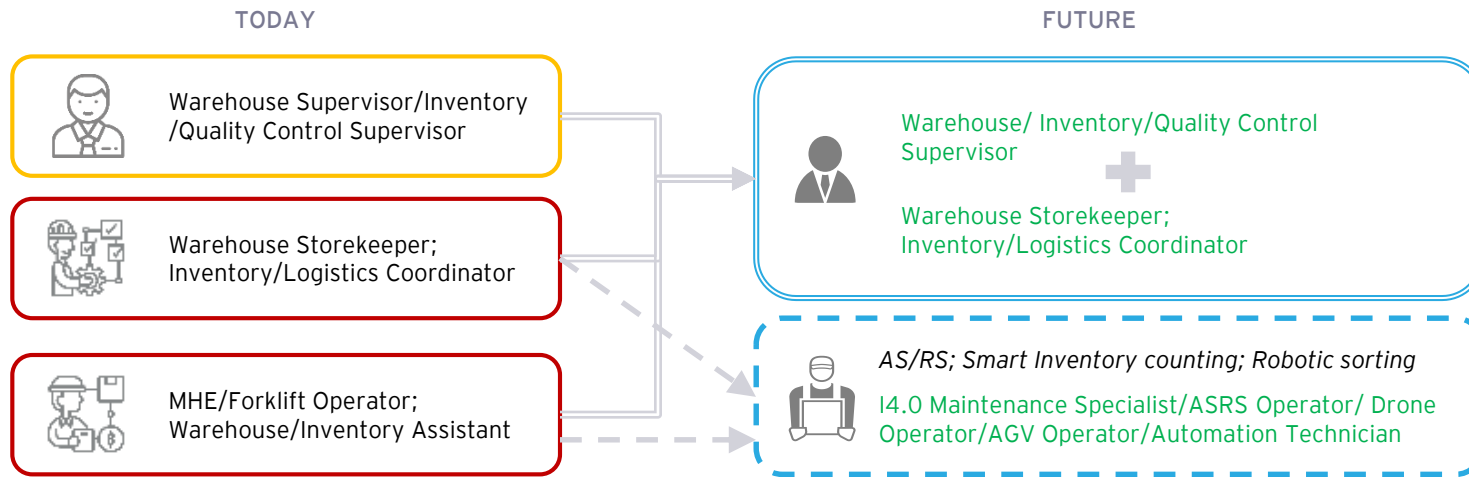
Overall, assuming the same output levels and business environment, technology implementation may result in reduced headcount requirements for the new and redesigned job roles.

What will happen to the WORKERS in job roles that will undergo displacement or be redesigned?



Safeguarding employment & employability of workers in roles that will undergo displacement or be redesigned

Warehouse Management and Operations



JOB REDESIGN and UPSKILLING/RESKILLING will prepare workers to take on the future job roles

Dashboards for future view of job roles:

- [MHE/Forklift Operator job role](#)
- [Warehouse Storekeeper](#)
- [Warehouse Supervisor](#)

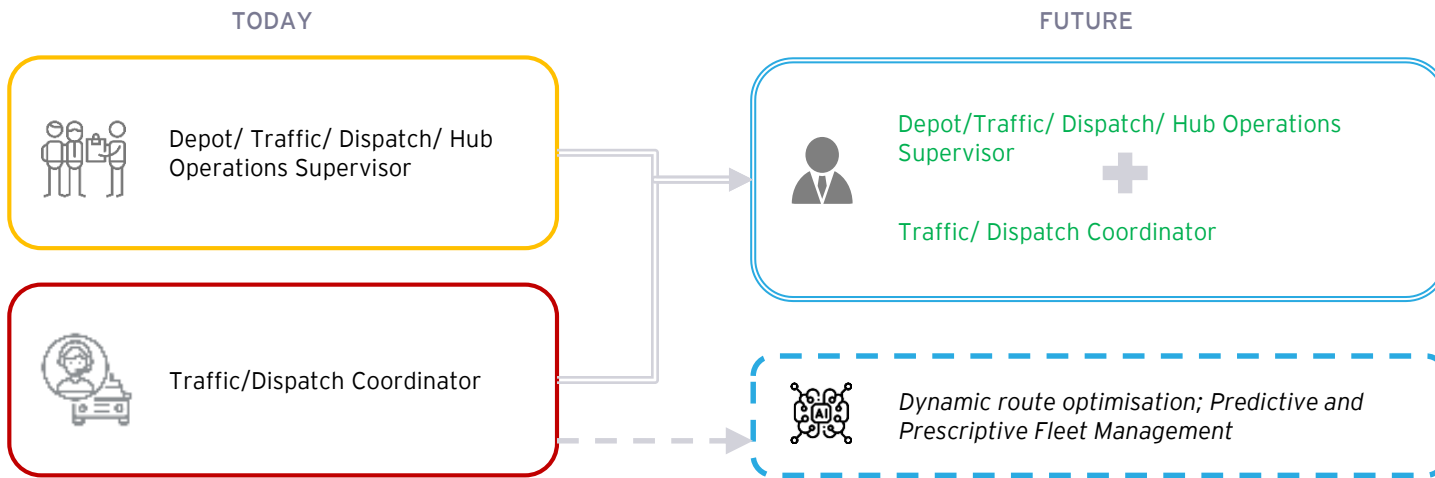
Dashboard for new job role

- [I4.0 Maintenance Specialist job role](#)

Job roles that will undergo displacement	Redeployment opportunities within the logistics sector			Redeployment opportunities outside the logistics sector
	Mobility to newly created job role	Vertical mobility within the same function	Horizontal/diagonal mobility to different job function (top 3)	
MHE/Forklift Operator; Warehouse/Inventory Assistant	<ul style="list-style-type: none"> I4.0 Maintenance Specialist/ASRS Operator/ Drone Operator/AGV Operator/Automation Technician 	<ul style="list-style-type: none"> Warehouse Supervisor / Inventory Control Supervisor / Quality Control Supervisor 	<ul style="list-style-type: none"> Project Supervisor Rigger / Signaller / Lifting Supervisor Dispatch Operator / Transport Operator / Last Mile Delivery Driver / Container Driver 	<ul style="list-style-type: none"> Mobility to similar job functions or job roles requiring similar skills in other sectors
Warehouse Storekeeper; Inventory/ Logistics Coordinator	<ul style="list-style-type: none"> I4.0 Maintenance Specialist/ASRS Operator/ Drone Operator/AGV Operator/Automation Technician 	<ul style="list-style-type: none"> Warehouse Supervisor / Inventory Control Supervisor / Quality Control Supervisor 	<ul style="list-style-type: none"> Health, Safety and Environmental Coordinator Project Supervisor Lifting Supervisor 	

Safeguarding employment & employability of workers in roles that will undergo displacement or be redesigned

Transportation Management and Operations



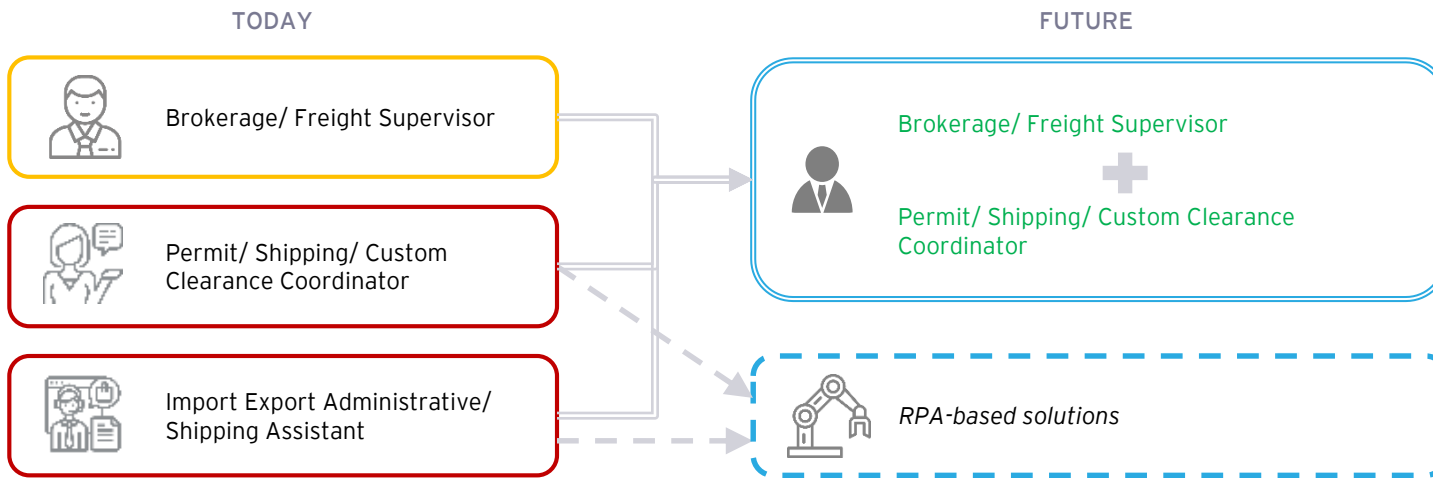
JOB REDESIGN and UPSKILLING/RESKILLING will prepare workers to take on the future job roles

Dashboards for future view of job roles:

- Traffic/ Dispatch Coordinator
- Depot/ Traffic/ Dispatch/ Hub Operations Supervisor

Job roles that will undergo displacement	Redeployment opportunities within the logistics sector		Redeployment opportunities outside the logistics sector
	Vertical mobility within the same function	Horizontal/diagonal mobility to different job function (top 3)	
Traffic/ Dispatch Coordinator	<ul style="list-style-type: none"> Depot Supervisor / Traffic Supervisor / Dispatch Supervisor / Hub Operations Supervisor + Traffic/ Dispatch Coordinator Traffic Controller / Transport Officer / Line Haul Operations Officer 	<ul style="list-style-type: none"> Warehouse Supervisor / Inventory Control Supervisor / Quality Control Supervisor Health, Safety and Environmental Coordinator Project Supervisor 	<ul style="list-style-type: none"> Mobility to similar job functions or job roles requiring similar skills in other sectors

Safeguarding employment & employability of workers in roles that will undergo displacement or be redesigned



JOB REDESIGN and UPSKILLING/RESKILLING will prepare workers to take on the future job roles

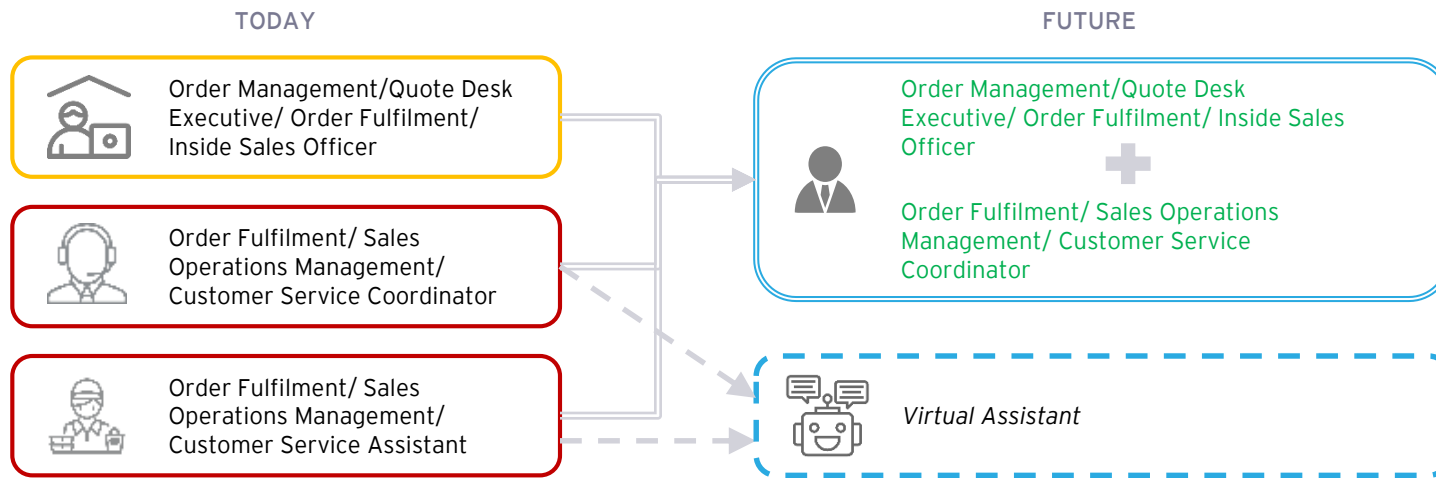
Dashboards for future view of job roles:

- Import Export Administrative/ Shipping Assistant
- Permit/ Shipping/ Custom Clearance Coordinator
- Brokerage/ Freight Supervisor

Job roles that will undergo displacement	Redeployment opportunities within the logistics sector		Redeployment opportunities outside the logistics sector
	Vertical mobility within the same function	Horizontal/diagonal mobility to different job function (top 3)	
Import Export Administrative/ Shipping Assistant	<ul style="list-style-type: none"> • Brokerage Supervisor/ Freight Supervisor + Permit/ Shipping/ Custom Clearance Coordinator • Freight Officer • Incoming Quality Coordinator/ Tally Assistant 	<ul style="list-style-type: none"> • Depot Supervisor/ Traffic Supervisor/ Dispatch Supervisor/ Hub Operations Supervisor • Order Management Executive/ Quote Desk Executive/ Order Fulfilment Officer/ Inside Sales Officer • Dispatch Operator/ Transport Operator/ Last Mile Delivery Driver / Container Driver 	<ul style="list-style-type: none"> • Mobility to similar job functions or job roles requiring similar skills in other sectors
Permit/ Shipping/ Custom Clearance Coordinator	<ul style="list-style-type: none"> • Brokerage Supervisor/ Freight Supervisor + Permit/ Shipping/ Custom Clearance Coordinator • Freight officer • Incoming Quality Coordinator/ Tally Assistant • Freight Inspector/ Incoming Quality Inspector 	<ul style="list-style-type: none"> • Depot Supervisor/ Traffic Supervisor/ Dispatch Supervisor/ Hub Operations Supervisor • Order Management Executive/ Quote Desk Executive/ Order Fulfilment Officer/ Inside Sales Officer • Traffic Controller/ Transport Officer/ Line Haul Operations Officer 	

Safeguarding employment & employability of workers in roles that will undergo displacement or be redesigned

Sales and Customer Service



JOB REDESIGN and UPSKILLING/RESKILLING will prepare workers to take on the future job roles

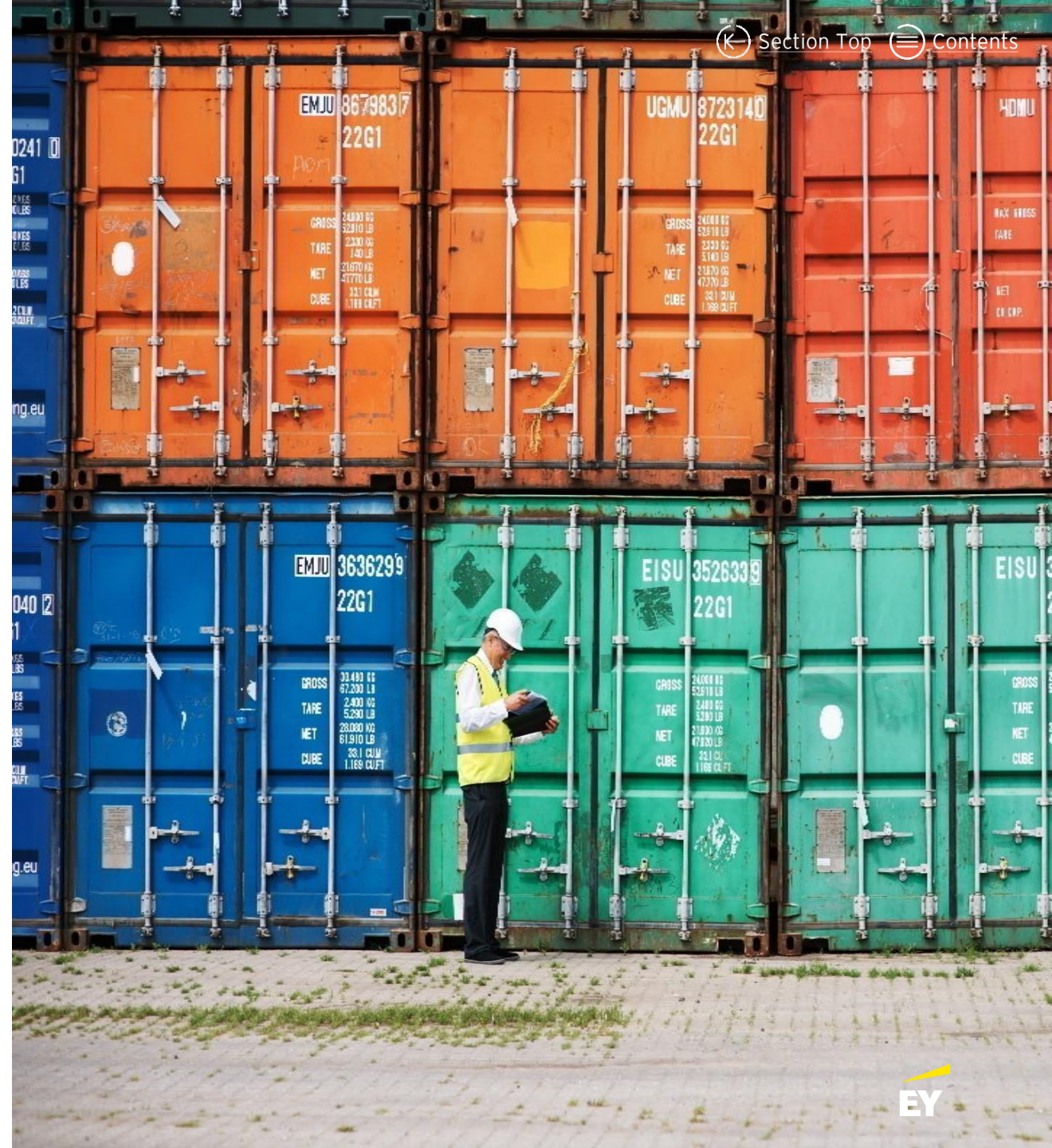
Dashboards for future view of job roles:

- Order Fulfilment/ Sales Operations Management/ Customer Service Assistant
- Order Fulfilment/ Sales Operations Management/ Customer Service Coordinator
- Order Management/ Quote Desk Executive/ Order Fulfilment/ Inside Sales Officer

Job roles that will undergo displacement	Redeployment opportunities within the logistics sector		Redeployment opportunities outside the logistics sector
	Vertical mobility within the same function	Horizontal/diagonal mobility to different job function (top 3)	
Order Fulfilment/ Sales Operations Management/ Customer Service Assistant	<ul style="list-style-type: none"> • Order Management Executive/ Quote Desk Executive/ Order Fulfilment Officer/ Inside Sales Officer + Coordinator • Field Sales Executive/ Key Account Executive/ Sales Operations Management Specialist 	<ul style="list-style-type: none"> • Freight Officer • Brokerage Supervisor/ Freight Supervisor • Customer Service Officer/ Service Quality Analyst 	<ul style="list-style-type: none"> • Mobility to similar job functions or job roles requiring similar skills in other sectors
Order Fulfilment/ Sales Operations Management/ Customer Service Coordinator	<ul style="list-style-type: none"> • Order Management Executive/ Quote Desk Executive/ Order Fulfilment Officer/ Inside Sales Officer + Coordinator • Field Sales Executive/ Key Account Executive/ Sales Operations Management Specialist 	<ul style="list-style-type: none"> • Customer Service Officer/ Service Quality Analyst • Brokerage Supervisor/ Freight Supervisor • Logistics Data Management Coordinator/ Logistics Data Entry Coordinator 	



Safeguarding the employment & employability of older workers



14.0 adoption has a downstream impact on older workers, amongst others

A common opinion shared by sector practitioners is that, impact on older workers is attributed more to physical fitness, health, and the individual's lifestyle choices aspirations, and less to technology adoption.

14.0 adoption will empower older workers to perform traditionally laborious **non-PME jobs with some bit of training**, while workers in PME jobs will require upskilling and reskilling to become future-ready.

For PME job roles

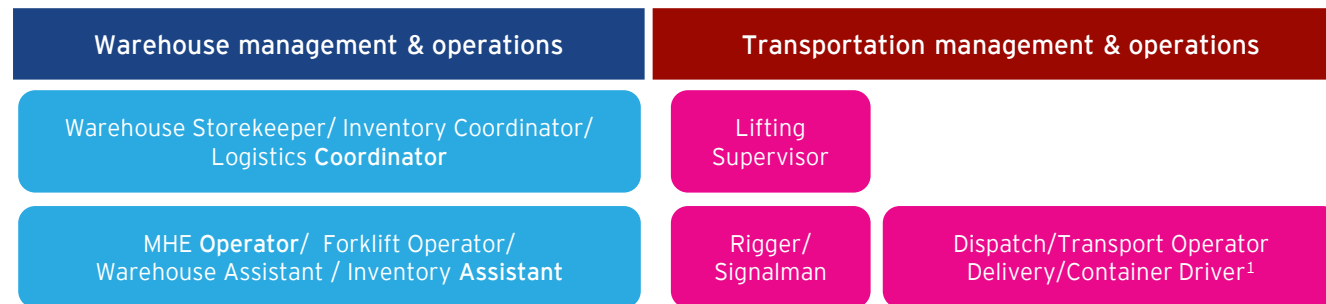
Older workers experience a **similar impact as all other workers** as the job roles undergo a change in job tasks with technology adoption.

THE IMPACT: Workers in these jobs will **require upskilling and/or reskilling** to continue to be an effective contributor as the job roles undergo redesign or change incrementally.

For non-PME job roles

Generally speaking, older workers in these jobs will experience a **similar impact as all other workers**. In fact, technology will augment performance of manual, labour-intensive and heavy-lifting tasks through use of AS/RS, automated forklifts, assistance robots, AGVs, drones, etc. This will **empower older workers to perform the traditionally laborious job roles**, with some bit of reskilling and upskilling.

THE IMPACT: 7 out of 11 non-PME job roles are already at a risk of displacement or convergence, implying a potential headcount reduction. Additional considerations including **ROI on retention** and **physical fitness and health**, exacerbate the risk of displacement of older workers from these jobs, especially in warehousing and transportation (see [Exhibit E12](#)).



¹ For cases where drivers are expected to double-hat as delivery assistants for lifting and transferring goods to warehouses or stores.

Exhibit E12: Jobs with a high risk of displacement for older workers

Companies can leverage the experience and expertise of older workers

Employment opportunities for older workers in the logistics sector: Given Singapore’s aging population, we infer that older workers will continue to constitute a major proportion of the total logistics workforce. Hence, efforts need to be made to ensure that the sector derives the best value from these employees, while simultaneously equipping them to contribute effectively. There are a range of **jobs with a high absorptive capacity where older workers may be employed in the future**, given their **experience, intuition, and tacit knowledge of company’s operations and ways of working**. These include:

1

REDESIGNED / NEW I4.0 JOB ROLES

Technology will automate or assist the performance of traditionally labour-intensive tasks, thus enabling older workers to perform these redesigned job roles with ease. Workers can also be trained to take on new positions such as **I4.0 Maintenance Specialist/ ASRS Operator**.

Example: At DHL, the oldest logistics assistant is 78 years old, technology enablement having reduced the physical demands of this role.

2

HSE, COMPLIANCE & MENTORING ROLES

Given their **knowledge of operations and processes**, older workers will be well-suited for monitoring workplace safety, health and compliance activities. Additionally, given their experience, older workers can take on training and mentoring roles.

Example: DB Schenker leverages the experience of older workers through lunch-and-learn (knowledge transfer) sessions.

3

SUPERVISORY ROLES

Older workers will be able to take on supervisory or team lead roles within respective functions which would require them to **oversee and monitor operations** along the logistics value chain.

Example: StorBest leverages the strong work ethic and professionalism - traits commonly found in older workers for supervisory roles.

4

ADVISORY/CONSULTING ROLES

Going forward, older workers will be able to utilise their experience accumulated over the years to perform **process improvement and consulting or advisory roles**.

Example: At Yang Kee, older workers find mobility in the form of consulting or business development roles, allowing them to utilise their experience.

5

SALES AND CUSTOMER SERVICE ROLES

Lower physical demands, **experience and knowledge of operations and customers** make older workers well-suited for sales and customer service roles.

Example: At ParcelSanta, older workers generally take on customer service, compliance, tracking and monitoring roles.

Integrating silos @ Allied

Thomas Chee, now in his mid-fifties, is the Business Development Manager at Allied Container. He has an interesting story to share where he was able to tap on his experience and **initiate an innovative technology solution to integrate siloed operations** in the company. He started off as a navy officer before assuming many different positions across the logistics value chain. His experience spans across different companies (including Winspec Group, WRIST Far East, BATAMINDO Shipping & Warehouse, Ceva Logistics, etc.) and he has amassed great, **diverse experiences in the logistics sector** which brings him to where he is today.

Turning a dream into reality

Thomas understands the **importance of keeping up with technology to remain competitive**, especially for small-medium enterprises, where resources are limited. Drawing from his varied experience with larger companies that operate control towers, he **saw an opportunity to enhance operations** within Allied. "There must be a better way of doing this...", says Thomas, referring to integration of information flows across various departments.

He pursued his dream to integrate all the systems across the logistics value chain to allow intelligent flow of information in the company. He proposed the idea of the integrated system and **convinced his MD** that "with this technology we can compete with other companies."

Thereafter, the idea was taken forward - vendors pitched solutions to the company and Thomas and his team also **entered the Singapore Logistics Association Challenge** in 2018. The company has garnered support from Enterprise Singapore to build the integrated system. User acceptance testing will be conducted over the next 1-2 months, and they expect the system to be rolled out by end of 2020.

Experience is the best teacher

When asked what helped him throughout this journey, Thomas says, "I was there (to experience it), and I understand the pain points". He strongly believes that his success is attributed to his experiences and the fact that he **leads with example**.

Thomas has not stopped challenging himself. He has **taken on the role to design** the integrated system and work with the vendors to oversee implementation in accordance to the design. "I know what results I want to see, and what will be useful for the customer", says Thomas. "Its not just about tech, it's also about the attitude to think out of the box and go through the hard time first in garnering that experience"

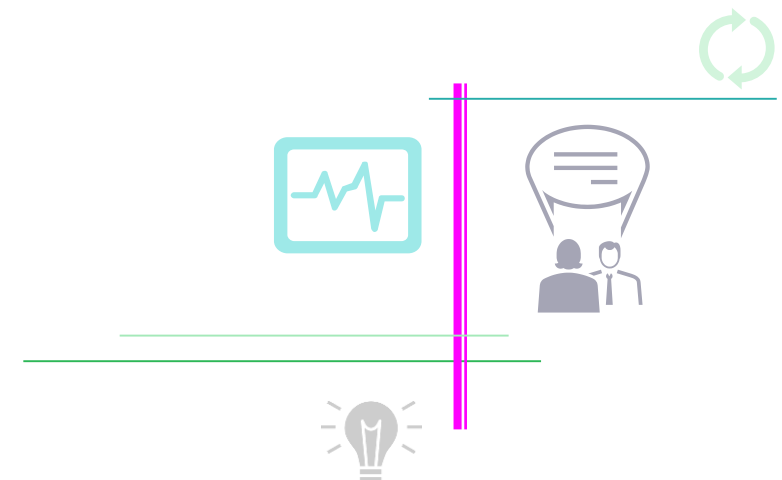
Today, Thomas is **also a lecturer** in the Singapore Logistics Association and Nanyang Polytechnic, where he is determined to **tap on his experience to educate the next generation**. "Mindset shift is required both ways - from older workers as well as companies. We need to identify the people with useful experiences and give them the opportunity to play a dignified role".



'Buddying up' to upskill on technology usage @ StorBest

StorBest values workers for their loyalty, work ethic and professionalism. Amidst the company's efforts for going digital, "we try to maintain a good diversity of younger and older employees to complement each other", says **Timothy Fang, Business Manager, StorBest-SSHK Cold Logistics Pte Ltd.** He shared the example of one of their long-time employees, Ben (name changed).

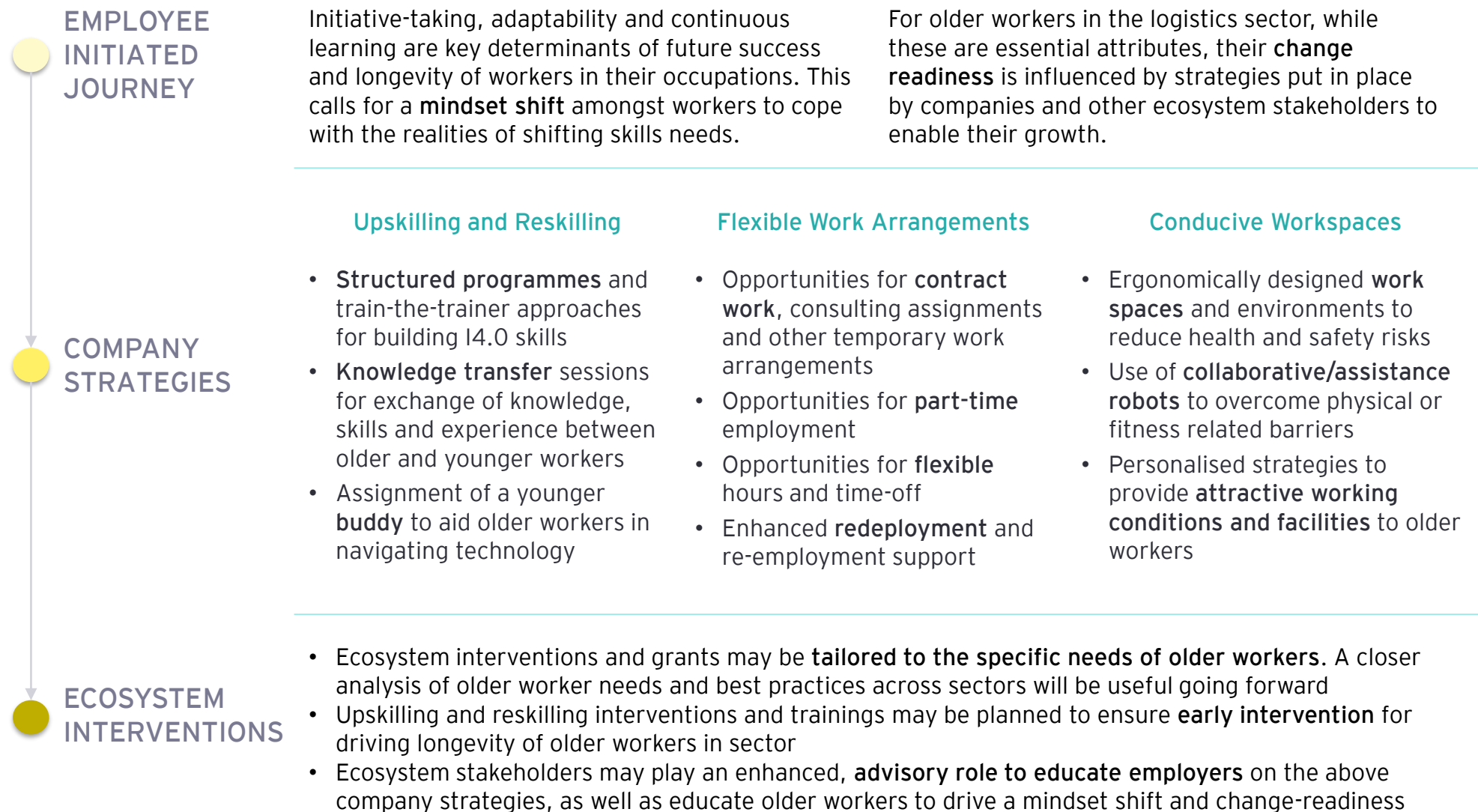
With the integration of in-house management systems, Ben had to move from paper-based activities to digital documentation, processing, and planning. StorBest used a **buddy system**, pairing Ben up with a younger employee for cross-training. Ben was able to share his **operational experience** with the younger employee, while the younger employee showed him how to navigate through **system complexities**. Both workers made a good team and mutually added to their skillsets over time.



A mindset shift is required to prepare older workers for I4.0 adoption

A **mindset shift** is necessary, not only amongst business leaders to provide enhanced opportunities to older workers for contributing to business, but also amongst older workers to take initiative and adapt to changing times.

Going forward, there is a **need for sustained efforts to upskill, reskill, and provide a conducive work environment for older workers** so that the sector can continue to derive the best value from this workforce group, while simultaneously equipping them to contribute effectively to business.



MANPOWER CAPABILITY-BUILDING ECOSYSTEM



Singapore has an expansive manpower capability-building ecosystem for logistics

The logistics manpower capability-building ecosystem comprises ecosystem stakeholders, interventions and grants, and training programmes¹. This ecosystem enables individuals and companies to keep pace with latest trends and technological innovations, and remain competitive amidst local and global disruptions in the dynamic logistics sector.




ECOSYSTEM STAKEHOLDERS

Ecosystem stakeholders refer to all parties that enable logistics companies and individuals to build technology and manpower capabilities

- 7  **Government agencies** that support and develop the logistics sector
- 7  **Institutes of higher learning** that provide training programmes
- 71  **Private education providers** that provide training programmes
- 16  **Trade associations and chambers (TACs) and SME Centres** that drive excellence and growth in the sector
- 4  **Unions** that actively support the well-being and growth of employees

GOVERNMENT INTERVENTIONS & GRANTS

Government interventions and grants refer to all schemes intended to support logistics companies and individuals to prepare for I4.0 adoption

- 28  **Unique interventions/grants for companies** that support I4.0 logistics capability building through technology adoption, manpower upskilling, and recruitment and career support
- 13  **Unique interventions/grants for companies and individuals** that seek to build individual skills and competencies through upskilling, reskilling, and placement support.
- 4  **Unique interventions/grants for individuals** that seek to build individual skills and competencies through upskilling, reskilling, and placement support.

TRAINING PROGRAMMES

Upskilling and reskilling courses provided by education institutes to enable fresh graduates and mid-careerists to build requisite future skills

- 91  **New entrant full-time training programmes** for students looking to join the logistics sector
- 463  **Employee full-time training programmes** for mid-careerists looking to join the logistics sector
- 1007  **Employee part-time training programmes** for mid-careerists looking to join the logistics sector

There are a host of government interventions and grants available to logistics companies

Our analysis reveals that manpower capability-building interventions and grants primarily fall under three categories as shown below¹:

Packaged Transformative	Manpower Upskilling	Recruitment and Career Support
<p>Interventions/grants that drive partnerships between agencies and/or sector experts, making them a low-risk investment for companies to adopt technologies, upskill manpower and/or redesign job roles. The grants fall into the following 3 subcategories:</p> <ul style="list-style-type: none">• Technology-centric interventions supporting digital innovation• Manpower-centric interventions supporting people capability building• Market-centric interventions supporting companies to penetrate foreign markets	<p>Interventions and grants that aim to fully or partially reimburse employee training fees and expenses incurred by companies. We identified 15 such grants under 2 subcategories:</p> <ul style="list-style-type: none">• Interventions which support upskilling for technical or business skills• Interventions which support upskilling for industry 4.0 skills or information and communications technology (ICT) skills	<p>Interventions and grants that aim to provide full or partial employee salary support to companies for employing candidates in a specific age group. We identified 9 such grants for employment of 4 employee groups:</p> <ul style="list-style-type: none">• Young talent: fresh graduates or less than three years of work experience• Mid-careerists: employees with 10-20 years work experience and less than 50 years old• Mature/older workers: employees more than 50 years old• General: employees from all age groups

There are a host of government interventions and grants available to logistics companies

Our analysis reveals that manpower capability-building interventions and grants primarily fall under three categories as shown below¹:

Packaged Transformative	Manpower Upskilling	Recruitment and Career Support
<ul style="list-style-type: none"> Enterprise Development Grant - Includes market assessment and market readiness (ESG) ★ Productivity Solutions Grant (ESG) ★ SMEs Go Digital Programme (IMDA) ★ Industry 4.0 Human Capital Initiative (IHCI) Enabler Programme (SBF/ WSG) ★ Digital Transformation Innovation Programme (SSG) ★ Capability Transfer Programme (WSG) ★ Redeployment Professional Conversion Programme and Redeployment Programme (WSG) ★ 	<ul style="list-style-type: none"> Training Grant for Company (EDB) ★ ASEAN Leadership Programme (ALP) (ESG) ★ Business China Advanced Leadership Programme (BCALP) (ESG) ★ Overseas Market Workshop (OMW) (ESG) ★ Study Awards for International Business (ESG)★ Company Led Training (IMDA) ★ Critical Information Technology Resource Programme Plus (IMDA) ★ Tech Immersion & Placement (IMDA) ★ Advanced Executive Programme in Supply Chain Innovation (SSG) ★ Advanced Manufacturing Lead Programme (SSG) ★ Internationalisation Skills (iSkills) Talent Development Programme (SSG) ★ Mid-Career Enhanced Subsidy (SSG) ★ Operations Management Innovation Programme (OMNI) (SSG) ★ 	<ul style="list-style-type: none"> Tech@SG (EDB) ★ Global Ready Talent (GRT) (ESG) ★ Singapore Govt-Industry Scholarship (SGIs) ★ Wage Credit Scheme (IRAS) ★ Senior Worker Support Package (MOM) ★ Additional SkillsFuture Credit Mid-Career Support (SSG) ★ Mid Career Support Package (SSG) ★ Mid-Career Enhanced Subsidy (SSG) ★ Work-Study Certificate (SSG) ★ Work-Study Programmes (SSG) ★ Career Support Programme (WSG) ★ Career Trial (WSG) ★ Hiring Incentive (WSG) ★ P-Max Programme (WSG) ★ Professional Conversion Programme (WSG) ★ SGUnited Traineeships Programme for Trainees (WSG) ★ Work-Life Grant (WSG) ★

There are numerous training programmes for logistics workers

Our analysis reveals that, the IHLs and private training providers provide numerous training programmes for new entrants and in-service personnel to acquire skills and competencies required for various job roles in the logistics sector.

- **Training programmes for new entrants:** There are 91 training programmes that equip new entrants with skills and knowledge for the specific job roles in the sector at their respective entry level.
- **Training programmes for in-service employees:** For in-service employees who work in the logistics sector and who aspire to take on more challenging roles at work, there are 463 full-time and 1007 part-time training programmes that enable them to acquire the relevant skills. The breakdown of these programmes by logistics functional track is shown below

Functional Tracks	Training programmes for in-service employees		
	463 full-time training programmes	1007 part-time training programmes	Total
Warehouse Management and Operations	96	313	409
Transportation Management and Operations	105	403	508
Freight Forwarding and Operations	79	149	228
Sales and Customer Service	80	14	94
Logistics Solutioning and Programme Management	66	113	179
Logistics Process Improvement and Information System	37	15	52

WAY FORWARD



Each company's digital transformation journey is unique

Going forward, companies need to first identify their current I4.0 maturity stage. The next steps and future focus will be determined based on whether the company is a Digital Novice, a Digital Player or a Digital Leader.

- **Define your I4.0 strategy:** At the outset, companies will need to define a strong technology vision and roadmap. This needs to be supported and driven by a strong, digital leadership
- **Build your business case for I4.0:** Define a solid business case by focusing on specific business problems to solve, and define the expected value creation opportunities
- **Assess current state:** Assess the current state of your processes, systems, and data, software and hardware infrastructures. This will help you to identify your company archetype based on your digital maturity level or the digitalisation stage you are at
- **Define future focus:** Depending on your current state and company archetypes, identify next steps to progress in your digitalisation journey

For typical characteristics that define each of the company archetypes, see next page. The jobs and skills impact assessment, talent management strategies and ecosystem support too will need to be tailored to company needs.



Actions for way forward and response strategies will need to be tailored to company needs

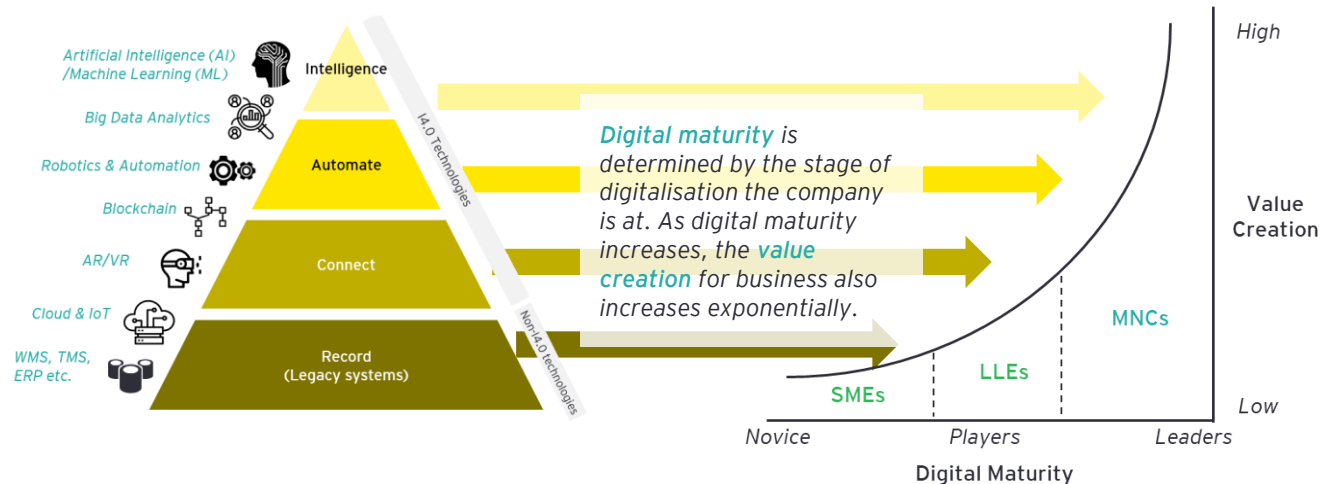
STEP 1 EMBARK ON DIGITAL TRANSFORMATION



- **I4.0 strategy:** Lacks a strong technology vision, roadmap and leadership
- **Business case:** Limited need for I4.0, low economies of scale and limited financial resources do not justify return on investment (ROI)
- **Current state:** Basic systems e.g. WMS, TMS, CRM, ERPs are in place to capture data digitally
- **Future focus:** Mindset shift for I4.0 adoption; process re-engineering and systems integration; setting up automated data capture mechanisms using cloud and IoT; and building requisite software and hardware infrastructure

- **I4.0 strategy:** Defined technology vision and roadmap with aligned leadership
- **Business case:** Defined business benefits supported by attractive ROI on account of output, scale, financial resources, government support
- **Current state:** Real-time data capture capability using IoT, cloud, blockchain etc.; automated processes and operations; actively leveraging point solutions and experimenting with proof of concept solutions for business value creation
- **Future focus:** Gradual move to completely autonomous operations, where necessary; embedding 'intelligence' into processes and operations; building technology and people capability to move to the next stage of the digitalisation journey

- **I4.0 strategy:** Technology strategy aligned and integrated with corporate vision and business strategy, spearheaded by a strong leadership
- **Business case:** Purpose-led I4.0 transformations driving exponential gains and competitive advantage; ROI justified on account of output, scale, financial resources, government / global business support
- **Current state:** Enterprise-wide integrated logistics I4.0 solutions leveraging big data and artificial intelligence for predictive and prescriptive capabilities; high integration with business needs and operations
- **Future focus:** Large-scale digital transformations; accelerated research and development; customised and innovative solutions to stay ahead of the curve






The digitalisation journey for various company archetypes

Digital Novice: Sets off at the 'record' stage; has digital capabilities in pockets to capture data digitally; typically SMEs

Digital Player: Fully implemented 'record' capabilities and currently at 'connect' or 'automate' stage and leveraging technologies such as IoT, cloud, robotics and process automation; typically LLEs or MNCs

Digital Leader: Advanced I4.0 capabilities and 'intelligence' infused in their processes and business operations through artificial intelligence and predictive capabilities; typically large MNCs

Actions for way forward and response strategies will need to be tailored to company needs

	 DIGITAL NOVICE	 DIGITAL PLAYER	 DIGITAL LEADER
STEP 2 ASSESS IMPACT ON JOB ROLES AND SKILLS	<ul style="list-style-type: none"> • Scale of impact: Minimal impact on job roles as operations are largely manual requiring high human intervention; high or consistent demand for manpower across all existing job roles • Impact on job roles: Need for personnel to operate legacy management systems • Impact on skills: Need for basic digital skills for administering legacy management systems e.g. technology usage, digital acumen, data entry • I4.0 job roles: Outsourced or contract hires, if any; high dependence on technology vendors for future focus activities 	<ul style="list-style-type: none"> • Scale of impact: Differing impact on job roles across different functions, depending on type of I4.0 solutions implemented; lower headcount required with automation • Impact on job roles: Potential convergence of job roles on account of automation of manual, repetitive job tasks may lead to excess manpower; augmentation of job roles with high value-adding tasks; high human-machine collaboration • Impact on skills: Need for I4.0 skills e.g. technology application, automation management, data analytics, robotics, software and hardware skills • I4.0 job roles: In-house I4.0 personnel to support solution development, customisation, and maintenance; high collaboration with external vendors 	<ul style="list-style-type: none"> • Scale of impact: Organisation-wide impact on job roles on account of large scale I4.0 transformations; huge potential for reduction in headcount with advanced I4.0 capabilities • Impact on job roles: Displacement and/or convergence of job roles on account of automation, artificial intelligence, self-learning algorithms, resulting in excess manpower and a lean workforce with niche talent capabilities • Impact on skills: Need for agile workforce with innovation, technology roadmapping, business advisory, technology risk management, cross-functional skills. to drive holistic transformations • I4.0 job roles: I4.0 talent embedded within operations teams to drive synergies in technology solutions and operations
STEP 3: DEVISE TALENT MANAGEMENT STRATEGIES	<ul style="list-style-type: none"> • Drive a mindset shift, among leaders as well as the mass employee population, to kick-start I4.0 adoption • Upskill employees on digital leadership and technology-savviness 	<ul style="list-style-type: none"> • Job redesign to drive productivity improvements through technology and value-adding tasks • Upskilling and reskilling to equip job holders to perform new and enhanced job roles • Redeployment or relocation of excess manpower to other job roles • Relocation of subject-matter-experts and leaders to other parts of the business • Recruitment for I4.0 job roles • Culture and change management 	
STEP 4 GARNER ECOSYSTEM SUPPORT	<ul style="list-style-type: none"> • Interventions to support I4.0 adoption e.g. Enterprise Development Grant (ESG), IHCI (WSG), SMEs Go Digital Programme (IMDA) etc. • Interventions to build digital leadership capabilities in business owners and help them kickstart their I4.0 journey e.g. Company-Led Training Programme (IMDA) 	<ul style="list-style-type: none"> • Job redesign interventions e.g. Inclusive Growth Programme (e2i), Job Redesign under Productivity Solutions Grant (WSG), etc. • Manpower upskilling interventions like Training Grant for Company (EDB), Tech@SG (EDB), Company Led Training, (IMDA) Professional Conversion Programme (WSG), SkillsFuture Enterprise Credit (SSG), etc., 	<ul style="list-style-type: none"> • Talent attraction and recruitment interventions e.g. Career Trial (WSG), Work-study Programme (SSG), Career Support Program (WSG) to tap on the wider local workforce pool and find a talent fit • Relocation grants to aid in ease of hiring from overseas talent pool • Collaborative ventures to partner with IHLs and training providers to build and groom the necessary talent supply with for latest technology innovations

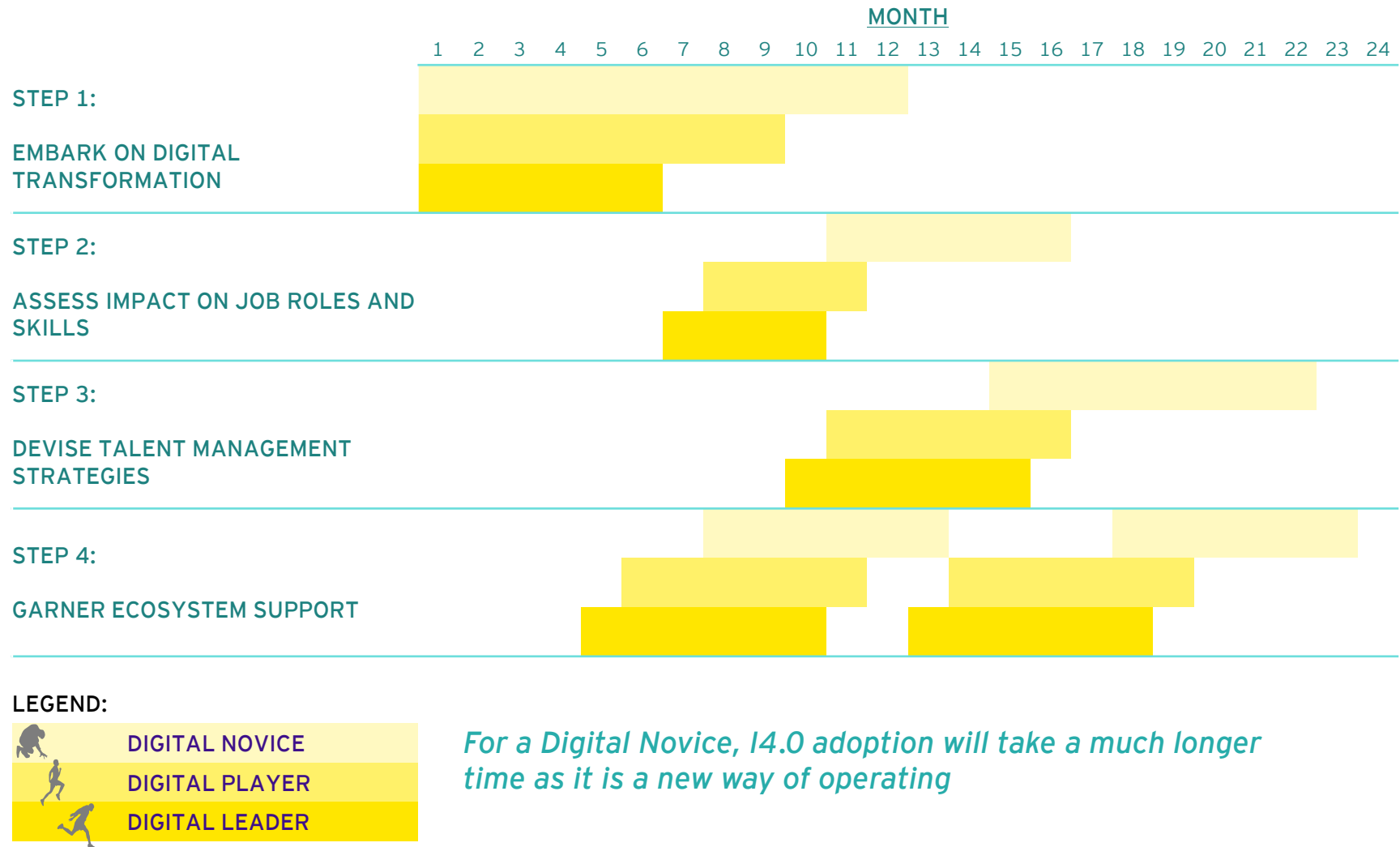
Companies need to start assessing their technology and workforce needs as this journey will take at least 18 months to see real results

In view of I4.0 adoption, preparing both companies and the workforce to adopt and adapt **will take up to 24 months for some companies.**

Depending on the maturity stage, the first step is critical to fully understand the business problem and assess the current digital state. Step 1 alone can take between 6 to 12 months. As Digital Novices embark on this journey for the first time, there will be a high degree of effort in diagnosing pain points and deciding on the technology solution to adopt.

There is a wide range of interventions that can support businesses and a multistep approach will be needed in getting that support. You will notice that in **Step 4**, there are two phases. **First phase will support companies' technology assessment in Step 1 and second phase will support talent assessment and management in Steps 2 and 3.**

It is clear that there will be a fair amount of time spent on the technology assessment, workforce upskilling and in getting ecosystem support. **Going forward, it will be critical for business leaders to quickly start assessing their needs, as this journey will take at least 18 months to see any results.**



For a Digital Novice, I4.0 adoption will take a much longer time as it is a new way of operating

Going forward, individuals too will need to prepare for the future of work



Recommendations for individuals going forward

Place emphasis on lifelong learning to become future-ready and ensure that their 'supply' of skills matches the current and future 'demands' of the logistics services sector. For this, individuals will need to

- Keep abreast of latest technology trends and other sector developments to understand how one can differentiate oneself. Different kinds of work are likely to arise with I4.0 adoption, which may require individuals to comfortably use I4.0 tools and work alongside technology.
- Take initiative and build a personal and professional development roadmap. Actively seeking opportunities to reskill according to sector needs will greatly assist in maintaining their employability, while understanding how to capitalise on their uniquely 'human' skills that can fuel innovation and collaboration.
- Leverage ecosystem resources and contact points to learn more about employment and growth opportunities in the sector and means to ensure future employability

Embrace change-readiness and agility. It is evident that there is a constant change in the ways of working across sectors. This study shows that many job roles in logistics will undergo a change in job scopes, job tasks and subsequent skills required to perform these jobs. As an employee, it is important to

- Recognise and appreciate the dynamic landscape of the logistics sector and jobs
- Understand and stay aware of changes in the sector, career opportunities and individual job roles, as well as anticipate how their job roles may change and identify the right opportunities that can prepare them to take on changing job tasks
- Keep up with the pace of innovation in the company and sector at large, and leverage the ecosystem resources to reskill themselves and prepare for this inevitable move towards working with and alongside technology

METHODOLOGY

Project objectives

Key objectives of this study include...

The overall objective of the study is to assess the impact of industry 4.0 (I4.0) on Singapore's logistics workforce, with a focus on **envisioning future jobs and skills**, so as to build an ecosystem that nurtures a **future-ready and competitive workforce** equipped with the **right skills** to thrive in a constantly evolving environment.



JOB IMPACT ANALYSIS

To assess the impact of industry 4.0 adoption on the **job roles and skills** for Singapore's logistics workforce between now and 2030.



ECOSYSTEM ANALYSIS

To analyse the efficacy of Singapore's **capability building ecosystem** and propose recommendations and best practices for individuals and companies to prepare for industry 4.0 adoption.

Defining the logistics sector in Singapore

In-scope sub-sectors

Aligned with the Skills Framework for Logistics, the study focused on three key sub-sectors as depicted below. As such, for the purpose of this study, the definition of the logistics sector excludes air and sea transport functions and job roles.



CONTRACT LOGISTICS



FREIGHT FORWARDING



LAND TRANSPORTATION

The **Skills Framework for Logistics** served as the primary reference point to define the scope of the sector, logistics functions and job roles, as well as the existing technical skills and competencies. *Click on the image below for more information on the Skills Framework.*



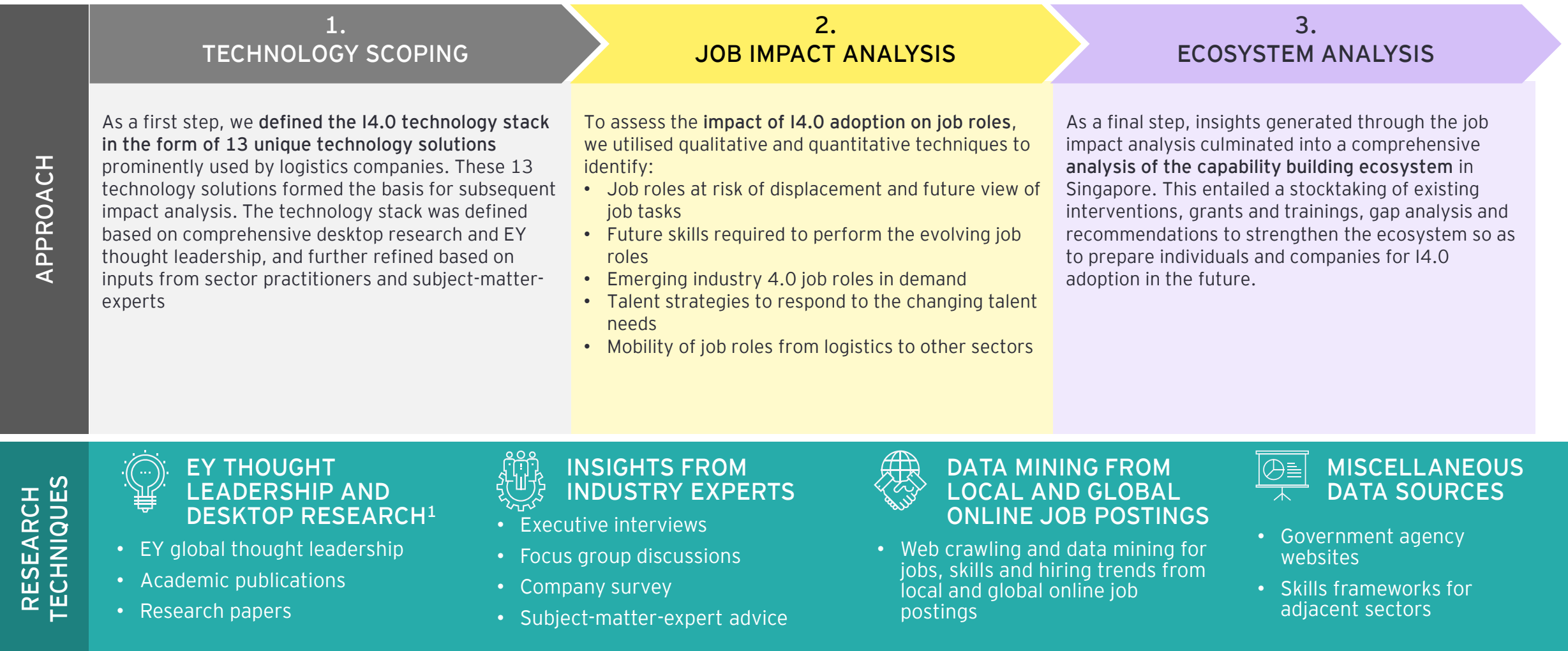
Defining the logistics sector in Singapore

In-scope functional tracks, job functions and job roles

WAREHOUSE MANAGEMENT AND OPERATIONS		TRANSPORTATION MANAGEMENT AND OPERATIONS		FREIGHT FORWARDING AND OPERATIONS	SALES AND CUSTOMER SERVICE	LOGISTICS SOLUTIONING AND PROGRAMME MANAGEMENT		LOGISTICS PROCESS IMPROVEMENT AND INFORMATION SYSTEM				
JOB FUNCTIONS	WAREHOUSE OPERATIONS	HEALTH, SAFETY AND ENVIRONMENT	PROJECT MANAGEMENT	TRANSPORT OPERATIONS	FREIGHT INSPECTION & OPERATIONS	ORDER FULFILMENT/ SALES/ BD		CONTRACT LOGISTICS	SOLUTION DESIGN	PROCESS IMPROVEMENT	IT SOLUTIONS/ SYSTEMS	DATA MANAGEMENT
PME ROLES	Warehouse Operations Manager/ Inventory Management Manager/ Capacity Management Manager; Warehouse Operations Executive/ Inventory Management Executive/ Warehouse Assistant Manager; Warehouse/ Supervisor/ Inventory Control Supervisor/ Quality Control Supervisor; Warehouse Officer/ Inventory Controller/ Quality Control Officer/ Warehouse Facilities Management Officer;	Health, Safety and Environmental Manager; Health, Safety and Environmental Officer; Health, Safety and Environmental Coordinator;	Project Manager; Senior Project Engineer; Project Executive; Project Engineer; Project Supervisor;	Transportation Operations Manager; Transport Assistant Manager/ Transport Executive/ Line Haul Operations Executive; Depot/ Traffic/ Dispatch / Hub Operations Supervisor; Traffic Controller / Transport Officer / Line Haul Ops Officer;	Import Export Manager/ Freight Allocation Manager/ Freight Shipping Manager/ Freight Documentation Manager/ Freight Pricing Manager; Shipping Specialist/ Import Export Specialist/ Freight Executive; Freight Inspector/ Incoming Quality Inspector; Brokerage Supervisor/ Freight Supervisor; Freight Officer;	Business Development Director/ Country Route Development Director/ Trade Lane Director/ Freight Trade Director; Business Development Manager/ Sales and Marketing Manager/ Vertical Sales Account Manager/ Key Account Manager/ Project Cargo Sales Manager/ Route Development Manager/ Trade Lane Manager; Customer Service Manger; Field Sales Executive/ Key Account Executive/ Sales Operations Management Specialist; Order Management Executive/ Quote Desk Executive/ Order Fulfilment Officer/ Inside Sales Officer; Senior Customer Service Officer/ Customer Service Specialist; Customer Service Officer/ Service Quality Analyst;	Logistics Solutions and Implementation Director/ Tailored Supply Chain Director/ Channel Operations Director; Logistics Contracts Manager/ Logistics Programme Manager; Vertical Product Manager; Logistics Contracts Executive/ Logistics Operations Executive/ Logistics Operations Specialist; Vertical Specialist; Logistics Contract Analyst/ Logistics Operations Analyst;	Logistics Solutions Manager; Logistics Solutions Specialist/ Logistics Solutions Engineer; Logistics Solutions Analyst;	Logistics Innovation & Process Improvement Manager/ Customer & Logistics Systems Manager; Business Process Excellence Engineer/ Operations Specialist/ Industrial Operations Engineer;	IT Business Solutions Manager/ Digital Services Manager; Operations Integration Specialist/ System Integration Engineer/ Infrastructure Specialist; IT Business Solutions Project Specialist/ Digital Services Project Specialist; Logistics IT Executive/ Digital Services Executive/ Logistics System Analyst;	Logistics Data Specialist/ Master Data Analyst/ Master Data Executive; Logistics Data Management Coordinator/ Logistics Data Entry Coordinator;	
	NON-PME ROLES	Warehouse Storekeeper/ Inventory Coordinator/ Logistics Coordinator; MHE Operator/ Forklift Operator/ Warehouse Assistant/ Inventory Assistant;		Lifting Supervisor; Traffic Coordinator/ Dispatch Coordinator; Rigger/ Signalman; Dispatch Operator / Transport Operator/ Delivery/Container Driver;	Incoming Quality Coordinator/Tally Assistant; Permit Coordinator/ Shipping Coordinator/ Custom Clearance Coordinator; Import Export Administrative Assistant/ Shipping Assistant;	Order Fulfilment Coordinator/ Sales Operations Management Coordinator/ Customer Service Coordinator; Order Fulfilment Assistant/ Sales Operations Management Assistant/ Customer Service Assistant;						

Overall approach and research techniques

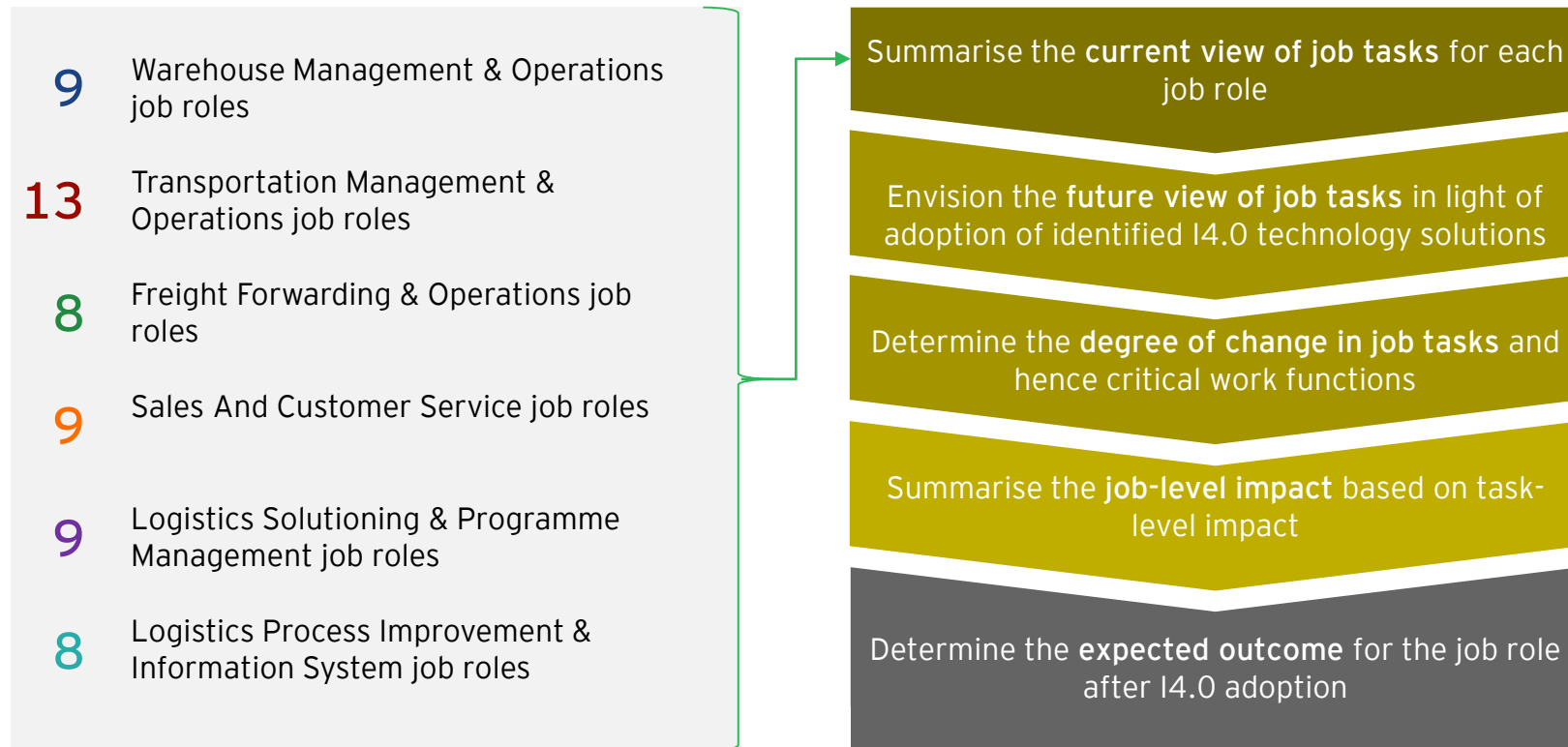
We adopted a four-step approach and utilised various qualitative and quantitative research techniques to generate insights and meet the objectives of the study.



Methodology for assessing the impact on job roles

The team used the **56 job roles** captured in the Skills Framework for Logistics as a starting point to articulate the current view of critical work functions and key tasks. Subsequently, a **bottom-up task-based assessment** was conducted to examine the impact of industry 4.0 technology solutions on the job roles.

56 JOB ROLES were identified for a TASK-BASED IMPACT ASSESSMENT



Some key considerations...

In this study, a company's journey to I4.0 adoption is considered to be the primary source of impact on job roles and skills. As such:

- As different companies may have different strategies and timelines for I4.0 adoption, **the timeline for impact on job roles and skills may vary**
- As some companies, especially SMEs, may choose not to build or manage the solutions in-house, the I4.0 job roles and talent capabilities may initially be **outsourced or hired on contract-basis**

Certain other factors e.g. operating models, business strategies, lean operations, talent constraints etc. may also overstate or understate the impact assessment for specific companies.

The study however, has been calibrated to provide a sector-wide view of impact on job roles and skills. The findings should be interpreted by individual companies to be applied in their operating context.

Methodology for assessing the impact on skills

Our skills analysis methodology entailed three key steps to identify future skills for logistics job roles in light of adoption of I4.0 technologies. This approach is depicted below

1

In-depth analysis of skills patterns and demand trends in the local and global logistics sector for creation of a Skills Library

The first step of the Skills Analysis entailed consolidating primary and secondary data insights from multiple sources to understand skills patterns for major sector players locally and globally. This involved

- deep interaction with sector practitioners through 1-1 executive interviews and focus group discussions
- data mining of emerging skills from multiple sources including local and global online job postings, skills frameworks for adjacent sectors, and EY thought leadership and research

Outcome: Creation of a standardised Skills Library

2

Task-to-skills analysis for formulating preliminary hypotheses of skills required for each job role in light of evolving job tasks

The second step of the Skills Analysis entailed evaluating the future view of job tasks derived from the task-based assessment, to understand skills implications. Industry interactions were leveraged to identify which skills are rising in demand, and which skills are declining in demand.

Subsequently, a detailed task-to-skills analysis was conducted to develop preliminary hypotheses of future skills for each job role. These hypotheses were then aggregated at function level to enable sector validations.

Outcome: Preliminary hypotheses of future skills

3

Industry validation sessions for testing our hypotheses and building a balanced view of future skills

The third and final step of the Skills Analysis entailed a robust second round of validation sessions with sector practitioners to test our hypotheses. This culminated in building a holistic and balanced view of future skills.

Outcome: Industry validated future skills

Methodology for assessing the impact on skills

Key data sources used for in-depth analysis of skills patterns and trends



EY THOUGHT LEADERSHIP AND DESKTOP RESEARCH¹

We leveraged EY thought leadership on emerging skills in a knowledge-based economy and desktop research as a baseline to understand digital skills patterns and trends. We also utilised our expertise in competency frameworks to articulate other business and foundational skills required for future job roles.

Insights on future skills required:

- customer behaviour analysis
- innovation management
- knowledge management
- lateral thinking
- personal influence
- social media management
- technology troubleshooting
- threat intelligence and detection etc.



DATA MINING FROM LOCAL AND GLOBAL ONLINE JOB POSTINGS

We utilised web crawling and data mining to identify hiring trends and frequency of key skills in local and global online job postings. This was done for :

- ~13,000 job postings between Q1 2019 to Q1 2020
- ~50 countries for leading logistics players

Insights on future skills required:

- applications development
- automation management
- artificial intelligence
- big data analytics
- data strategy
- data visualisation
- internet of things etc.



INDUSTRY INSIGHTS THROUGH 1-1 AND GROUP INTERACTIONS

We engaged sector stakeholders through multiple channels including:

- 1-1 executive interviews
- Focus group discussions

Stakeholders were polled and queried on skills that are becoming less relevant as well as skills that are emerging due to adoption of I4.0 technologies.

Insights on future skills required:

- automation management
- business advisory
- complex problem-solving
- cyber risk management
- data interpretation and analytics
- digital acumen
- global perspective
- systems thinking
- technology application etc.



SKILLS FRAMEWORKS FOR LOGISTICS AND ADJACENT SECTORS

We leveraged the existing Skills Framework for Logistics and other adjacent sectors with leading technology adoption practices such as infocomm technology, financial services, wholesale trade, retail, etc. Skills were consolidated based on their relevance to logistics I4.0 technology solutions and sieved out based on sector insights.

Insights on future skills required:

- augmented reality application
- compliance mindset development
- robotic and automation maintenance
- safety audit
- strategic service excellence
- sustainability management
- user experience design etc.

Methodology for assessing the impact on skills

Creation of the skills library to define the impact on skills

THE SKILLS LIBRARY

The skills library is a standardised list of critical skills required for employees and companies to prepare for adoption of I4.0 technologies in the logistics sector.

The library comprises a total of **116 skills**...

- 53 Technical Skills¹
- 26 Industry 4.0 Skills
- 27 Business Skills
- 10 Foundational Skills

¹Technical Skills were referenced from the Skills Framework for Logistics

THE SKILLS LIBRARY IS COMPOSED OF 4 TYPES OF SKILLS¹...



TECHNICAL SKILLS

These are the functional or logistics sector-specific skills which are critical to perform the job role

For example...
Cargo Security Control; Freight Insurance Administration



INDUSTRY 4.0 SKILLS

These are the data and industry 4.0 technology-related skills essential for design and implementation of I4.0 solutions

For example...
Big Data Analytics; Robotic and Automation System Maintenance



BUSINESS SKILLS

These are the general business administration and people management skills

For example...
Business Advisory; Global Perspective



FOUNDATIONAL SKILLS

These are the generic or soft skills required for personal excellence regardless of the job role

For example...
Complex Problem Solving; Lateral Thinking

APPENDIX

- I. I4.0 technology solutions
- II. New I4.0 job roles
- III. Job dashboards: Future view of jobs & skills
- IV. Skills library
- V. Guidelines for job redesign
- VI. Ecosystem stakeholders
- VII. References

Appendix I

14.0 TECHNOLOGY SOLUTIONS



The better the question. The better the answer.
The better the world works.

I4.0 technology solutions stack



AUTOMATED STORAGE AND RETRIEVAL SYSTEMS (AS/RS)

Intelligent robotics systems designed to automate the storage and retrieval of goods in the warehouse. AS/RS solutions range from semi-autonomous picker-to-parts solutions to fully automated parts-to-picker or goods-to-man solutions.

Adoption Timeline: Between 3-5 years



I4.0 TECHNOLOGY ENABLERS

Robotics

Internet of Things

Autonomous Vehicles

KEY BENEFITS

- Enhanced picking throughput and accuracy
- Better inventory management and control especially for high-volume high-mix delivery requirements
- Improved floor space utilisation
- Better productivity, optimised manpower and enhanced ergonomics

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

AS/RS is the most widely adopted I4.0 solution among larger players. A few SMEs shared deferred or no plans to implement AS/RS due to their limited scale of operations, cost and resource considerations, and limited customisation opportunities.

Globally, Amazon Robotics (formerly Kiva Systems) and AutoStore provide sophisticated AS/RS solutions.

I4.0 technology solutions stack



SMART INVENTORY COUNTING

Sophisticated inventory management solutions using unmanned aerial vehicles (UAVs), autonomous vehicles (e.g. AGVs) or high-accuracy counting robots, coupled with advanced optical, RFID and barcoding sensor capabilities to automate the inventory tracking, cycle-counting, stocktaking and product inspections in the warehouse.

Adoption Timeline: Between 3-5 years



I4.0 TECHNOLOGY ENABLERS

- Unmanned Aerial Vehicles
- Artificial Intelligence
- Machine Learning
- Big Data

KEY BENEFITS

- Real-time inventory tracking, stock-taking, cycle-counting
- Enhanced demand planning and forecasting capabilities
- Better visibility and accuracy in monitoring inventory levels
- Automated track and trace, check-in, check-out for items
- Enhanced inventory reporting and audit
- Enhanced productivity and reduced human errors

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

Smart inventory counting is increasing in popularity in Singapore, with companies using RFID readers, counting robots, autonomous vehicles and drones for this purpose. Larger players and technology disruptors have implemented this solution.

Globally, there are many use cases for this solution, with a range of inventory robotics providers such as PINC offering advanced warehouse drones for inventory counting.

I4.0 technology solutions stack



INTELLIGENT ROBOTIC SORTING

Use of sophisticated robotic systems, powered by computer vision, laser technology and machine learning, to automate sorting operations for incoming and outgoing cargo including performing various multi-channel, sortation tasks, basic quality checks, and routing and transporting materials.

Adoption Timeline: Between 3-5 years



I4.0 TECHNOLOGY ENABLERS



Robotics



Artificial Intelligence



Machine Learning



Big Data

KEY BENEFITS

- Improved task allocation when robotic sorting systems integrate with warehouse management systems to group similar tasks
- Enhanced sorting speed with collaborative robots leading the picker, displaying the item and the quantity of the pick at each location

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

Robotic sorting is a relatively novel solution. Technology disruptors and larger B2C players rely heavily on robotic sorting systems. Many other companies are investing in robotic palletising as an incremental first step in the move towards more autonomous sorting systems.

Global e-commerce players such as Alibaba are at the forefront of leveraging advanced robotics in sorting processes.

I4.0 technology solutions stack



PREDICTIVE & PRESCRIPTIVE MAINTENANCE

Application of advanced analytics and artificial intelligence techniques to data collected from IoT-enabled devices to monitor health of machinery in real-time, predict impending failures of equipment, systems or facilities, and also prescribe recommended solutions for troubleshooting and maintenance.

Adoption Timeline: Between 3-5 years



I4.0 TECHNOLOGY ENABLERS



Machine Learning



Big Data



Artificial Intelligence



Predictive Analytics

KEY BENEFITS

- Improved machine uptime and reduced maintenance cost
- Enhanced overall equipment effectiveness
- Reduced number and duration of planned downtimes
- Reduced number or complete prevention of breakdowns
- Improved maintenance work order management
- Mitigation of operational risk owing to better data visibility

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

Larger companies have implemented predictive analytics capabilities. Many other local players, especially SMEs, currently do not have the requisite data infrastructure, historical trends or the artificial intelligence capabilities required to implement this solution.

Globally, DB Schenker has also created an 'industrial data space' to allow for secure data exchanges between companies to enable predictive maintenance.

I4.0 technology solutions stack



PREDICTIVE AND PRESCRIPTIVE FLEET MANAGEMENT

Use of sophisticated technologies such as IoT sensors, in-vehicle telematics, predictive analytics and artificial intelligence techniques to predict impending failures of equipment or vehicles, and track and monitor fleet for efficient deployment and effective utilisation.

Adoption Timeline: Between 3-5 years



I4.0 TECHNOLOGY ENABLERS



Machine Learning



Big Data



Internet of Things



Predictive Analytics

KEY BENEFITS

- Optimal fleet and asset utilisation
- Reduced vehicle idle-time and downtime
- Optimised fuel efficiency and fuel costs
- Better visibility on driver analytics
- Reduced risk of accidents by leveraging big data

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

Companies are increasingly using in-vehicle telematics and remote sensors to build real-time visibility on fleet and driver behaviours. Additionally, most companies deploy these solutions depending on customer needs. For example, high-value low-volume goods e.g. semi-conductors require real-time tracking but this is not essential for low-value high-moving goods e.g. FMCG. Global logistics giants such as FedEx and Maersk are using data and predictive analytics to optimise fleet usage and deployment.

I4.0 technology solutions stack



DYNAMIC ROUTE OPTIMISATION

Application of big data, artificial intelligence and prescriptive analytics to perform real-time route planning based on various data streams such as delivery destinations, traffic, weather etc. This results in identification of the most optimal delivery routes to drive cost effectiveness, timely delivery and risk mitigation.

Adoption Timeline: Within 2 years



I4.0 TECHNOLOGY ENABLERS

- Machine Learning
- Big Data
- Internet of Things
- Predictive Analytics

KEY BENEFITS

- Optimal scheduling of assignments and load sequences
- Increased use of cost-effective routes
- Improved vehicle mileage and fleet utilisation
- Enhanced customer satisfaction and service delivery
- Increased number of jobs per day
- Boost in driver morale

KEY JOB FUNCTIONS IMPACTED

Transportation Operations	Contract Logistics	Data Management
Transportation Project Management	Solutions Design	Process Improvement
		IT Solutions / Systems

I4.0 solution adoption

Dynamic route optimisation solutions are widely adopted by B2C players. For a few companies moving heavy machinery or dangerous goods, dynamic route optimisation cannot be applied as they need to adhere to routes prescribed by regulatory authorities.

Globally, UPS' ORION is a route-optimisation system that analyses data points including package deliveries, pickup times, and past route performance to create the most efficient daily route for drivers.

I4.0 technology solutions stack



AUTONOMOUS LAST MILE DELIVERY

Use of autonomous vehicles such as aerial delivery drones, ground delivery bots, self-driving truck and vans etc. to deliver a product without any human intervention in the last-mile delivery process.

Adoption Timeline: No current plans to adopt



I4.0 TECHNOLOGY ENABLERS

- Autonomous Vehicles
- Big Data
- Machine Learning
- Artificial Intelligence

KEY BENEFITS

- Enhanced 24x7 delivery capabilities
- Reduced labour cost for ground delivery personnel
- Management of on-road traffic and congestion
- Reduced safety incidents due to human errors
- Reduced maintenance costs

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

While globally, technology disruptors are aggressively experimenting with last-mile delivery solutions, there are many challenges related to technical feasibility, regulatory requirements and physical infrastructure that prevent implementation globally, and specifically in Singapore. A nation-wide, collaborative effort will be required to drive advancements in this space.

Phantom Auto, a Silicon Valley start-up, piloting the remote operation of yard trucks from an operations center several states away.

I4.0 technology solutions stack




AUTONOMOUS LAST YARD DELIVERY

Use of unmanned aerial vehicles such as aerial delivery drones to deliver a product to the customer's doorstep without any human intervention in the last-yard delivery process.

Adoption Timeline: No current plans to adopt



I4.0 TECHNOLOGY ENABLERS

-  Unmanned Aerial Vehicles
-  Big Data
-  Machine Learning
-  Artificial Intelligence

KEY BENEFITS

- Enhanced 24x7 delivery capabilities
- Better delivery efficiency for time critical items
- Reduced labour cost for ground delivery personnel
- Reduced delivery time to as low as 30 minutes

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

There exist point solutions for the use of drones within confined spaces e.g. Airbus's shore-to-ship trials in Singapore with its Skyways parcel delivery drones to deliver a variety of small, time-critical maritime essentials to working vessels at anchorage. However, at large, companies are faced with software, hardware and data privacy concerns in the widespread use of drones.

Globally, Amazon Prime Air is expected to begin operations in 2020 to deliver packages to customers in 30 minutes or less using drones.

I4.0 technology solutions stack



CONNECTED TRADE PLATFORMS (CTP)

Blockchain-based, cloud computing platforms which establish a secure network between businesses, governments, and trade communities to encourage open collaboration and sharing of information between all parties across the logistics value chain.

Adoption Timeline: Between 3-5 years



I4.0 TECHNOLOGY ENABLERS



Blockchain



Internet of Things



Advanced Cloud Computing

KEY BENEFITS

- One-stop solution for all regulatory transactions
- Enhanced security of trade-related documents
- Increased collaboration with supply chain partners
- Better transparency and trust between stakeholders
- Reduced time required to establish individual connection in multiple countries for cross border trade

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

The launch of the government's Networked Trade Platform and PSA International's B2B and B2G platform - CALISTA - are testament to the proliferation of trade platforms in Singapore. Many local players see benefits from such platforms.

Globally, Maersk and IBM have also launched TradeLens, a platform that connects the entire supply chain ecosystem enabling secured sharing of information.

I4.0 technology solutions stack



SMART BILLING, COSTING & RECONCILIATION

Blockchain-based secure platforms which allow real-time access to shipment details, order statuses and bills to facilitate downstream billing, costing and reconciliation processes. Smart contracts are self-executing tasks that are coded through the blockchain and executed when a certain condition is met e.g. release of payment to a shipper when an item reaches its destination.

Adoption Timeline: Between 3-5 years



I4.0 TECHNOLOGY ENABLERS

- 💡 Blockchain
- 💡 Advanced Cloud Computing
- 💡 Robotic Process Automation
- 💡 Artificial Intelligence

KEY BENEFITS

- Optimised record keeping, cash flow and fulfillment
- Consolidation of tasks and automation to streamline business operations and boost efficiency
- Reduced reliance on intermediaries like banks, escrow services, and even legal services
- Utilisation of digital wallets for faster transactions

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

In Singapore the Cargo Community Network (CCN) and Microsoft have launched a billing, costing, and reconciliation system. At large, B2C companies are faster in adoption of smart billing solutions compares to some of the traditional freight forwarders. Globally, many blockchain start-ups e.g. CargoX are launching platforms for applications in multiple modes of transportation to minimise billing discrepancies.

I4.0 technology solutions stack



SMART LOCKERS

Sophisticated storage solutions enabled by technologies such as IoT, software robotics, computer vision, biometrics etc. which allow users to track mail items at every stage of their journey, receive notifications when they arrive, and retrieve them from a storage unit using facial recognition and other forms of authentication.

Adoption Timeline: Within 2 years



I4.0 TECHNOLOGY ENABLERS

- Internet of Things
- QR Code & OTP
- Facial Recognition
- Bluetooth

KEY BENEFITS

- Enhanced customer freedom with respect to time slots for package collection
- Reduced travel time, resources and manpower for delivery
- Reduced risk of missing or stolen packages
- Enhanced employee productivity

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

This is a relatively niche solution, the application of which is determined by the business operating models. Largely, parcel delivery companies see value in the smart lockers concept, especially with the rise of e-commerce. There will be increased focus on smart lockers with Singapore's recent plans to launch a nationwide network of 1000 parcel locker stations by end-2022.

Globally, SF Express runs a smart express delivery locker service to provide flexible delivery services.

I4.0 technology solutions stack



OPTIMISED DOCUMENTATION

Application of software robotics i.e. robotic process automation and cognitive automation couples technologies such as optical character recognition, image scanning and computer vision to automate data entry, data capture, data conversion and form processing tasks.

Adoption Timeline: Within 2 years



I4.0 TECHNOLOGY ENABLERS



Machine Learning



Big Data



Artificial Intelligence



Computer Vision

KEY BENEFITS

- Decreased time, cost and resources for time-intensive, repetitive documentation activities
- Automated data capture for better accuracy and reliability
- Increased data security
- Increased storage space with paperless operations

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

There is widespread adoption of optimised documentation solutions across larger players, technology disruptors and SMEs in Singapore. Companies rely on SAP's eDocument and advanced warehouse, transportation, and other logistics management systems for streamlining documentation.

There is also a rapid rise in technology startups in this space such as Abbyy, ParaScript, Kofax, EcoDox etc. which specialise in automation of logistics documentation processes.

I4.0 technology solutions stack



ROUND-THE-CLOCK CUSTOMER SERVICE VIA VIRTUAL ASSISTANTS

Chatbots equipped with self-learning algorithms that can address customers queries, offer templatised solutions and route complex queries to human specialists thus reducing the time and manual effort involved in basic customer support activities.

Adoption Timeline: Between 3-5 years



I4.0 TECHNOLOGY ENABLERS



Machine Learning



Big Data



Artificial Intelligence

KEY BENEFITS

- Reduced labour hours required for basic queries
- Optimised cost for customer support processes
- Enhanced customer analytics through historical analysis
- Increased freedom for employees to work on higher value add tasks
- Enhanced employee productivity

KEY JOB FUNCTIONS IMPACTED



I4.0 solution adoption

While human interactions play a key role on customer relationship management, companies identify virtual assistants as an essential step in enhancing customer service. Many companies use chatbots to provide 24x7 customer support.

Global logistics giant UPS uses an AI-based chatbot for shipment tracking queries. Many technology startups offer customised chatbots and other conversational user interface solutions for logistics operations.

Appendix II

NEW I4.0 JOB ROLES



The better the question. The better the answer.
The better the world works.

Industry 4.0 job roles in demand

Data analysis and management job roles

Data Analyst

Job Description

Responsible for preprocessing, modelling and analysis of data from a wide variety of datasets to enable informed business and operational decisions

Key Responsibilities

- Work closely with stakeholders to understand business problems and opportunities to apply advanced data analysis
- Integrate and prepare datasets, organising data to a format that can be analysed and managed
- Build and evaluate data models using statistical, algorithmic, mining, and visualisation for data discovery and analysis
- Interpret data to synthesise meaningful insights, and propose recommendations for decision making, and development of strategies and action plans

SKILLS AND OTHER REQUIREMENTS

- **Data programming languages:** Python, R, SQL etc.
- **Data visualisation:** Well-versed with tools such as Tableau, Power BI, Python, JavaScript etc.
- **Data modeling:** Able to build predictive models using data modeling tools
- **Big data analysis:** Able to compute large set of data with tools like Hadoop
- **Machine learning:** Good understanding of self-learning algorithms to create new automated processes

COMPANIES HIRING FOR THIS JOB ROLE

- Agility
- Amazon
- Bollore
- DB Schenker
- DHL
- FedEx
- Foodpanda
- Ninja Logistics
- StorBest
- Toll Group
- UPS
- Yang Kee
- YCH

(The above list is not exhaustive)

Number of local job postings ¹	16
Number of global job postings ¹	50

Over **50% of the participating companies employ data analysts** to enhance business intelligence, and strengthen warehousing and transportation processes such as demand and capacity planning, route optimisation, warehouse space utilisation etc. While **SMEs typically find it difficult to attract talent** for these job roles, some are now offering competitive pay as a means to hire these roles in-house.

Typical education and experience requirements: Bachelor's degree in Mathematics, Economics, Computer Science, Information Management, Statistics or equivalent; Logistics sector experience preferred, but open for fresh graduates.

Key attributes: Research-oriented; innovative, resourceful and collaborative problem-solver; curious; detail-oriented.

Industry 4.0 job roles in demand

Data analysis and management job roles

Data Scientist

Job Description

Responsible for application of data science methods, processes, algorithms and systems to extract knowledge and insights from structured and unstructured data

Key Responsibilities

- Design, develop and maintain innovative analytical solutions using machine learning, predictive models, recommendation engines, and optimisation models
- Identify what data is available and relevant to the problem, design and develop strategic methods for data collection, integration and retention
- Advise and communicate implications of the data for processes and decisions to stakeholders, and propose implications for future business opportunities

SKILLS AND OTHER REQUIREMENTS

- **Data programming languages:** Python, R, SQL, Shell Scripting etc.
- **Quantitative analysis and statistics:** Practical statistics or modeling experience
- **Data distribution systems:** Redshift, BigQuery, Hadoop, Spark, Amazon Web Services etc.
- **Business intelligence:** Practical in-depth knowledge of data integration, metadata, BI analytics tools
- **Data visualisation:** Well-versed with tools such as Tableau, Power BI, Python, JavaScript etc.
- **Machine learning:** Able to develop self-learning algorithms to enhance automated processes

COMPANIES HIRING FOR THIS JOB ROLE

- Agility
- Amazon
- DHL
- FedEX
- Foodpanda
- Lazada
- Toll Group
- UPS

(The above list is not exhaustive)

Number of local job postings ¹	5
Number of global job postings ¹	15

Data scientists are typically hired by **larger multinational corporations and technology startups** to apply a scientific approach to logistics processes. There is a constant and high turnover in these jobs, with loss of talent to sectors such as IT, e-commerce, banking, retail etc. Generally, most Singaporean **SMEs do not have the appetite** for hiring data scientists in-house.

Typical education and experience requirements: Bachelor's or Master's degree in Mathematics, Computer Science, Information Management, Statistics or equivalent; At least five years relevant research or work experience preferred.

Key attributes: Constant learner mindset; complex problem-solving; strong logical, analytical and deductive capabilities.

Industry 4.0 job roles in demand

Data analysis and management job roles

Data Architect/Engineer

Job Description

Responsible for managing the data analytics lifecycle including optimising the data architecture, data discovery and flow processes, modeling and operationalisation

Key Responsibilities

- Develop data design based on exploratory data analysis to meet stated business need
- Build application programming interfaces (APIs) to integrate data models with other systems
- Build analytics tools that utilise the data pipeline to provide actionable insights into key business performance metrics
- Guide Data Analysts and Data Scientists on data initiatives and ensure optimal and consistent data delivery architecture throughout ongoing projects

SKILLS AND OTHER REQUIREMENTS

- **Data scripting languages:** SQL, Bash, Perl, Python
- **Data infrastructure and warehouse:** Able to develop and organise tools and agents for data collection, storage, and transfer
- **Data migration:** Able to select, prepare, extract and transform and transfer of data onto other networks/platforms like cloud computing platforms such as AWS platforms, EC2, S3, VPC, Redshift etc.
- **Database environment:** Good working knowledge on database systems like Oracle, SQL Sever, MySQL, etc.

COMPANIES HIRING FOR THIS JOB ROLE

- Alibaba
- Amazon
- DB Schenker
- PSA International
- Ninja Logistics
- UPS

(The above list is not exhaustive)

Number of local job postings ¹	9
Number of global job postings ¹	42

A sizable proportion of participating companies i.e. **23% hire** for these job roles in-house to build robust data architectures and optimise the data processes across warehousing, transportation and freight forwarding operations. More than three quarters of these employment opportunities are with **technology disruptors and startups** in the logistics sector.

Typical education and experience requirements: Master's degree or PhD in Mathematics, Computer Science, Information Management, Statistics or equivalent; At least eight years relevant work experience preferred.

Key attributes: strategic thinker; product mindset; solution-oriented; innovative thinker; stakeholder management skills.

Industry 4.0 job roles in demand

Software development job roles

Software Developer

Job Description

Responsible for programming software for development of in-house applications, customisation and integration of vendor solutions and maintenance of software

Key Responsibilities

- Conceptualise and execute all software development stages
- Build backend and frontend applications and systems which support business and stakeholder needs
- Provide troubleshooting and root cause analysis for software issues escalated by the team
- Review existing systems and applications, and specify program components of the new computer system
- Manage the day-to-day activities pertaining to robotic process automation (RPA) solutions

SKILLS AND OTHER REQUIREMENTS

- **System implementation cycle:** Able to design, code, test systems
- **Programming languages:** Java, C#, C++, Angular, J2EE, Oracle databases, Linux; ES6+, React + Redux, Webpack, SQL etc.
- **Testing frameworks and scripts:** Proficient in conducting system testing on tools like ES6, typescript, E2E Test etc.
- **Build automation tools:** Maven, TeamCity and Gradle etc.

COMPANIES HIRING FOR THIS JOB ROLE

- Agility
- Allied Container
- Amazon
- Blu World
- Bok Seng
- CJ Logistics
- DB Schenker
- DHL
- FedEx
- Foodpanda
- Hualio
- Hup Soon Cheong
- Lazada
- Ninja Logistics
- Parcel Santa
- Teckwah
- UPS
- YCH

(The above list is not exhaustive)

Number of local job postings ¹	64
Number of global job postings ¹	145

These jobs, **traditionally outsourced**, are now **hired in-house** to enable tighter integration between technology solution and operations. However, the rising demand for software developers is not met through local manpower supply. As such, companies increasingly hire **foreign workers** in these roles, typically from countries such as China, US, Malaysia India etc.

Typical education and experience requirements:

Diploma or Bachelor's Degree in Computer Science, Computer Engineering, IT or equivalent; Relevant work experience preferred, but open for fresh graduates.

Key attributes: Self-starter with high initiative; fast learner; analytical, conceptual, and problem-solving abilities; creative thinker.

Industry 4.0 job roles in demand

Software development job roles

Mobile Developer

Job Description

Responsible for the design, development, testing and maintenance of mobile applications and software to meet business and customer needs

Key Responsibilities

- Design, build and maintain software and applications for mobile usage based on business and customer needs
- Perform full-stack iOS and android development using tools such as Swift, Foundation, UIKit, XCTest, Core Animation, Core Data, MapKit etc.
- Collaborate with back end developers, designers, product owners to constantly improve customer experience within applications

SKILLS AND OTHER REQUIREMENTS

- **Functional and reactive mobile programming languages:** Java, Python, Scala, .Net, Ruby, API etc.
- **Mobile application development:** Able to build applications that has specifications to work on multiple mobile operating systems like iOS and Android
- **Mobile resource management:** GPS tracking, routing, fuel management, mobile security
- **Mobile UI/UX framework:** Good knowledge on mobile interface to enhance usability
- **Mobile application testing:** Able to perform application testing for various operating systems like iOS and Android

COMPANIES HIRING FOR THIS JOB ROLE

- Foodpanda
- Parcel Santa
- Hualio

(The above list is not exhaustive)

Number of local job postings¹ 4

Number of global job postings¹ -

These jobs are largely prevalent in **B2C logistics companies** which require high levels of customer engagement. Companies are also beginning to hire these roles for deploying logistics IT solutions across multiple devices. However, there are companies who see **more value in outsourcing** this service to external vendors.

Typical education and experience requirements: Diploma or Bachelor's Degree in Computer Science, Computer Engineering, IT or equivalent; Relevant work experience preferred, but open for fresh graduates.

Key attributes: Self-starter with high initiative; fast learner; analytical, conceptual, and problem-solving abilities; creative thinker.

Industry 4.0 job roles in demand

Software development job roles

Software Engineer

Job Description

Responsible for application of computer science principles for the design, development, maintenance, testing, and evaluation of software systems

Key Responsibilities

- Conceptualise and design frontend and backend applications using latest technologies
- Drive key technical decisions for design, development and implementation of software
- Document architectural aspects of software applications including requirements, design, implementation of the system, risks and alternative solutions

SKILLS AND OTHER REQUIREMENTS

- **Programming languages:** Java, Python, Scala, .Net, Ruby, API, Dev Ops, ReactJS etc.
- **Frontend and backend system development:** Practical experience in frontend and backend systems development
- **Unit and integration testing framework:** Able to design and drive system testing
- **Technology stack:** In-depth knowledge and experience on all technology solutions required for system
- **Technical design documentation:** Able to document requirements, designs and risks in frameworks like sequence diagrams, class diagrams etc.
- **System deployment:** Able to deploy system for end-users

COMPANIES HIRING FOR THIS JOB ROLE

- Amazon
- FedEx
- UrbanFox
- Agility
- Foodpanda
- YCH
- DB Schenker
- Toll Group
- Zuellig Pharma
- DHL
- UPS

(The above list is not exhaustive)

Number of local job postings¹ 18

Number of global job postings¹ 31

Software engineers play a critical role in **software design** rather than development. As these roles require experienced personnel, local logistics companies generally **compete for this talent** with technology firms, startups, and other sectors where the pace of innovation is higher.

Typical education and experience requirements: Bachelor's or Master's Degree in Computer Science, Computer Engineering, IT or equivalent; At least five years relevant work experience preferred.

Key attributes: Ability to handle steep learning curves, dynamic environments and complex stakeholders; performance and optimisation mindset; process-oriented.

Industry 4.0 job roles in demand

Software development job roles

Solution/Application Architect

Job Description

Responsible for conceptualising and designing IT business solutions ensuring fulfilment of business requirements, high performance, and technical standards adherence

Key Responsibilities

- Analyse business requirements, develop functional/system specification and ensure high-value architecture and design artefacts for all solutions
- Define, champion and govern solutions architecture standards, tools, best practices, and development methodologies
- Provide technical guidance to application development teams, consult on integration and conversion issues and participate in mapping technology-independent application architecture to the chosen technology platform

SKILLS AND OTHER REQUIREMENTS

- Architectural and development skills:** Good knowledge of architectural patterns, architecture and product roadmapping, web service, API development, continuous integration/continuous development etc.
- Architecture design:** Able to design microservices, APIs, Containers etc.
- Technical design documentation:** Able to document requirements, designs and risks in frameworks like sequence diagrams, class diagrams
- Programming languages:** Java, OpenShift etc.
- Big data analysis tools:** Hadoop, Apache Spark, MongoDB, R etc.

COMPANIES HIRING FOR THIS JOB ROLE

- Amazon
- DB Schenker
- DHL
- UPS
- FedEx
- Singapore Post

(The above list is not exhaustive)

Number of local job postings ¹	9
Number of global job postings ¹	22

This role is commonly found in **larger multinational corporations** with relatively complex business operations. Mostly, these jobs are posted overseas as technology solutions are often rolled down from global headquarters for integration across regional offices. Local **SMEs** generally do not have the need to hire these roles in-house.

Typical education and experience requirements: Bachelor's or Master's Degree in Computer Science, Computer Engineering, IT or equivalent; At least eight years relevant work experience and logistics background preferred.

Key attributes: Strategic thinker with high business acumen; systems thinking skills; ability to handle dynamic environments and complex stakeholders; performance and optimisation mindset.

Industry 4.0 job roles in demand

Software development job roles

UI/UX Designer

Job Description

Responsible for the design of user interfaces for machines and software with a focus on maximising usability and the user experience

Key Responsibilities

- Provide the iterative development of user tasks, interaction and interfaces to meet user requirements, considering the whole user experience
- Refine design solutions in response to user-centered evaluation and feedback and communicate the design to those responsible for implementation
- Develop communication strategies with the aim to improve the effectiveness of communication to the designer community at IT Services and business IT teams

SKILLS AND OTHER REQUIREMENTS

- **UI/UX design and research:** Well-versed in diverse software/application interfaces to maximise usability and experience
- **UX writing:** Able to design words people see and hear when they interact with software
- **Wireframing and UI prototyping:** Able to design skeleton of the eventual user interface to showcase the main features and functions
- **Design and illustrative tools:** Photoshop, Axure, Illustrator, and associated design tools

COMPANIES HIRING FOR THIS JOB ROLE

- Amazon
- DHL
- Hualio
- Lazada

(The above list is not exhaustive)

Number of local job postings ¹	2
Number of global job postings ¹	8

These job roles are mostly found in **large multinational corporations**, typically with high interface with external customers. UI/UX designers are also in demand for companies to ensure that their I4.0 solutions are usable across different employee demographics, and specifically usable by **older workers**.

Typical education and experience requirements: Diploma or Bachelor's Degree in Computer Science, Computer Engineering, IT or equivalent; At least two years relevant work experience and logistics background preferred.

Key attributes: Innovative thinker; creative problem-solver; research-oriented; strong conceptual and design thinking; data-mindset.

Industry 4.0 job roles in demand

Digitalisation and automation job roles

Digital Innovation Lead

Job Description

Responsible for strategising, recommending and managing the company's digital innovation roadmap and blueprint in line with business strategy and goals

Key Responsibilities

- Perform technology watch and collaborate across functions to anticipate future sector trends and develop strategies to address future demand
- Manage digital innovation projects: define objectives, assign projects, measure progress and performance, evaluate effectiveness, drive continuous improvements
- Frame and scope new projects which include developing capabilities in warehouse automation, robotics, process automation and digitalisation

SKILLS AND OTHER REQUIREMENTS

- **Digital literacy:** Able to tap on multiple digital platforms for communication and information sourcing
- **Digital innovation:** Good experience in using digital technology to enhance services and operations
- **Databases proficiency:** SQL and RDBMS systems
- **Data warehouse:** Good practical knowledge on data collection, storage and analysis
- **Business intelligence tools:** Tableau, IBM Cognos, Analysis Studio, Report Studio, Query Studio etc.
- **Robotic process automation tools:** UiPath, Blue Prism etc.

COMPANIES HIRING FOR THIS JOB ROLE

- Bollore
- DB Schenker
- DHL
- Foodpanda
- ST Logistics
- Toll Group

(The above list is not exhaustive)

Number of local job postings¹ 8

Number of global job postings¹ -

Over 60% of the participating logistics companies expressed interest to hire digital innovation leads within the next 5 years. While larger players are increasingly looking to employ digital innovation leads roles as they undergo **technology transformations**, SMEs are not hiring aggressively for these roles. Experts foresee that there will be a rising need for experienced technology leads to drive targeted innovations.

Typical education and experience requirements:

Bachelor's or Master's degree in Business Administration or Statistics; At least ten years relevant work experience and logistics background preferred.

Key attributes: Strategic thinker with high business acumen; technology-savvy; innovation mindset; strong negotiator and influencer.

Industry 4.0 job roles in demand

Digitalisation and automation job roles

Machine Learning Engineer

Job Description

Responsible for building, deploying and optimising machine learning algorithms and solutions to meet the predictive goals of the business

Key Responsibilities

- Build machine learning algorithms based on data science models
- Create, research and utilise machine learning opportunities to aid the businesses automation and predictive goals
- Develop processes and tools to monitor and analyse model performance and data accuracy
- Assess the effectiveness and accuracy of new data sources and data gathering techniques
- Provide subject matter expertise to operations teams

SKILLS AND OTHER REQUIREMENTS

- **Query languages:** SQL, HIVE etc.
- **Distributed data/computing tools:** MapReduce, Hadoop, Hive, Spark etc.
- **Machine learning algorithm:** Able to develop algorithm and statics with regression, simulation, modelling, clustering, decision trees and neural networks
- **AI/machine learning techniques:** Good knowledge on clustering, decision tree learning and artificial neural networks
- **Big data tools:** Spark, Hive, Hadoop etc.

COMPANIES HIRING FOR THIS JOB ROLE

- DHL
- Hualio

(The above list is not exhaustive)

Number of local job postings ¹	3
Number of global job postings ¹	2

As the logistics companies continue to automate processes and build predictive capabilities, machine learning engineer job roles are **emerging in the market**. Since this is a very **niche role**, very few companies are currently employing such talent locally and globally.

Typical education and experience requirements: Bachelor's or Master's degree in Mathematics, Computer Science, Information Management, Statistics or equivalent; At least two years relevant work experience preferred.

Key attributes: Constant learner mindset; data-driven mindset; creative thinker; complex problem-solving; strong logical, analytical and deductive capabilities.

Industry 4.0 job roles in demand

Digitalisation and automation job roles

Automation Engineer

Job Description

Responsible for the design, selection, installation, testing and qualification of software and hardware automation systems in logistics functions

Key Responsibilities

- Work closely with process experts and process automation analysts to develop system and process designs that can be automated and carry out the technical implementation
- Implement software and hardware automation projects including gathering user requirements, design, development, performing user acceptance tests, deployment, and handover to business
- Conduct technical monitoring and control of automations used in business processes

SKILLS AND OTHER REQUIREMENTS

- **Hardware automation management:** Knowledge of robotics, vision systems, barcode scanning, RFID etc.
- **Robotic process automation technology:** Good experience and knowledge on technology like UiPath, Blue prism, Atomic, IWA, Orsyp etc.
- **Automated and manual testing:** Able to utilise tools like Cucumber, Selenium, Appium for testing
- **Programming languages:** C#, MSSQL etc.
- **Artificial intelligence:** Practical SAP knowledge of process optimization methods such as lean six sigma

COMPANIES HIRING FOR THIS JOB ROLE

- Amazon
- DB Schenker
- Lazada
- DHL
- Ninja Logistics
- ST Logistics

(The above list is not exhaustive)

Number of local job postings ¹	1
Number of global job postings ¹	18

Larger logistics players are increasingly hiring for automation engineer roles, especially in the **warehousing and transportation** functions. These roles require strong **technical background and operations knowledge** to translate business requirements into scalable solutions.

Typical education and experience requirements: Bachelor's or Master's degree in Mechanical, Electrical, Electronics Engineering, IT, Computer Science or equivalent; At least two years relevant work experience and logistics background preferred.

Key attributes: Continuous improvement and innovation mindset; technology-savvy; high business and operations acumen; data-driven decision making; strong negotiator.

Industry 4.0 job roles in demand

Digitalisation and automation job roles

I4.0 Maintenance Specialist...

Job Description

Responsible for monitoring, troubleshooting and maintenance of I4.0 equipment and systems to ensure uninterrupted operations

Key Responsibilities

- Assist in setup, calibration, management and operation of automated equipment and systems
- Plan and execute servicing and maintenance of I4.0 equipment and systems to minimise or eliminate breakdowns
- Perform basic troubleshooting, maintenance and upgrades of I4.0 systems
- Resolve operational problems relating to sensors, conveyor systems and other electrical and/or mechanical installations
- Escalate complex cases to OEMs and other maintenance specialists

SKILLS AND OTHER REQUIREMENTS

- **Electrical and mechanical skills:** Good knowledge and experience with monitoring and operating of automated systems
- **Equipment design:** Well-versed and knowledgeable with the equipment design
- **Maintenance skills:** Able to troubleshoot standard operating system of the equipment
- **Data management:** Retrieve and make sense of data collected from the database to draw insights on equipment and need for maintenance
- **Identification system:** Able to recognise identification systems (BCR, QR code, RFID) and understand the principles behind it to enhance maintenance operations
- **Industrial communication:** Able to identify the right protocol to connect devices for information transfer

COMPANIES HIRING FOR THIS JOB ROLE

- Amazon
- DB Schenker
- LF logistics
- YCH
- ST Logistics

(The above list is not exhaustive)

Number of local job postings¹ 4

Number of global job postings¹ -

This role may go by several job titles such as **I4.0 Maintenance Specialist, or ASRS/Drone/AGV Operator, or Automation Technician**. Companies have expressed the need for hiring I4.0 operator and maintenance specialists especially for **AS/RS**, drones and other advanced robotics systems deployed in warehouses. While the demand for this has not picked up as yet, experts foresee that there will be a rapid increase in maintenance personnel once I4.0 solutions are implemented.

Typical education and experience requirements: Diploma in Mechanical, Electrical, Electronics or equivalent; Logistics sector experience preferred, but also open for fresh graduates.

Key attributes: Problem-solver; detail-oriented; process compliance mindset; willingness to work in shifts and physically demanding environments.

Appendix III

JOB DASHBOARDS



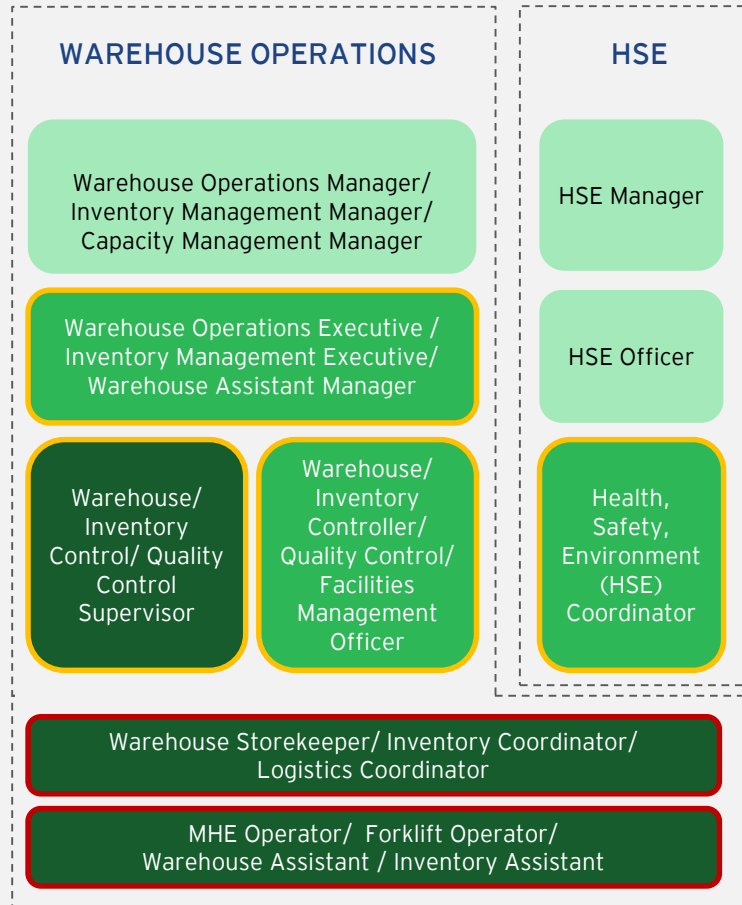
The better the question. The better the answer.
The better the world works.



Job Dashboards for Warehouse Management and Operations

Impact assessment

Within 3 - 5 years



Legend:


- High degree of change in tasks
- Medium degree of change in tasks
- Low degree of change in tasks
- Undergo displacement
- Require redesign
- Change incrementally
- Job functions within this functional track

Material Handling Equipment (MHE) Operator/ Forklift Operator/ Warehouse Assistant/ Inventory Assistant

Technology solutions impacting this job...

- Smart Inventory Counting
- Intelligent Robotic Sorting
- Automated Storage and Retrieval Systems (AS/RS)
- Predictive & Prescriptive Maintenance

Impact assessment...



HIGH degree of change in tasks

A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within **3 to 5 years**, the role will potentially...

UNDERGO DISPLACEMENT

Today, this job role is responsible for manually sorting, routing, and loading and unloading cargo to and from various warehousing or storage locations, and identifying maintenance needs for the safe and efficient operation of material-handling equipment.

Emerging skills

Going forward, these job holders will potentially take on new roles such as I4.0 Maintenance Specialist/ASRS Operator/ Drone Operator/AGV Operator/ Automation Technician. The following skills will be critical:

- Advanced Digital Acumen
- Data Interpretation and Analysis
- Robotic and Automation System Maintenance
- Technology Troubleshooting
- Complex Problem Solving
- Decision Making

Job tasks today	Impact at task-level / Future view of job tasks
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Perform loading, unloading, moving, arranging of warehouse cargo	H <ul style="list-style-type: none"> Tasks for stacking, moving and arranging of items on pallets will be automated through use of AGVs, AS/RS & robotic systems. Focus will shift to operating computerised systems, and picking and packing from automated systems. These tasks will further be augmented by use of AR-powered vision-picking or voice-picking solutions.
Perform container stuffing / unstuffing, cargo and material handling	H <ul style="list-style-type: none"> Intelligent robotic sorting solutions will automate the sorting, routing and first level quality checks of standard-sized goods. Cargo-related documents will be digitalised with the use of RPA and optimised documentation solutions. The job holder will be tasked with operating loading and unloading robotic systems, cleaning and maintaining automated systems, electronic labelling, and manually sorting odd-sized items.
Assist in quality improvement activities	H <ul style="list-style-type: none"> Use of automated processes and robotics will ensure adherence to pre-configured quality control parameters and minimise human errors. The focus will shift to intermittent check-ins and oversight to ensure quality and accuracy.
Highlight safety and health risks, report incidents	M <ul style="list-style-type: none"> IoT sensors will provide visibility on impending failures of material handling equipment, forklifts etc., thus eliminating the need for this job role to identify maintenance needs or report incidents. AR will allow annotation of non-compliances and defects at site to provide clarity for rectification works.

Mobility options for displaced workers

- Project Supervisor
- Rigger / Signaller
- Lifting Supervisor
- Dispatch Operator / Transport Operator / Last Mile Delivery Driver / Container Driver
- Incoming Quality Coordinator

In the next 3 - 5 years... As industry 4.0 technologies automate the manual, labour-intensive tasks, the focus will shift to monitoring operations of, troubleshooting and maintaining automated systems. This role will potentially **evolve to roles such as I4.0 Maintenance Specialist/ASRS Operator/ Drone Operator/AGV Operator/Automation Technician** or **converge with the Coordinator role.**




Warehouse Storekeeper / Inventory Coordinator / Logistics Coordinator

Technology solutions impacting this job...

- Smart Inventory Counting
- Intelligent Robotic Sorting
- Automated Storage and Retrieval Systems (AS/RS)
- Predictive & Prescriptive Maintenance

Impact assessment...



HIGH degree of change in tasks

A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within **3 to 5 years**, the role will potentially...

UNDERGO DISPLACEMENT

Today, this job role is responsible for coordinating general warehouse operations and activities including shipping and receiving deliveries, manually conducting stock checks, documenting warehouse transactions and records, and storing of inventory.

Emerging skills

On convergence with the Supervisor role, the job holder will take on higher responsibilities, and need upskilling on:

- Advanced Digital Acumen
- Data Interpretation and Analysis
- Robotic and Automation System Maintenance
- Technology Application
- Technology Troubleshooting
- Threat Intelligence and Detection
- Systems Thinking
- Complex Problem Solving
- Decision Making

Job tasks today	Impact at task-level / Future view of job tasks
Coordinate stock checks, arrangement and rotation of warehouse cargo	<p>H</p> <ul style="list-style-type: none"> Tasks for inventory checks, stocktaking and locating inventory will be performed by UAVs and AR-powered vision-picking and voice-picking solutions. AS/RS and AGVs will eliminate the need to coordinate arrangement and rotation of warehouse items. Focus will shift to monitoring technology solutions and interpreting data to manage exceptions, and select the best storage locations, storage media, and pick paths for stock.
Coordinate cargo handling schedules, monitor special needs cargo	<p>H</p> <ul style="list-style-type: none"> IoT sensors will enable real-time visibility and monitoring of goods, especially cargo requiring special conditions e.g. time-sensitive/ temperature-sensitive/ dangerous/ high-security goods. With robotic sorting solutions, the focus will shift to troubleshooting operational roadblocks, coordinating workflows, and handling any exception parcels such as items that require repacking, relabeling, or customs checks.
Perform documentation and quality improvement	<p>H</p> <ul style="list-style-type: none"> Digital data logging, basic documentation and standard report generation are possible through use of RPA and AI (NLG). Data on quality control and sustainability parameters will enable the job holder to make well-informed decisions to pre-empt operational shortfall and quality issues.
Support safety and health risk assessments	<p>M</p> <ul style="list-style-type: none"> With more data on safety and health parameters, the focus will shift towards monitoring sensor data and interpreting trends to identify potential risks and propose solutions. The job holder will also need to be familiar with evolving safety standards in light of technology evolution, and continue to ensure personal compliance.
In the next 3 - 5 years...	This role will be responsible for overseeing operations of industry 4.0 technology solutions and troubleshooting operational roadblocks. This role will likely cease to exist for small-scale operations . There is high potential for convergence with the Warehouse/Inventory Control/Quality Control Supervisor role for medium to large-scale operations

Mobility options for displaced workers

- HSE Coordinator
- Project Supervisor
- Lifting Supervisor
- Depot Supervisor / Traffic Supervisor / Dispatch Supervisor / Hub Operations Supervisor
- Incoming Quality Coordinator / Tally Assistant




Warehouse Supervisor / Inventory Control Supervisor / Quality Control Supervisor

Technology solutions impacting this job...

- Smart Inventory Counting
- Intelligent Robotic Sorting
- Automated Storage and Retrieval Systems (AS/RS)
- Predictive & Prescriptive Maintenance

Impact assessment...



HIGH degree of change in tasks

A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within **3 to 5 years**, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for supervising general warehouse operations including shipping and receiving deliveries, monitoring stock checks, documenting warehouse transactions and records, and quality control. This includes monitoring performance of the warehouse team.

Emerging skills

With redesign of this role to use I4.0 technologies for supervision of complex warehousing activities, the job holder will need to gain higher proficiency levels on the following skills:

- Advanced Digital Acumen
- Data Interpretation and Analysis
- Robotic and Automation System Maintenance
- Technology Application
- Technology Troubleshooting
- Threat Intelligence and Detection
- Business Advisory
- Systems Thinking
- Complex Problem Solving
- Decision Making

Job tasks today	Impact at task-level / Future view of job tasks
Monitor warehouse and inventory operations	<p>H</p> <ul style="list-style-type: none"> The use of RFID-logging, barcode scanning, sensor technology and UAVs coupled with warehouse management systems will automate the processes for monitoring inventory levels, storage utilisation and operational performance in the warehouse. Focus will shift to utilising data to optimise resource allocation, scheduling and planning to control inventory and reduce cost
Organise cargo schedules, monitor cargo operations	<p>H</p> <ul style="list-style-type: none"> Robotic sorting systems and AI will augment tasks for monitoring and inspection of cargo handling and consolidation activities. The focus will shift to monitoring robot operations, ensuring quality control, and supervising complex cargo consolidation, cross-docking, transshipment and transloading tasks.
Identify continuous improvement opportunities	<p>M</p> <ul style="list-style-type: none"> Advanced analytics will provide insights on process performance and quality metrics. The job holder will require a production mindset to identify gaps and suggest process improvements. Sensor-enabled data collection coupled with predictive analytics will help optimise critical parameters such as machine utilisation, energy consumption, and resource optimisation, thus enhancing sustainability activities.
Conduct WSH risk assessments, create WSH reports	<p>M</p> <ul style="list-style-type: none"> Use of quality, safety and health monitoring applications will help in generating investigation reports. AI and big data will be used to predict WSH risks at an early stage, and conduct root cause analysis. Insights from machine health monitoring processes will be leveraged for robust risk assessment and timely prevention of workplace accidents.


In the next 3 - 5 years... There is high potential for this job role to be **redesigned to use advanced technologies and systems** for monitoring inventory levels, warehouse performance and cargo inspection. This role will be required to **provide data-driven feedback** to enhance operations. Supervision will be required for complex warehousing, inventory and cargo activities.

Warehouse Officer / Inventory Controller / Quality Control Officer / Warehouse Facilities Management Officer

Technology solutions impacting this job...

- Smart Inventory Counting
- Intelligent Robotic Sorting
- Automated Storage and Retrieval Systems (AS/RS)
- Predictive & Prescriptive Maintenance

Impact assessment...



MEDIUM degree of change in tasks

A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within **3 to 5 years**, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for planning and implementing warehouse processes, operations and technology. He/she monitors storage utilisation levels, manages warehouse facilities and reviews operational quality and efficiency of warehouse storage and layout plans.

Emerging skills

With redesign of this role to use I4.0 technologies for supervision of complex warehousing activities, the job holder will need to gain higher proficiency levels on the following skills:

- Advanced Digital Acumen
- Data Interpretation and Analysis
- Technology Application
- Threat Intelligence and Detection
- Business Advisory
- Systems Thinking
- Complex Problem Solving
- Decision Making

Job tasks today	Impact at task-level / Future view of job tasks
Execute warehouse storage and layout plans	M <ul style="list-style-type: none"> Predictive demand planning will augment traditional warehouse planning processes by predicting unexpected volume spikes for trending products to avoid over-stocking or out-of-stock situations. Sensor data will alert the user to anticipated issues. The focus will shift to remote monitoring of key performance metrics for equipment, systems and facilities.
Plan cargo-handling and delivery operations	M <ul style="list-style-type: none"> Cognitive automation and data analytics (e.g. customer demands, traffic, weather etc.) will enable anticipatory planning, scheduling and load optimisation for cargo handling and consolidation activities. The job holder will be tasked with providing inputs for configuration of technology solutions with process control parameters including special handling requirements for time-sensitive/ temperature-sensitive/ dangerous/ high-security goods.
Plan continuous improvement activities	M <ul style="list-style-type: none"> AI and advanced analytics will help job holder conduct "what-if" analyses and scenario testing to evaluate the impact of potential solutions for process improvement. Predictive analytics will be used to synthesise information from multiple sources to model customer and market trends better. This will enable the job holder to propose business requirements and ensure alignment of work products to business priorities.
Propose solutions to improve WSH processes	M <ul style="list-style-type: none"> While AI and predictive analytics will be used to strengthen risk assessment and analyse safety reports, human judgment is key in deriving mitigating solutions and addressing areas of non-conformance. The job holder will also need to be familiar with evolving safety standards in light of technology evolution to manage compliance.


In the next **3 - 5** years... There is high potential for this job role to be **redesigned to oversee the setup and configuration of industry 4.0 technology solutions**. This role will be required to interpret operational warehouse, inventory and cargo handling plans to suggest process control parameters, and ensure that operation of technology solutions is line with expected outcomes.

Warehouse Operations Executive / Inventory Management Executive / Warehouse Assistant Manager

Technology solutions impacting this job...

- Smart Inventory Counting
- Intelligent Robotic Sorting
- Automated Storage and Retrieval Systems (AS/RS)
- Predictive & Prescriptive Maintenance

Impact assessment...



MEDIUM degree of change in tasks

A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within **3 to 5 years**, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for planning and implementing complex warehouse processes, operations and technology. He/she develops plans to optimise operations, implements quality programmes and coordinates with stakeholders to assist in the management of the department.

Emerging skills

With increased focus on leveraging data for smarter, faster and predictive inventory and warehouse operations, the job holder will need to reskilled on the following areas:

- Data Interpretation and Analysis
- Advanced Digital Acumen
- Technology Application
- Threat Intelligence and Detection
- Business Advisory
- Strategic Service Excellence
- Sustainability Management
- Systems Thinking
- Complex Problem Solving
- Decision Making

Job tasks today	Impact at task-level / Future view of job tasks
-----------------	---

Develop warehousing and inventory management plans	M <ul style="list-style-type: none"> • Smarter forecasting of demand, capacity, and labour through data analytics will significantly optimise planning and resource utilisation. IoT-based devices will provide live sensor data and performance metrics for facilities, equipment and systems which will enable process planning and expedited root cause analysis to improve machine uptime and reduce maintenance cost.
Manage cargo operations including documentation	M <ul style="list-style-type: none"> • RPA and blockchain-based solutions will help to streamline cargo documentation processes including creating tamper-proof custody records and replacing paper-based bills of lading. Smart containerisation and special packaging will ensure transparency and traceability across the supply chain such that losses, thefts and damage will be reduced. • Technical expertise and human intervention will remain critical in managing complex cargo operations.
Analyse process improvements and associated risks	L <ul style="list-style-type: none"> • Machine learning will develop complex models, such as predictions on customer and market trends, process risk profiling, workflow analysis and environmental performance. • While this will inform decision-making, the job role will continue to require human judgment and experience.
Review WSH report to manage solutioning	M <ul style="list-style-type: none"> • While AI and predictive analytics will be used to strengthen risk assessment and analyse reports, human judgment is key in deriving mitigating solutions and addressing areas of non-conformance. • The job holder will also need to be familiar with evolving safety standards in light of technology evolution to manage compliance.


In the next **3 - 5** years...
 With increased use of cognitive automation and robotics, there is high potential for this job role to be **redesigned to leverage data and predictive insights** for anticipatory planning, scheduling and performance monitoring of equipment, systems and facilities. There will be increased focus on solutioning and planning to meet business requirements.

Warehouse Operations Manager / Inventory Management Manager / Capacity Management Manager

Technology solutions impacting this job...

- Smart Inventory Counting
- Intelligent Robotic Sorting
- Automated Storage and Retrieval Systems (AS/RS)
- Predictive & Prescriptive Maintenance

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, as a department lead, this job role is responsible for managing and optimising warehouse operational policies, resources, standards and procedures including the implementation of warehousing solutions, in accordance to business and customer needs.

Emerging skills

The job holder will play a larger role in data-driven solutioning and business advisory. As such, there will be a need to build the following skills:

- Advanced Digital Acumen
- Data Interpretation and Analysis
- Threat Intelligence and Detection
- Business Advisory
- Strategic Service Excellence
- Sustainability Management
- Systems Thinking
- Complex Problem Solving
- Decision Making

Job tasks today	Impact at task-level / Future view of job tasks
Strategise warehousing and inventory operations	L <ul style="list-style-type: none"> • Integration of automated processes with traditional warehouse and inventory management systems will significantly improve AI algorithms and predictive capabilities. This will enhance the job holder's ability to conduct data-driven demand planning, strategise storage and warehouse layout, optimise process workflows and forecast resource needs.
Review cargo operations and performance	L <ul style="list-style-type: none"> • Advanced predictive analytics will be used to assess performance levels and detect early warning of potential crises or issues that could severely affect the business. This will enable the job holder in formulation of incident/crisis management plans. • Technical expertise and human judgment will remain critical in strategising cargo operations.
Manage business process improvement solutions	L <ul style="list-style-type: none"> • Prescriptive analytics that utilise learning algorithms and dynamic rule engines will provide interpretations and process improvement recommendations. While this will inform policy decisions, strategic thinking, personal influence and leadership qualities remain critical for driving continuous improvement in the department.
Drive WSH activities to ensure compliance	L <ul style="list-style-type: none"> • AI and big data will be used to inform solutioning around improvement of existing WSH policies and procedures. • Human intervention remains critical for influencing behavioural changes and driving a culture of compliance.


In the next 3 - 5 years... This role will continue to **require human judgment, technical expertise and personal influence** to make strategic decisions and drive a culture of high performance, continuous improvement and safety compliance.

Health, Safety and Environmental (HSE) Coordinator

Technology solutions impacting this job...

- Smart Inventory Counting
- Intelligent Robotic Sorting
- Automated Storage and Retrieval Systems (AS/RS)
- Predictive & Prescriptive Maintenance

Impact assessment...



MEDIUM degree of change in tasks

A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for assisting in the identification of any unsafe conditions or unsafe work practices, recommending measures to remedy the unsafe conditions or work practices and assisting in the implementation of mitigation measures.

Emerging skills

To be able to analyse data and identify trends and patterns for suggesting improvements to HSE processes, the following skills will become more prominent:

- Augmented Reality Application
- Data Interpretation and Analysis
- Complex Problem Solving
- Compliance Mindset Development
- Lateral Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Assess HSE risks, highlight incidents, generate reports	M <ul style="list-style-type: none"> IoT devices will report incidents of deterioration or impending failures of material handling equipment, forklifts etc. and assess potential HSE risks. Use of quality, safety and health monitoring applications will help in generating investigation reports. With more data on safety and health parameters, this job role will be tasked with monitoring sensor data and interpreting trends to suggest WSH solutions.
Perform sustainability activities, monitor environmental impact	M <ul style="list-style-type: none"> Sensor-enabled data collection will help to monitor sustainability parameters such as carbon emissions, machine utilisation, energy consumption, and resource usage. The job holder will be tasked with identifying trends and patterns to optimise the environmental impact.
Perform quality and compliance checks	L <ul style="list-style-type: none"> With basic quality and compliance checks embedded into automated processes, the focus of audits will shift towards handling exceptions and troubleshooting to ensure compliance. Human intervention remains critical for managing sensitive employment issues such as dispute resolution.
Communicate with stakeholders, plan resource allocation	L <ul style="list-style-type: none"> Digital platforms will allow easy exchange of information between stakeholders and business units. While data and advanced analytics will help in better resource planning and basic risk assessment, the job role will require human intervention for coordinating workflows and applying SOPs.
In the next 3 - 5 years...	Industry 4.0 technology solutions will relieve some of the manual tasks for this job role such as data collection on sustainability parameters, safety and compliance monitoring, documentation and reporting. The focus will shift to analysing data and identifying trends and patterns to improve HSE processes.

Health, Safety and Environmental (HSE) Officer

Technology solutions impacting this job...

- Smart Inventory Counting
- Intelligent Robotic Sorting
- Automated Storage and Retrieval Systems (AS/RS)
- Predictive & Prescriptive Maintenance

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for supervising a quality HSE team, and identifying, assessing and advising on risks arising from the workplace or work processes, recommending measures to eliminate or minimise and control the risks, and implementing the measures.

Emerging skills

With more data and increasing visibility on sustainability parameters, the job holder will be in a better position to monitor and track operations with a high environmental impact. The following skills will be in play:

- Augmented Reality Application
- Data Interpretation and Analysis
- Sustainability Management
- Complex Problem Solving
- Compliance Mindset Development
- Lateral Thinking

Job tasks today	Impact at task-level / Future view of job tasks
Propose solutions to improve HSE processes	L <ul style="list-style-type: none"> While AI and advanced analytics will be useful for analysing HSE reports to conduct root cause analysis and strengthen corrective action-planning, human judgment will be critical in addressing identified areas of non-conformance. Augmented reality solutions will expedite solution testing and training to enhance HSE compliance.
Develop environmental protection measures	L <ul style="list-style-type: none"> Self-learning algorithms will provide insights on the carbon footprint of the business operations, which will aid the job holder in policy decisions. AI and advanced analytics will help the job holder conduct "what-if" analyses and scenario testing to evaluate the impact of potential solutions for complex problem solving on HSE issues.
Review measures to enhance quality and compliance	L <ul style="list-style-type: none"> Quality, safety and health monitoring applications will expedite compliance and audit processes, but human intervention remains critical to ensure compliance operations.
Manage stakeholders and optimise resource allocation	L <ul style="list-style-type: none"> Cloud-based platforms will provide end-to-end visibility to all stakeholders in the logistics value chain. Warehouse and inventory management systems, equipped with advanced data analytics will help in resource optimisation and risk assessment. The job role will continue to require human intervention for people and stakeholder management.


In the next 3 - 5 years... AR and cloud-based platforms will expedite some activities such as HSE training and communications. This role will **continue to be responsible for proposing solutions** to address gaps in existing HSE processes and developing measures to enhance safety, compliance and environmental impact of logistics operations.

Health, Safety and Environmental (HSE) Manager

Technology solutions impacting this job...

- Smart Inventory Counting
- Intelligent Robotic Sorting
- Automated Storage and Retrieval Systems (AS/RS)
- Predictive & Prescriptive Maintenance

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, as a department lead, this job role is responsible for managing and optimising HSE policies, standards, procedures and the Workplace Safety and Health Management System (WSHMS) in accordance with logistics business needs, including high stakeholder interaction.

Emerging skills

Data and predictive insights from I4.0 technologies will support the job holder in HSE strategy formulation and inform decision-making for HSE policies and procedures. The following skills will become critical:

- Data Interpretation and Analysis
- Sustainability Management
- Workplace Safety and Health Audit System Management
- Complex Problem Solving
- Compliance Mindset Development
- Lateral Thinking

Job tasks today	Impact at task-level / Future view of job tasks
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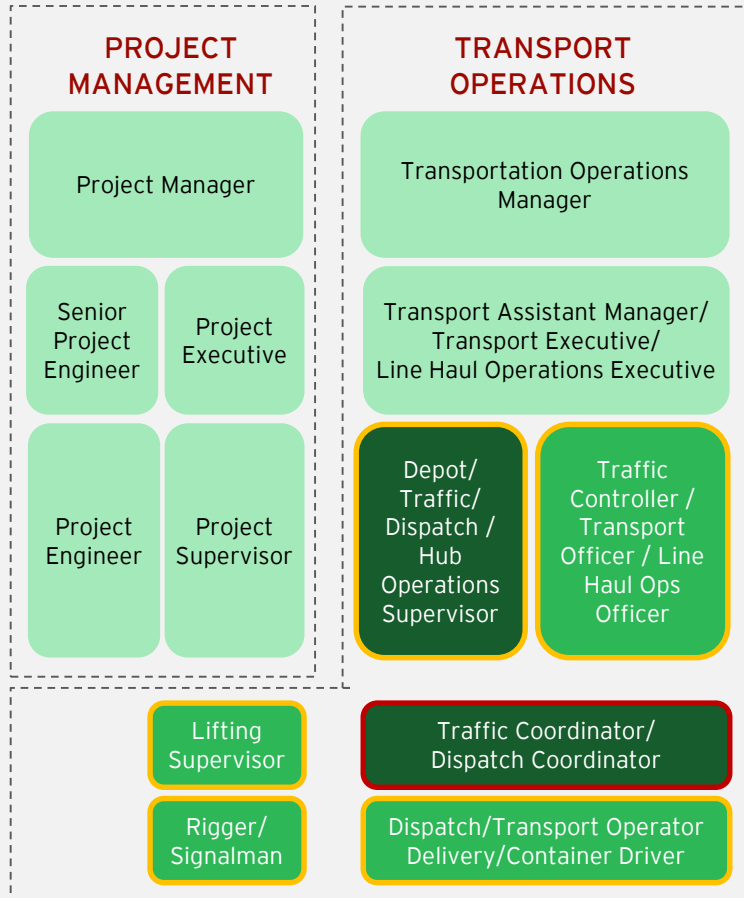
Set company HSE strategy and manage compliance	L <ul style="list-style-type: none"> • AI (NLP) will enable faster thematic analysis to enable focused discussion on HSE findings. AI and big data will be used to inform solutioning around improvement of existing HSE policies and procedures. • Human intervention remains critical for influencing behavioural changes and strategy planning.
Perform business continuous improvement	L <ul style="list-style-type: none"> • Prescriptive analytics that utilise learning algorithms and dynamic rule engines will provide interpretations and process improvement recommendations. While this will inform policy decisions and operations management, strategic thinking, personal influence and leadership qualities remain critical for success.
Formulate SOPs for quality standards and compliance	L <ul style="list-style-type: none"> • Advanced data analytics and RPA will be leveraged to strengthen compliance and audit process. However, human intervention and judgment remain critical in the development of compliance strategies and policy formulation.
Lead business administration for the department	L <ul style="list-style-type: none"> • Behavioural and social analytics will help inform stakeholder management and communications. Predictive and prescriptive analytics will expedite resource management, risk assessment and mitigation planning. • However, human judgment and experience is required to make sound and well-reasoned strategy decisions based on business needs. Leveraging personal relationships and influence remains critical for success in this role.

In the next 3 - 5 years... This role will increasingly utilise data and advanced analytics to inform decision-making and strengthen HSE policies and procedures. However, **human intervention and judgment remain critical** in the development of compliance strategies, policy formulation and stakeholder management.

Job Dashboards for Transportation Management and Operations

Impact assessment

Within 3 - 5 years




Legend:


- High degree of change in tasks
- Medium degree of change in tasks
- Low degree of change in tasks
- Undergo displacement
- Require redesign
- Change incrementally
- Job functions within this functional track


Rigger / Signalman

Technology solutions impacting this job...

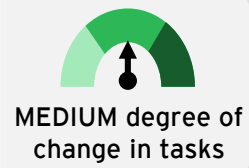
 Predictive & Prescriptive Fleet Management

 Autonomous Last Mile Delivery

 Dynamic Route Optimisation

 Autonomous Last Yard Delivery

Impact assessment...



A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for communications and signaling with the transportation operations team to move cargo onto the transportation, and the set-up, safe and efficient operations and quality checks of the rigging and lifting equipment.

Emerging skills

As the job holder will be expected to work in a technologically-rich environment with advanced robotic systems, the following skills will become critical:


- Advanced Digital Acumen
- Augmented Reality Application
- Technology Troubleshooting
- Complex Problem Solving
- Decision Making


Job tasks today	Impact at task-level / Future view of job tasks
Set-up, operate and maintain rigging and lifting equipment	M <ul style="list-style-type: none"> • Smart robotics will augment traditional rigging and cargo lifting operations. AR and remote assistance capabilities will aid the job holder in performing maintenance tasks. • Focus will shift to operating computerised systems, working with collaborative robots and troubleshooting in case of operational hindrances, and remote monitoring of data from predictive fleet management systems to highlight risks and exceptions.
Prepare cargo for transfer operations	M <ul style="list-style-type: none"> • Robotic sorting solutions will automate the sorting, routing and first-level quality checks of standard-sized goods and cargo. • The job holder will be tasked with electronic labelling, RFID / barcode scanning, goods registry into the system, and manually sorting odd-sized items.
Perform equipment quality checks & sustainability support	M <ul style="list-style-type: none"> • Automated processes and robotics solutions will be pre-configured with quality control and sustainability parameters such as fuel consumption, energy efficiency and carbon emissions. • The focus of the job role will shift to monitoring such parameters and highlighting deviations for quality control and sustainability.
Highlight safety and health risks, report incidents	M <ul style="list-style-type: none"> • IoT sensors and devices will report incidents of deterioration or impending failures of cargo handling equipment, forklifts etc. thus eliminating the need for this job role to report incidents. The job holder may be required to work with bionic enhancement technologies such as advanced wearables and exoskeletons which have the potential to minimise health and safety risks in the workplace.


In the next 3 - 5 years... Industry 4.0 technologies will automate some of the manual, labour-intensive tasks involved in rigging and lifting cargo. The job holder will be tasked with operating advanced robotics systems, working with assistance/collaborative robots, and monitoring key operational parameters for such technology systems.


Lifting Supervisor

Technology solutions impacting this job...


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Impact assessment...


MEDIUM degree of change in tasks

A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for coordinating and supervising all lifting activities in accordance with regulations, and overseeing the set-up, maintenance and safe and efficient operations of the lifting equipment. He/She is required to be present during all lifting operations.

Emerging skills

With the focus shifting to supervising, troubleshooting and maintaining advanced technology solutions with inputs from data, the job holder will need to be reskilled on the following skills:

- Advanced Digital Acumen
- Augmented Reality Application
- Automation Management
- Data Interpretation and Analysis
- Technology Troubleshooting
- Systems Thinking
- Complex Problem Solving
- Decision Making


Job tasks today	Impact at task-level / Future view of job tasks
Troubleshoot equipment, determine maintenance needs	M <ul style="list-style-type: none"> • Remote monitoring systems will provide visibility on impending failures and issues, thus minimising the need for this job role to identify maintenance needs. The focus will shift to handling exceptions and troubleshooting complex issues. • While the focus will shift to overseeing robot operations and coordinating workflows to ensure smooth operations, human supervision during lifting operations will also continue to be critical to ensure compliance with regulatory requirements.
Apply methods to manage cargo with special needs	M <ul style="list-style-type: none"> • Sensor technology will enable real-time visibility and monitoring of cargo, especially for those requiring special conditions e.g. time-sensitive, temperature-sensitive, dangerous and high-security cargo. With robotic cargo-handling solutions, the focus will shift to troubleshooting and coordinating complex cargo operations.
Perform equipment quality checks & sustainability support	M <ul style="list-style-type: none"> • With basic quality checks and sustainability parameters embedded into automated processes, the focus will shift to ensuring accuracy in meeting customer requirements while adhering to standard operating procedures and business needs.
Support safety and health risk assessments	M <ul style="list-style-type: none"> • The focus will shift to monitoring sensor data and trend analysis reports to identify potential safety and health risks and propose solutions for improvement of processes. The job holder will also need to be familiar with evolving safety standards in light of technology evolution, and continue to ensure personal compliance.


In the next **3 - 5** years... There will be **opportunities to relieve some of the manual tasks** that are part of this role. The focus will shift to supervising, troubleshooting and maintaining advanced technology solutions. The job holder will assume higher responsibilities for interpreting data to ensure smooth operations, safety and compliance.


Project Engineer

Technology solutions impacting this job...


 Predictive & Prescriptive Fleet Management

 Autonomous Last Mile Delivery

 Dynamic Route Optimisation

 Autonomous Last Yard Delivery

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for the integration and installation of automation, rigging and lifting equipment and the management of contractors and/or vendors. He/She is also responsible for conducting the set-up of all project components.

Emerging skills

With increasing use data and predictive insights for informed decision-making in relation to installation and integration of automation technologies, the job holder will need to continue to hone the following skills:


- Artificial Intelligence Application
- Augmented Reality Application
- Internet of Things Application
- Threat Intelligence and Detection
- Knowledge Management
- Systems Thinking
- Critical Thinking


Job tasks today	Impact at task-level / Future view of job tasks	
Coordinate with stakeholders, estimate resources for project activities	M	<ul style="list-style-type: none"> • Digital platforms will enable real-time sharing of updates to all stakeholders for better collaboration. Predictive resource planning will augment the traditional resource forecasting and estimation processes. • Focus will shift to interpreting data and analytical insights for improving workflows and managing exceptions.
Gather information on the latest technology trends	L	<ul style="list-style-type: none"> • Digital, intelligent channels will help to streamline and accelerate data gathering process for technology solutions and partners. Data visualisation and interpretation techniques will aid the job holder to make informed decisions in identifying relevant technology solutions.
Support continuous improvement; assess situational factors that inhibit change	L	<ul style="list-style-type: none"> • AI and advanced analytics will support the job holder in conducting “what-if” analysis and scenario testing to evaluate the impact of potential solutions to business problems. Behavioural analytics will be used to augment change management efforts by synthesising information from multiple sources to model cultural and psychological factors.
Review WSH reports to determine impact on work processes	L	<ul style="list-style-type: none"> • While AI and predictive analytics will be used to strengthen safety and health risk assessment and analyse reports, human judgment is key in deriving mitigating solutions and addressing areas of non-conformance.
<p>In the next 3 - 5 years...</p>		<p>This job will increasingly use data and predictive insights for informed decision-making in relation to installation and integration of automation technologies and selection of contractors/vendors. The job holder will continue to be responsible for conducting the set-up of all project components.</p>


Project Supervisor

Technology solutions impacting this job...


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Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for supervising the set-up, maintenance and safe and efficient operations of equipment used for moving cargo onto the transportation, overseeing checks on the rigging or mechanised equipment, and performing quality checks for the operation.

Emerging skills

The job holder will make more use of real-time data from IoT devices for monitoring performance of project activities. As such, the following skills will need to be honed further:

- Artificial Intelligence Application
- Augmented Reality Application
- Internet of Things Application
- Threat Intelligence and Detection
- Knowledge Management
- Systems Thinking
- Critical Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Coordinate resolution of breakdowns to minimise downtime	<p>M</p> <ul style="list-style-type: none"> • IoT devices will provide real-time data and performance metrics for transport operations, facilities, equipment and systems. • Focus will shift to utilising this data to expedite root cause analysis to resolve maintenance issues in a timely manner, and ensure execution of operations within allocated resources and cost. Human judgment remains critical
Handle cargo documentation and monitor activities	<p>L</p> <ul style="list-style-type: none"> • AI-based computer vision systems will augment logistics operations including documentation and basic inspection of cargo handling and consolidation activities. • The job holder will be tasked with supervising robotic technology operations, ensuring quality control, and overseeing complex cargo consolidation, cross-docking and shipment consolidation tasks.
Facilitate adherence to quality and sustainability procedures	<p>L</p> <ul style="list-style-type: none"> • Sensor-enabled data collection coupled with predictive analytics will help optimise critical parameters such as machine utilisation, energy consumption and resource optimisation, thus helping the job holder to ensure adherence to environmental protection and sustainability procedures.
Conduct WSH risk assessments; suggest solutions	<p>L</p> <ul style="list-style-type: none"> • Use of quality, safety and health monitoring applications will help in generating investigation reports. AI and big data will be used to predict WSH risks at an early stage, and conduct root cause analysis. Insights from predictive maintenance processes will be leveraged for robust risk assessment and timely prevention of workplace accidents.


In the next 3 - 5 years... The job holder will continue to be responsible for project supervision. Increasing use real-time data on performance metrics for transport operations, facilities, equipment and systems will enhance the job holder's performance of supervision activities, exception handling and adherence to project plans.


Senior Project Engineer

Technology solutions impacting this job...


 Predictive & Prescriptive Fleet Management

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Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for advanced planning, design, integration and installation of automation, rigging/lifting equipment. This includes managing contractors, assessing set-up of project components, exploring alternative solutions and analysing feasibility of plans.

Emerging skills

The job holder will need to play a larger role in technology selection, application and risk management. This will require building the following skills:

- Artificial Intelligence Application
- Internet of Things Application
- Threat Intelligence and Detection
- Knowledge Management
- Systems Thinking
- Critical Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Lead delivery of key project outcomes within team or departmental projects	<div style="background-color: #e0ffe0; padding: 5px; display: inline-block; margin-right: 10px;">L</div> <ul style="list-style-type: none"> • Dynamic route and resource optimisation solutions, equipped with advanced data analytics will help in resource optimisation, risk assessment and anticipating service disruptions. While this will augment decision-making, technical expertise and people management remain critical to ensure delivery of key project outcomes.
Plan key activities and milestones in technology projects	<div style="background-color: #e0ffe0; padding: 5px; display: inline-block; margin-right: 10px;">L</div> <ul style="list-style-type: none"> • Data analytics and business intelligence capabilities will help assess the impact of technology on company performance. The job holder will continue to perform these tasks by leveraging technical expertise and stakeholder management skills.
Review better ways to approach business problems	<div style="background-color: #e0ffe0; padding: 5px; display: inline-block; margin-right: 10px;">L</div> <ul style="list-style-type: none"> • Prescriptive analytics that utilise learning algorithms and dynamic rule engines will provide interpretations and recommendations for business problems. While this will inform decision-making for continuous improvement, technical expertise and experience remain critical for success.
Analyse WSH reports and suggest solutions to improve WSH processes	<div style="background-color: #e0ffe0; padding: 5px; display: inline-block; margin-right: 10px;">L</div> <ul style="list-style-type: none"> • While AI and predictive analytics will be used to strengthen safety and health risk assessment and analyse reports, human judgment is key in deriving mitigating solutions and addressing areas of non-conformance.


In the next 3 - 5 years... While Industry 4.0 technologies will enhance decision-making in relation to planning and execution of technology projects, **technical expertise and people management remain critical** to ensure delivery of key project outcomes. More focus on enhancing customer experience while deploying innovations to improve processes and business outcomes.


Project Executive

Technology solutions impacting this job...


 Predictive & Prescriptive Fleet Management

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Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for gathering requirements from stakeholders, planning and implementing project logistics for storage and transport of complex and heavy cargo, and ensuring the project lifecycle is followed through and performed in accordance to project requirements.

Emerging skills

While human intervention remains critical for people and stakeholder management, the job holder will also need to leverage advanced technologies for better project-lifecycle management


- Artificial Intelligence Application
- Internet of Things Application
- Threat Intelligence and Detection
- Knowledge Management
- Systems Thinking
- Critical Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Provide administrative support for project management	<div style="display: flex; align-items: center;"> <div style="background-color: #c8e6c9; width: 20px; height: 20px; margin-right: 5px; display: flex; align-items: center; justify-content: center; font-size: 10px;">L</div> <ul style="list-style-type: none"> Connected trade platforms provide end-to-end visibility to all stakeholders in the value chain, enhancing collaboration. The focus will shift to remote monitoring of key performance metrics and action-planning to mitigate risks and optimise performance. The job role will continue to require human intervention for people and stakeholder management. </div>
Analyse level of technology usage and efficiency	<div style="display: flex; align-items: center;"> <div style="background-color: #c8e6c9; width: 20px; height: 20px; margin-right: 5px; display: flex; align-items: center; justify-content: center; font-size: 10px;">L</div> <ul style="list-style-type: none"> Smart, connected technology solutions equipped with self-reporting capabilities will provide insights on usage and efficiency, enabling the job holder to make informed decisions about impact on process performance. Human intervention remains critical for technical expertise and knowledge. </div>
Define project scope and objectives aligned to business requirements	<div style="display: flex; align-items: center;"> <div style="background-color: #c8e6c9; width: 20px; height: 20px; margin-right: 5px; display: flex; align-items: center; justify-content: center; font-size: 10px;">L</div> <ul style="list-style-type: none"> Machine learning is seen to develop complex models, such as predictions on customer and market trends, risk profiling or workflow analysis. This will enable the job holder to propose business requirements and ensure alignment of products and projects to business priorities. </div>
Review WSH reports to determine impact on work processes	<div style="display: flex; align-items: center;"> <div style="background-color: #c8e6c9; width: 20px; height: 20px; margin-right: 5px; display: flex; align-items: center; justify-content: center; font-size: 10px;">L</div> <ul style="list-style-type: none"> While AI and predictive analytics will be used to strengthen safety and health risk assessment and analyse reports, human judgment is key in deriving mitigating solutions and addressing areas of non-conformance. </div>
In the next 3 - 5 years...	Data and integrated digital platforms will provide greater transparency and enhance the job holder's ability to ensure that the project lifecycle is performed in accordance to project requirements. Human intervention remains critical for people and stakeholder management.


Project Manager

Technology solutions impacting this job...


 Predictive & Prescriptive Fleet Management

 Autonomous Last Mile Delivery

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 Autonomous Last Yard Delivery

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, as a department lead, this job role is responsible for managing and reviewing operational policies, standards and procedures related to project logistics, including integration and installation of automations, rigging and lifting technology, and managing stakeholders and resources.

Emerging skills

Technical expertise and people management skills remain critical for success in this role. Additionally, the job holder will need to be technology-savvy to keep up with the pace of change.

- Artificial Intelligence Application
- Internet of Things Application
- Threat Intelligence and Detection
- Knowledge Management
- Systems Thinking
- Critical Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Develop strategic project plans to align projects with business strategies	<p>L</p> <ul style="list-style-type: none"> Integration of automated processes with traditional management systems will significantly improve data availability and thus predictive capabilities. This will enhance the job holder's ability to develop strategic project plans, optimise process workflows and forecast resource needs. The job role will require technical expertise strategy formulation and leveraging personal networks and influence for people management.
Drive the successful completion of technology projects	<p>L</p> <ul style="list-style-type: none"> The job holder will continue to perform these tasks by leveraging technical expertise and stakeholder management skills. Data analytics and business intelligence capabilities will help assess the impact of technology on company performance
Manage business process improvement solutions	<p>L</p> <ul style="list-style-type: none"> While predictive and prescriptive analytics will expedite resource management, risk assessment and mitigation planning, strategic thinking and business acumen remain critical to make sound and well-reasoned strategy decisions based on business needs. Leveraging personal relationships and influence is critical for success in this role.
Drive WSH activities to ensure compliance	<p>L</p> <ul style="list-style-type: none"> Human intervention remains critical for influencing behavioural changes and driving a culture of compliance.


In the next 3 - 5 years... This role requires deep **technical expertise, domain knowledge and stakeholder management** skills. Data and technology will be leveraged to augment the job holder's ability to develop strategic project plans, optimise process workflows and forecast resource needs.


Dispatch Operator / Transport Operator / Last Mile Delivery Driver / Container Driver

Technology solutions impacting this job...

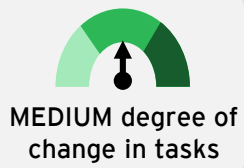
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Impact assessment...



A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for on-time delivery and operation of heavy vehicles (Full Container Load (FCL)/Less than Container Load (LCL): Class 4; Conventional Transport (CVT): Class 4, 5 (Prime movers, Cranes); Lorry/Light Load (LCL): Class 3) to load, move, unload goods.

Emerging skills

Going forward, the job holders will need to be technologically-trained to interpret instructions from assisted driving systems, advanced dashboards etc. for safer and smarter delivery operations.

- This necessitates training on:
- Advanced Digital Acumen
 - Augmented Reality Application
 - Data Interpretation and Analysis
 - Technology Troubleshooting
 - Complex Problem Solving
 - Decision Making

Job tasks today	Impact at task-level / Future view of job tasks
Operate transportation vehicles, lifting and rigging equipment	M <ul style="list-style-type: none"> • Smart glasses and object-recognition technology will enable the job holder to conduct completeness checks of each shipment and augment last-yard navigation to correctly locate delivery points. AR-powered assisted driving, augmented dashboards for drivers, and assistance robots for transporting heavy items will enhance the efficiency and reduce heavy physical labour requirement for this job role. Human oversight remains critical to performing this job role.
Perform cargo and material handling and delivery tasks	M <ul style="list-style-type: none"> • Cargo-related documents will be digitalised with companies issuing, transferring, and receiving original documents through a blockchain network. AR will also be utilised to virtually highlight inside a vehicle to display the optimal internal loading sequence of each shipment taking account of route, weight, fragility, etc.
Assist in quality improvement activities	M <ul style="list-style-type: none"> • With basic quality checks and sustainability controls embedded into smart containers and vehicle fleet, the focus will shift to handling exceptions and troubleshooting to ensure quality and accuracy in meeting customer requirements.
Highlight safety and health risks, report incidents	M <ul style="list-style-type: none"> • Safer and smarter driving will be achieved for vehicle operators by utilising AR as the next generation of navigation and driver-assistance systems. Windshields will be used as heads-up displays to project virtual layers of navigation information, to overlay this data on the real environment. AR will also highlight road hazards to the driver.


In the next 3 - 5 years... The job holder will need to be adept at working in a technologically-rich environment. AR-powered assisted driving, augmented dashboards for drivers, and assistance robots for transporting heavy items will enhance the efficiency and reduce heavy physical labour requirement for this job role.





Traffic Coordinator / Dispatch Coordinator

Technology solutions impacting this job...


 Predictive & Prescriptive Fleet Management

 Autonomous Last Mile Delivery

 Dynamic Route Optimisation

 Autonomous Last Yard Delivery

Impact assessment...



HIGH degree of change in tasks

A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within 3 to 5 years, the role will potentially...

UNDERGO DISPLACEMENT

Today, this job role is responsible for executing transport fleet management documentation, receiving and communicating schedules to transport operators and cargo loaders, and gathering general information from customers to support transport order fulfilments.

Job tasks today	Impact at task-level / Future view of job tasks
Coordinate transportation operation schedules	<p>H</p> <ul style="list-style-type: none"> With dynamic route optimisation solutions, AI and cognitive automation will be applied to transportation tasks such as communicating schedules to transport operators and ensuring the most updated customer information to bolster successful deliveries. Remote monitoring of fleet conditions and alerts on deterioration will enable smarter maintenance work order management so as to minimise vehicle downtime.
Track cargo-handling schedules and routes	<p>H</p> <ul style="list-style-type: none"> Intelligent transportation solutions will increase transparency through smart fleet concepts. In-vehicle telematics will collect data on movements and idle time to optimise schedules and conduct dynamic route planning and optimisation. The focus will shift to ensuring quality control and accuracy in cargo handling and cargo consolidation activities.
Perform documentation and quality improvement	<p>H</p> <ul style="list-style-type: none"> Digital data logging, basic documentation and standard report generation will be done through use of software robotics based on data extracted from transportation management systems and digital transactions. The job holder will be required to apply innovative means for process improvement.
Support safety and health risk assessments	<p>M</p> <ul style="list-style-type: none"> With more data on safety and health parameters, the focus will shift towards monitoring sensor data and interpreting trends to identify potential risks and propose solutions. The job holder will also need to be familiar with evolving safety standards in light of technology evolution, and continue to ensure personal compliance.

In the next 3 - 5 years... Most of the key tasks will be automated by Predictive & Prescriptive Fleet Management and Dynamic Route Optimisation solutions. For small-scale operations, this job role will **likely cease to exist**. For medium to large-scale operations, there is **high potential for convergence of this role with the Depot/ Traffic / Dispatch / Hub Operations Supervisor** role.

Emerging skills

- To perform supervisory role, the job holder will need reskilling on :
- Advanced Digital Acumen
 - Augmented Reality Application
 - Automation Management
 - Data Interpretation and Analysis
 - Technology Troubleshooting
 - Threat Intelligence and Detection
 - Systems Thinking
 - Complex Problem Solving
 - Decision Making
 - Lateral Thinking

Mobility options for displaced workers


- Warehouse Supervisor / Inventory Control Supervisor / Quality Control Supervisor
- HSE Coordinator
- Project Supervisor
- Logistics Contracts Analyst / Logistics Operations Analyst
- Incoming Quality Coordinator / Tally Assistant





Depot Supervisor / Traffic Supervisor / Dispatch Supervisor / Hub Operations Supervisor

Technology solutions impacting this job...


 Predictive & Prescriptive Fleet Management

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Impact assessment...



HIGH degree of change in tasks

A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for supervising general transport operations including planning and scheduling manpower and transportation resources and executing of transportation operations. He/She is also responsible for preparing and documenting transportation reports.

Emerging skills

With automated oversight on fleet and transport operations, there will be more scope for the job holder to be involved in planning and optimisation. The following skills will become critical:

- Advanced Digital Acumen
- Augmented Reality Application
- Automation Management
- Data Interpretation and Analysis
- Threat Intelligence and Detection
- Business Advisory
- Systems Thinking
- Complex Problem Solving
- Decision Making
- Lateral Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Develop and track transportation operation schedules and plans	<p>H</p> <ul style="list-style-type: none"> • Live data from smart vehicles, coupled with intelligent transportation management systems will enable real-time tracking and adjustment of transport schedules, plans and routes. IoT sensors will provide visibility on impending failures and fleet-related risks, thus expediting proactive resolution of issues and minimising vehicle downtime..
Manage cargo documentation	<p>H</p> <ul style="list-style-type: none"> • Cloud-based trade platforms and blockchain will streamline the sharing of cargo documentation. • The focus will shift to interpretation of data from transport management systems for resource optimisation, timeline adherence and customer order fulfilment.
Identify continuous improvement opportunities	<p>H</p> <ul style="list-style-type: none"> • Advanced analytics will provide insights on situational factors, process performance and quality metrics. The job holder will be tasked with identifying gaps and suggesting process improvements. Sensor-enabled data collection coupled with predictive analytics will help optimise critical parameters such as machine utilisation, energy consumption, and resource optimisation, thus enhancing sustainability activities.
Conduct WSH risk assessments, suggest solutions	<p>M</p> <ul style="list-style-type: none"> • Use of quality, safety and health monitoring applications will be used to predict WSH risks at an early stage, and conduct root cause analysis. Insights from machine health monitoring processes will be leveraged for identifying shortcomings in existing processes and timely prevention of workplace accidents


In the next 3 - 5 years... With implementation of Predictive & Prescriptive Fleet Management and Dynamic Route Optimisation solutions, this role will **transform from a supervisory role to a planning and reviewing role**. For small-scale operations, there is high potential for convergence of this role with the Traffic Controller / Transport Officer / Line Haul Operations Officer role.


Traffic Controller / Transport Officer / Line Haul Operations Officer

Technology solutions impacting this job...

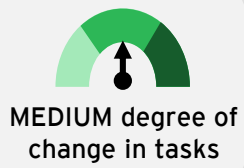
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Impact assessment...



A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for planning and implementing transportation processes, operations and technology. He/She is also responsible for developing plans to monitor transportation resources utilisation levels and reviewing efficiency of transportation operations.

Emerging skills

This role will be tasked with assessing the effectiveness of technology solutions and suggesting improvements based on data and analytics. This will require development of skills for:

- Advanced Digital Acumen
- Automation Management
- Data Interpretation and Analysis
- Threat Intelligence and Detection
- Business Advisory
- Complex Problem Solving
- Decision Making
- Lateral Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Review effectiveness of transportation operation schedules and plans	M <ul style="list-style-type: none"> • Dynamic, real-time route optimisation through the intelligent correlation of data streams (e.g. shipment information, weather, traffic etc.) will augment the transportation planning activities enabling the job holder to efficiently schedule assignments, optimise load sequences and resources, and predict 'down-to-the-minute' estimated time of arrival (ETA).
Plan cargo or material handling activities	M <ul style="list-style-type: none"> • Cognitive automation and data analytics on factors such as resource utilisation, customer demands, traffic, weather etc. will enable anticipatory planning, scheduling and load optimisation for cargo handling and consolidation activities. • Focus will shift to enhancing customer experiences and providing upward feedback for process improvements.
Support continuous improvement; assess situational factors that inhibit change	M <ul style="list-style-type: none"> • AI and advanced analytics will help job holder conduct "what-if" analyses and scenario testing to evaluate the impact of potential solutions for process improvement. Behavioural and social analytics will be used to model cultural, customer and market trends better. This will enable the job holder to assess situational factors that inhibit change.
Analyse level of technology usage and conduct training	M <ul style="list-style-type: none"> • Smart, connected technology solutions equipped with self-reporting capabilities will provide insights on usage and efficiency, enabling the job holder to make informed decisions about impact on operations and performance. VR and AR enabled simulations will be utilised to conduct learning activities and technology or electronic tools and devices.


In the next 3 - 5 years... The job holder will need to be adept at working in a technologically-rich environment. There is **high potential for this role to be redesigned to provide upward feedback** based on data and advanced analytics to assess the effectiveness of predictive fleet management and route optimisation algorithms, and suggesting improvements.





Transport Assistant Manager / Transport Executive / Line Haul Operations Executive

Technology solutions impacting this job...


 Predictive & Prescriptive Fleet Management

 Autonomous Last Mile Delivery

 Dynamic Route Optimisation

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Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for planning and implementing complex transportation processes, operations and technology. He/She is also responsible for developing plans to monitor transportation resources utilisation levels and reviewing efficiency of transportation operations.

Emerging skills

The job holder will play a larger role in planning and implementing complex transportation processes, operations and technology, enabled by advanced analytics.


- Advanced Digital Acumen
- Automation Management
- Data Interpretation and Analysis
- Threat Intelligence and Detection
- Business Advisory
- Strategic Service Excellence
- Sustainability Management
- Systems Thinking
- Lateral Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Optimise resources and cost of transportation operations	<p>L</p> <ul style="list-style-type: none"> • Predictive analytics will enable anticipatory shipping and transportation planning by analysing customers' purchasing behaviours, peak periods, market trends etc. leading to cost and resource optimisation. AI-powered intelligent fleet will enable improved transparency, real-time monitoring, and end-to-end live support.
Optimise space, cost and efficiency in cargo handling	<p>M</p> <ul style="list-style-type: none"> • Advanced analytics and machine learning will enable modelling complex transportation problems, and support scenario planning to develop optimal solutions for scheduling, cargo consolidation and handling of cargo with special needs e.g. time/temperature sensitive and dangerous goods.
Propose environmental protection procedures	<p>L</p> <ul style="list-style-type: none"> • Self-learning algorithms will provide insights on potential risks, business requirements and carbon footprint of the business operations. While this will inform decision-making, the job role will continue to require human judgment and experience for key policy decisions.
Optimise use of technology and other resources	<p>L</p> <ul style="list-style-type: none"> • The job holder will continue to perform these tasks by leveraging technical expertise and stakeholder management skills. Data analytics and business intelligence capabilities will help assess the impact of technology on company performance and resource optimisation. Human experience and technical expertise remain critical.


In the next 3 - 5 years... Intelligent transportation management systems, equipped with advanced data analytics will augment planning and implementation of complex transportation processes, operations and technology. The job role will continue to require **technical expertise, human judgment and stakeholder management skills.**


Transportation Operations Manager

Technology solutions impacting this job...


 Predictive & Prescriptive Fleet Management

 Autonomous Last Mile Delivery

 Dynamic Route Optimisation

 Autonomous Last Yard Delivery

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, as a department lead, this job role is responsible for managing and reviewing transportation operational policies, standards and procedures in accordance to transportation business and customers' needs, including the implementation of transportation solutions.

Emerging skills

This role will need to be technology-savvy going forward. However, technical expertise and leadership skills remain critical.

- Advanced Digital Acumen
- Automation Management
- Data Interpretation and Analysis
- Threat Intelligence and Detection
- Business Advisory
- Strategic Service Excellence
- Sustainability Management
- Systems Thinking
- Lateral Thinking

Job tasks today	Impact at task-level / Future view of job tasks
Strategise transportation and fleet management operations	L <ul style="list-style-type: none"> Machine learning will enable modelling and forecasting of demand, capacity, and resource requirements. This will enhance the job holder's ability to strategise transportation operations and fleet management. However human judgment and personal influence remain critical for stakeholder management and strategic decisions.
Manage complex cargo operations including dangerous goods	L <ul style="list-style-type: none"> Smart containerisation and special packaging will ensure transparency, traceability and handling of dangerous goods across the supply chain such that losses, thefts and damage will be reduced. Technical expertise and human judgment will remain critical in strategising cargo operations.
Manage continuous improvement for transportation	L <ul style="list-style-type: none"> Prescriptive analytics that utilise learning algorithms and dynamic rule engines will provide interpretations and process improvement recommendations. While this will inform policy decisions and operations management, strategic thinking, personal influence and leadership qualities remain critical for success.
Manage technology application, resources and teams	L <ul style="list-style-type: none"> Data analytics and business intelligence capabilities will help assess the impact of technology on company performance. Behavioural and social analytics will help inform stakeholder management and communications. Predictive and prescriptive analytics will expedite resource management, risk assessment and mitigation planning.

In the next 3 - 5 years... The job holder will continue to perform this role by leveraging **technical expertise and stakeholder management skills**. Leveraging personal relationships and influence remains critical for success in this role.

Job Dashboards for Freight Forwarding Operations

Impact assessment

Within 3 - 5 years

Import Export Manager/ Freight Allocation Manager/
Freight Shipping Manager/ Freight Documentation Manager/
Freight Pricing Manager

Shipping Specialist/ Import Export Specialist/ Freight
Executive

Freight
inspector/
Incoming Quality
Inspector

Brokerage
Supervisor/
Freight
Supervisor

Freight Officer

Incoming
Quality
Coordinator /
Tally Assistant

Permit Coordinator/
Shipping Coordinator/
Custom Clearance Coordinator

Import Export Administrative
Assistant/ Shipping Assistant

Legend:

- High degree of change in tasks
- Medium degree of change in tasks
- Low degree of change in tasks
- Undergo displacement
- Require redesign
- Change incrementally
- Job functions within this functional track

Incoming Quality Coordinator / Tally Assistant

Technology solutions impacting this job...

Smart Billing, Costing & Reconciliation

Connected Trade Platforms

Optimised Documentation

Impact assessment...

MEDIUM degree of change in tasks

A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for reviewing cargo and goods with reference to freight forwarding documents and conducting quality-control checks of goods in order to document the differences in specifications for quantity and quality between consigned and received.

Emerging skills

With automation of administrative tasks, the job holder will be responsible for exercising oversight on quality and compliance. This necessitates reskilling on:


- Process Improvement and Optimisation
- Advanced Digital Acumen
- Technology Application
- Systems Thinking
- Collaboration
- Compliance Mindset Development
- Decision Making


Job tasks today	Impact at task-level / Future view of job tasks
Inspect materials received and cargo acceptance documentation	M <ul style="list-style-type: none"> • Optimised documentation solutions will be used to create tamper-proof digital records for cargo acceptance to replace paper-based documentation. Intelligent robotic systems will be able to inspect incoming materials for conformance with standards for quality and quantity of goods received. • The focus will shift to exercising oversight, and downgrade and rejection assessment of incoming materials.
Perform compliance checks and report non-compliances	M <ul style="list-style-type: none"> • RPA and blockchain-based smart contracts, coupled with IoT sensors will enable real-time monitoring and checks for compliance requirements e.g. regulatory requirements for temperature-controlled fleet. Non-compliance will alert the parties or stakeholders of the potential contract breach. The focus will shift to handling such exception cases and taking corrective actions.
Perform safety and health risk assessments	M <ul style="list-style-type: none"> • IoT devices pre-configured with safety and risk controls will provide insights on impending failures and safety risks. The job holder will need to be familiar with evolving safety standards in light of technology evolution, and continue to ensure personal compliance.
Support resource estimation and allocation	M <ul style="list-style-type: none"> • While data and advanced analytics will help in better resource estimation and basic risk assessment, the job holder will need to exercise judgment while executing tasks so as to work with allocated resources.


In the next 3 - 5 years... As Industry 4.0 technologies will **automate the manual, administrative and documentation-heavy tasks**, this role will see in transition in responsibilities from coordinating and tallying documentation to inspecting freight for quality and quantity, and conducting downgrade and rejection assessment of incoming materials.

Freight Inspector / Incoming Quality Inspector

Technology solutions impacting this job...

 Smart Billing, Costing & Reconciliation

 Connected Trade Platforms

 Optimised Documentation

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for inspecting freight with reference to freight forwarding documents, and inspecting compliance with laws and regulations, including inspecting proper positioning, cushioning, restraining and balancing of cargo and inspecting safety.

Emerging skills


Given the high regulatory and compliance requirements for this role, the job holder will continue to With automation of administrative tasks, the job holder will utilise data insights for stricter due diligence.


- Process Improvement and Optimisation
- Advanced Digital Acumen
- Business Advisory
- Strategic Service Excellence
- Systems Thinking
- Collaboration
- Compliance Mindset Development
- Decision Making


Job tasks today	Impact at task-level / Future view of job tasks
Lead freight quantity, quality and documentation inspection	<p>M</p> <ul style="list-style-type: none"> • Blockchain-based systems will monitor critical information on freight such as details on production, transport method, customs, inspection and third-party verification. Sensors and AI will enable automated quality checks and alerts on material rejection. • The job holder will be required to intervene for handling escalated cases and complex freight inspections.
Drive compliance internal audit activities	<p>L</p> <ul style="list-style-type: none"> • With connected trade platforms, information and data on tariffs, rates, costs, licenses and agreements etc. are available for customers and relevant parties to access in real-time. Non-compliance in services will be flagged by smart legal contracts. The job holder will be required to handle exceptions, monitor audit workflows and focus on process improvements.
Generate WSH reports, suggest solutions	<p>L</p> <ul style="list-style-type: none"> • Use of quality, safety and health monitoring applications will help in generating investigation reports. AI and big data will be used to predict WSH risks at an early stage, and conduct root cause analysis. This will enable the job holder to propose solutions to existing shortcomings in the WSH processes.
Optimise use of resources and supervise teams	<p>L</p> <ul style="list-style-type: none"> • Dynamic resource optimisation solutions, equipped with advanced data analytics and AI will help in resource optimisation and risk assessment. The role will continue to require human intervention for people and stakeholder management.
In the next 3 - 5 years...	<p>This role will continue to be responsible for freight inspection and ensuring compliance with laws and regulations. Data availability and automation is likely to speed up administrative tasks involved and provide end-to-end visibility across the supply chain to ensure stricter due diligence and compliance.</p>

Import Export Administrative Assistant / Shipping Assistant

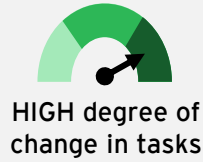
Technology solutions impacting this job...

 Smart Billing, Costing & Reconciliation

 Connected Trade Platforms

 Optimised Documentation

Impact assessment...



A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within 3 to 5 years, the role will potentially...

UNDERGO DISPLACEMENT

Today, this job role is responsible for providing assistance, preparing the necessary export/import documentations, and coordinating with customers or destination/origin logistics operators and customs to plan and track shipments and ensure that goods are cleared through customs.

Job tasks today	Impact at task-level / Future view of job tasks
Perform data entry for freight services	<p>H</p> <ul style="list-style-type: none"> Key freight-related documents will be digitalised with participants issuing, transferring, and receiving the original document through a blockchain network, thus eliminating data entry tasks. The job holder will be required to handle exception cases and respond to complex customer queries.
Prepare documentation for cargo operations	<p>H</p> <ul style="list-style-type: none"> Software robotics will automate manual data entry operations and streamline document processing for cargo consolidation, transshipment and transloading activities. The job holder will be tasked with customer-facing duties and focus more on cargo security procedures and process improvement.
Provide information on tariffs, rates, or quotations	<p>H</p> <ul style="list-style-type: none"> With smart billing, costing and reconciliation systems, information on tariffs, rates, costs or quotations will be easily available to customers. The focus will shift to analysing the information to provide expert recommendations and addressing non-compliance cases identified by the system.
Support resource estimation and allocation	<p>M</p> <ul style="list-style-type: none"> While data and advanced analytics will help in better resource estimation and basic risk assessment, the job holder will need to exercise judgment while executing tasks so as to work with allocated resources.
In the next 3 - 5 years...	As optimised documentation solutions enabled by RPA, OCR and blockchain continue to automate back-end functions and documentation tasks, this role will likely cease to exist for small-scale operations, or converge with Permit/Shipping/ Custom Clearance Coordinator role for medium to large-scale operations.

Emerging skills

On convergence with the Coordinator role, the job holder will need higher-order skills such as

- Process Improvement & Optimisation
- Advanced Digital Acumen
- Technology Application
- Business Advisory
- Systems Thinking
- Collaboration
- Decision Making

Mobility options for displaced workers

- Depot/Traffic/Dispatch/Hub Operations Supervisor
- Order Management/Quote Desk/Order Fulfilment/Inside Sales Officer
- Dispatch Operator/Transport Operator/ Last Mile Delivery Driver/Container Driver
- Logistics Data Management Coordinator / Logistics Data Entry Coordinator
- Logistics Contracts Analyst / Logistics Operations Analyst



Permit Coordinator / Shipping Coordinator / Custom Clearance Coordinator


Technology solutions impacting this job...

Smart Billing, Costing & Reconciliation

Connected Trade Platforms

Optimised Documentation

Impact assessment...



HIGH degree of change in tasks

A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within 3 to 5 years, the role will potentially...

UNDERGO DISPLACEMENT

Today, this job role is responsible for freight forwarding permit processing from preparation, application submission through to final inspection, providing precise information to all stakeholders, attending to customers' enquiries, and handling claims and cargo discrepancies.

Job tasks today	Impact at task-level / Future view of job tasks
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Coordinate with stakeholders for freight services; resolve queries	<p>H</p> <ul style="list-style-type: none"> Connected trade platforms will provide transparency for all parties including customers, airlines, carriers, destination/origin co-loaders, customs etc. to access freight status, permit processing updates, status of customs documents and other data. This will enable faster collaboration on freight services. Intelligent virtual assistants will attend to basic customers queries. Focus will shift to final inspection for permit processing and customs clearances and identifying appropriate solutions to address customer queries based on technical knowledge.
Organise cargo documentation as per industry standards or sector requirements	<p>H</p> <ul style="list-style-type: none"> Cloud technology coupled with OCR and computer vision for optimised documentation will record all cargo-related documentation on a blockchain ledger, making physical paperwork largely unnecessary. Data will be securely stored in the system and can be retrieved when needed. Focus will shift to ensuring quality control and accuracy in tasks and handling cargo security procedures.
Provide information on tariffs, rates, or quotations	<p>H</p> <ul style="list-style-type: none"> With smart billing, costing and reconciliation systems, information on tariffs, rates, costs or quotations will be easily available to customers. The focus will shift to analysing the information to provide expert recommendations and addressing non-compliance cases identified by the system.
Estimate resources required for project activities	<p>M</p> <ul style="list-style-type: none"> Dynamic resource optimisation solutions, equipped with advanced data analytics and AI will help in resource optimisation and basic risk assessment. The job role will require human intervention for people and stakeholder management in case of large scale-operations.

In the next 3 - 5 years... This role will evolve as key tasks including permit processing, customs clearance and customer coordination for freight services are largely automated. There is **high likelihood of convergence of this role with Brokerage/Freight Supervisor role**, with greater focus on customer management, quality control, security and compliance procedures.

Emerging skills

- The following skills will become critical:
- Process Improvement & Optimisation
 - Advanced Digital Acumen
 - Automation Management
 - Technology Application
 - Systems Thinking
 - Collaboration
 - Compliance Mindset Development
 - Decision Making


Mobility options for displaced workers


- Depot/Traffic/Dispatch/Hub Operations Supervisor
- Order Management Executive / Quote Desk Executive / Order Fulfilment Officer / Inside Sales Officer
- Traffic Controller / Transport Officer / Line Haul Operations Officer
- Logistics Data Management Coordinator / Logistics Data Entry Coordinator
- HSE Coordinator




Brokerage Supervisor / Freight Supervisor

Technology solutions impacting this job...

 Smart Billing, Costing & Reconciliation

 Connected Trade Platforms

 Optimised Documentation

Impact assessment...



A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for liaising with customers, logistics operators and customs officials and supervising the custom clearance and freight forwarding process to ensure goods are cleared through customs or quarantine in accordance with import & export regulations.

Emerging skills

The job holder will play an enhanced role in planning and optimising freight routes and plans. This will need reskilling on the following areas:

- Process Improvement and Optimisation
- Advanced Digital Acumen
- Automation Management
- Technology Application
- Business Advisory
- Systems Thinking
- Collaboration
- Compliance Mindset Development
- Decision Making

Job tasks today	Impact at task-level / Future view of job tasks
Prepare freight performance reports and status updates	H <ul style="list-style-type: none"> • Blockchain-based trade platforms will enable faster processing of trade licenses, import and export permits, and customs clearances. Any lapses will be notified through the system. Big data and AI (NLG) will be able to generate daily operation performance reports and status updates. • The job holder will be tasked with resolving escalated customer concerns and issues on freight services and identifying performance improvement opportunities.
Apply rating principles, state and operator variations for freight; track cargo	H <ul style="list-style-type: none"> • Smart billing, costing and reconciliation systems will provide real-time data on rating principles, and state and operator variations. The data shared across these decentralised networks will enable comprehensive track-and-trace capabilities for cargo and verification of cargo and material-handling requirements across the logistics value chain, thus eliminating the needs for manual checks.
Perform compliance-related administrative activities	M <ul style="list-style-type: none"> • Connected trade platforms will serve as a one-stop interface for all regulatory transactions. Non-compliance will trigger alerts to the supervisor. Cognitive automation will enable documentation of licenses and agreements for completing compliance-related administrative activities. The job holder will supervise workflows and manage performance of checks in accordance to internal standard operating procedures (SOP), government regulatory requirements and legislations to identify non-compliance.
Optimise use of allocated resources; evaluate risks	M <ul style="list-style-type: none"> • Machine learning is seen to model complex scenarios for resource allocation and risk evaluation. This will inform decision-making for this job role. • Human intervention will remain critical for supervising teams and managing stakeholders.
In the next 3 - 5 years...	There is high potential for this role to be redesigned to generate insights from industry 4.0 technology solutions including smart billing, costing and reconciliation systems and connected trade platforms to play a larger role in planning the movement of goods, optimising freight costs, and resolving escalated customer issues on freight services.

Freight Officer

Technology solutions impacting this job...

Smart Billing, Costing & Reconciliation

Connected Trade Platforms

Optimised Documentation

Impact assessment...

MEDIUM degree of change in tasks

A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within **3 to 5 years**, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for liaising with stakeholders for planning and tracking the movement of goods to ensure goods are cleared through customs or quarantine, reviewing freight costs, negotiating rates with logistics and insurance companies, preparing quotes for customers.

Emerging skills


The role will evolve to utilising data insights for optimising freight services and having more informed conversations with stakeholders.


- Process Improvement and Optimisation
- Advanced Digital Acumen
- Automation Management
- Technology Application
- Business Advisory
- Systems Thinking
- Collaboration
- Compliance Mindset Development
- Decision Making


Job tasks today	Impact at task-level / Future view of job tasks
Evaluate customer needs to improve freight operations processes and plans	M <ul style="list-style-type: none"> • Data from IOT sensors, geolocation-devices and stakeholder databases will provide real-time insights for planning and tracking the movement of goods including large-scale freight. Machine learning will provide predictive insights on customer needs and market trends. • The job holder will be tasked with analysing the data to make well-informed decisions for improving operational efficiencies.
Recommend cargo solutions to optimise space, cost and efficiency	M <ul style="list-style-type: none"> • Cognitive automation and simulation modeling techniques will support the job holder in scenario planning to test different solution prototypes and suggest optimal solutions for scheduling, cargo consolidation and handling of dangerous goods.
Perform compliance-related administrative activities	M <ul style="list-style-type: none"> • Connected trade platforms will serve as a one-stop interface for all regulatory transactions. Non-compliance will trigger alerts. Cognitive automation will enable documentation of licenses and agreements for completing compliance-related administrative activities. The job holder will supervise workflows and manage performance of checks in accordance to internal standard operating procedures (SOP), government regulatory requirements and legislations to identify non-compliance.
Manage stakeholder communications	M <ul style="list-style-type: none"> • Connected trade platforms will provide end-to-end visibility to all stakeholders in the value chain. This will enable the job holder to better manage stakeholder communications. • The job role will continue to require human intervention for people and stakeholder management.
In the next 3 - 5 years...	This role will evolve to utilising data insights for optimising freight routes and plans, having more informed conversations with customers for personalising freight services, and collaborating with other stakeholders for negotiating rates. There will be more expectation on the job holder for recommending ways to improve operations and processes.

Shipping Specialist / Import Export Specialist / Freight Executive

Technology solutions impacting this job...

 Smart Billing, Costing & Reconciliation

 Connected Trade Platforms

 Optimised Documentation

Impact assessment...



The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for planning and reviewing complex freight and specialised custom clearance activities, analysing freight analytics to improve Return on Equity (ROE), and advising customers on import and export rules and regulations for complex freight.

Emerging skills

Enhanced data availability will augment the job holder's ability to recommend optimal solutions and provide feedback on process improvement.

- Process Improvement and Optimisation
- Advanced Digital Acumen
- Automation Management
- Cloud Computing Application
- Cyber Risk Management
- Technology Application
- Business Advisory
- Strategic Service Excellence
- Systems Thinking
- Compliance Mindset Development

Job tasks today

Impact at task-level / Future view of job tasks


Plan complex freight shipments; advise customers on freight shipment alternatives	M	<ul style="list-style-type: none"> • Advanced analytics and scenario planning will inform development of cost-efficient freight shipment alternatives based on prevalent tariffs, insurance and quotas. Modelling of data points such as customer needs, transaction value, price sensitivity, risk, etc. will enable freight forwarders to significantly improve their customer attraction and retention strategies. • Technical expertise and personal influence will continue remain critical for success in this job role.
Plan cargo-handling and delivery operations	L	<ul style="list-style-type: none"> • Advanced analytics on factors such as rating principles, operator variations, industry standards etc. will enable optimal planning of cargo-handling and delivery operations. Technical expertise and in-depth knowledge of complex freight operations remain critical.
Develop review measures to ensure compliance	L	<ul style="list-style-type: none"> • Cognitive engines will analyse high volumes of regulatory information and ensure that a business is alerted to the latest policies' and tariffs, rates, costs or quotations requirements and eligibility. This will augment development of review measures to ensure compliance with the latest government regulatory requirements and legislations.
Supervise teams in department activities	L	<ul style="list-style-type: none"> • While data and advanced analytics will help in better resource planning, the job role will require technical expertise and in-depth knowledge of freight operations for risk evaluation and developing SOPs, and people management skills for supervising teams.


In the next **3 - 5** years...


Going forward, this role **will require advanced digital acumen and a data mindset** to utilise real-time insights for optimising freight services, predicting customer needs and market trends, and recommending optimal solutions to meet those needs. This includes providing upward feedback to enable automation of relevant processes.

Import Export Manager / Freight Allocation Manager / Freight Shipping Manager / Freight Documentation Manager / Freight Pricing Manager

Technology solutions impacting this job...

 Smart Billing, Costing & Reconciliation

 Connected Trade Platforms

 Optimised Documentation

Impact assessment...



The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, as a department lead, this job role is responsible for managing and reviewing freight operational policies, standards and procedures in accordance to business and customer needs, implementing freight solutions, and managing resources, internal assets and external vendors.

Emerging skills

The role will make use of advanced analytics to offer personalised services to customers. Strategic decision-making and technical expertise remain critical for solutioning.

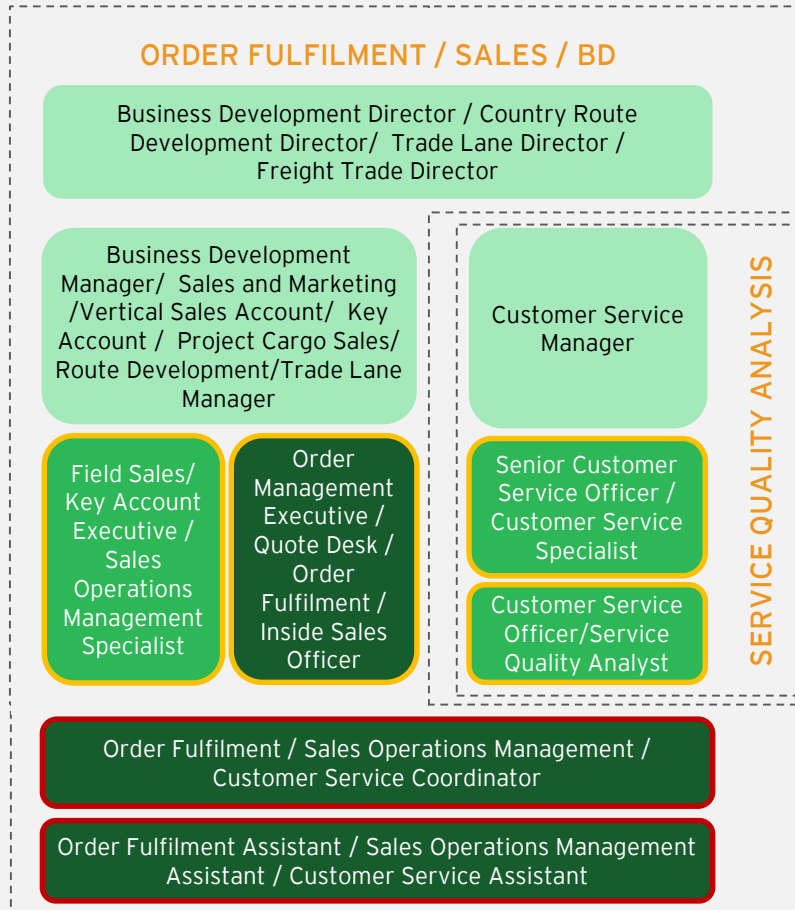
Job tasks today	Impact at task-level / Future view of job tasks
Strategise competitive shipping solutions for customers	L <ul style="list-style-type: none"> Use of smart contracts and smart billing and reconciliation systems will ensure compliance and performance on contractual obligations. Machine learning will enable development and scenario testing of complex models for freight shipment solutions. While this will inform strategic decision-making, technical expertise remains critical for solutioning.
Drive strategic cargo operations	L <ul style="list-style-type: none"> AI and advanced analytics will help to create robust customer profiles and facilitate classification of carriers and customers into segments (such as retention, migration, expansion, acquisition, and/or reprioritisation) to ensure strategic business is protected during periods of capacity shortage. Technical expertise and human judgment remain critical in strategising cargo operations.
Develop compliance strategies	L <ul style="list-style-type: none"> Predictive analytics that utilise learning algorithms and dynamic rule engines will provide insights on compliance. While this will inform policy decisions, human intervention is critical to develop compliance strategies to achieve acceptable level of compliance with company and industry standards.
Manage stakeholders and teams in the workplace	L <ul style="list-style-type: none"> Behavioural and social analytics will help inform stakeholder management and communications. Predictive and prescriptive analytics will expedite resource management, risk assessment and mitigation planning. However, leveraging personal relationships, leadership skills and influence remains critical for success in this role.
In the next 3 - 5 years...	This role will continue to be responsible for building and maintaining relationships with customers and other key stakeholders . With advanced analytics, the job holder will be able to better understand customer profiles and develop freight services tailored to the specific needs of customers.

- Process Improvement and Optimisation
- Advanced Digital Acumen
- Automation Management
- Cloud Computing Application
- Cyber Risk Management
- Business Advisory
- Strategic Service Excellence
- Systems Thinking
- Compliance Mindset Development

Job Dashboards for Sales and Customer Service

Impact assessment

Within 3 - 5 years




Legend:


- High degree of change in tasks
- Medium degree of change in tasks
- Low degree of change in tasks
- Undergo displacement
- Require redesign
- Change incrementally
- Job functions within this functional track

Order Fulfilment Assistant / Sales Operations Management Assistant / Customer Service Assistant


Technology solutions impacting this job...

 Smart Lockers

 Round-the-clock customer service via Virtual Assistants

 Optimised Documentation

Impact assessment...



HIGH degree of change in tasks

A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within 3 to 5 years, the role will potentially...

UNDERGO DISPLACEMENT

Today, this job role is responsible for providing assistance in the order fulfilment process, which includes handling point of sales inquiries, order processing, shipment and delivery of orders to the customer.

Job tasks today	Impact at task-level / Future view of job tasks
Address customer queries and issues	<p>H</p> <ul style="list-style-type: none"> Virtual assistants enabled by AI and ML will address basic customer queries and enable round-the-clock resolution of customer issues. Machine learning will continue to improve the query resolution capabilities of chatbots, and route queries to human specialists only for escalated issues and complex cases. Focus will shift to handling diverse, complex and escalated customer queries based on customer and technical knowledge.
Communicate requirements and status updates to stakeholders	<p>H</p> <ul style="list-style-type: none"> Integrated digital platforms, RPA and real-time notifications will provide end-to-end visibility to all parties on the status of order fulfilment. This will minimise the need for this role to manually monitor the order fulfilment process and communicate status updates to stakeholders.
Perform documentation of customer orders	<p>H</p> <ul style="list-style-type: none"> Optimised documentation solutions using RPA and blockchain will allow automated digital issuing and transfer of documents thus eliminating the need for this role to perform manual administrative tasks.
In the next 3 - 5 years...	As machine learning continues to improve the query resolution capabilities of virtual assistants, this job will likely cease to exist for small-scale operations . For medium to large-scale operations, there is high potential for convergence of this role with Order Fulfilment/Sales Operations/Customer Service Coordinator role.

Emerging skills

With a high risk of replacement of this role by virtual assistants or convergence with higher job roles, there will be need to reskill and upskill the job holder on:

- Process Improvement and Optimisation
- Advanced Digital Acumen
- Data Interpretation and Analysis
- Social Media Management
- Collaboration
- Lateral Thinking


Mobility options for displaced workers


- Freight Officer
- Brokerage Supervisor / Freight Supervisor
- Customer Service Officer / Service Quality Analyst
- Depot/Traffic/Dispatch/Hub Operations Supervisor
- Incoming Quality Coordinator / Tally Assistant

Order Fulfilment Coordinator / Sales Operations Management Coordinator / Customer Service Coordinator


Technology solutions impacting this job...

 Smart Lockers

 Round-the-clock customer service via Virtual Assistants

 Optimised Documentation

Impact assessment...



HIGH degree of change in tasks

A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within 3 to 5 years, the role will potentially...

UNDERGO DISPLACEMENT

Today, this job role is responsible for engaging diverse customers for handling the order fulfilment process, which includes handling point of sales inquiries, order processing, shipment and delivery of orders to the customer.

Job tasks today	Impact at task-level / Future view of job tasks
Identify solutions for customer issues; monitor delivery lapses	<p>H</p> <ul style="list-style-type: none"> Application of AI and ML capabilities to enriched data sets from customer queries will enable provision of customised solutions for customer issues through keyword identification. Technologies such as smart lockers and smart billing systems will make use of IoT to provide visibility and advanced track-and-trace capabilities for real-time monitoring of shipments. Delivery lapses will trigger alerts to the user for further troubleshooting.
Communicate requirements and status updates to stakeholders	<p>H</p> <ul style="list-style-type: none"> Integrated digital platforms, RPA and real-time notifications will provide end-to-end visibility to all parties on the status of order fulfilment. This will minimise the need for this role to manually monitor the order fulfilment process and communicate status updates to stakeholders.
Conduct studies to identify trends and market movements	<p>M</p> <ul style="list-style-type: none"> Advanced analytics along with AI will be used to gather and synthesise information from multiple sources for quicker reviewing to understand market trends better. 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.
In the next 3 - 5 years...	RPA and AI will continue to automate back-end functions and integrated digital platforms will automate inter-department coordination. With decreasing need for manual intervention, it is likely that this role will converge with Order Management Executive/Quote Desk Executive/Order Fulfilment Officer/Inside Sales Officer role.

Emerging skills

To take on Executive level responsibilities, the following skills will need to be developed:

- Process Improvement and Optimisation
- Advanced Digital Acumen
- Data Interpretation and Analysis
- Data Storytelling and Visualisation
- Customer Behaviour Analysis
- Social Media Management
- Collaboration
- Lateral Thinking


Mobility options for displaced workers


- Customer Service Officer / Service Quality Analyst
- Brokerage Supervisor / Freight Supervisor
- Logistics Data Management / Logistics Data Entry Coordinator
- Freight Inspector / Incoming Quality Inspector
- Project supervisor

Field Sales Executive / Key Account Executive / Sales Operations Management Specialist


Technology solutions impacting this job...

 Smart Lockers

 Round-the-clock customer service via Virtual Assistants

 Optimised Documentation

Impact assessment...


MEDIUM degree of change in tasks

A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is the contact point with commercial accounts on various logistics services, providing support in identifying potential customers, selling solutions and participating in sales programmes targeting different customers.

Emerging skills

While human involvement remains key for driving sales activities, the job holder will increasingly use data and analytical insights to support decisions:


- Process Improvement and Optimisation
- Advanced Digital Acumen
- Data Interpretation and Analysis
- Data Storytelling and Visualisation
- Customer Behaviour Analysis
- Social Media Management
- Collaboration
- Lateral Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Identify customer needs and resolve CRM conflicts	<p>M</p> <ul style="list-style-type: none"> • Big data analytics and AI will help to identify trends and patterns in customer needs based on various data streams e.g. purchasing behaviours, price sensitivity, seasonal demands, historical orders etc. • The focus will shift to identifying ways to improve overall customer service and resolving conflicts.
Identify custom solutions that address customer needs for BD	<p>M</p> <ul style="list-style-type: none"> • Predictive analytics will allow for auto-generation of recommendations on solutions from a standard suite of products and services to be offered to customers. High level of social interaction will still be required for the job holder to identify new business opportunities and grow relationships with key accounts that will assist in revenue generation within assigned verticals.
Perform sales of logistics products and services	<p>M</p> <ul style="list-style-type: none"> • Digital platforms enabled by AR and VR will augment sales activities. Machine learning will allow for more targeted advice on products or services while automation can help to direct customers to the most appropriate resource for more information on standard and bespoke logistics solutions offered by the company. • Focus will shift to utilising data and analytical insights to have targeted sales conversations with customers.
In the next 3 - 5 years...	This role will transform from a manual, social skills intensive role to utilising data, analytics and simulations to drive sales and key account management . This job holder will play a larger role in customer relationship building and service quality improvement.

Order Management Executive / Quote Desk Executive / Order Fulfilment Officer / Inside Sales Officer


Technology solutions impacting this job...

 Smart Lockers

 Round-the-clock customer service via Virtual Assistants

 Optimised Documentation

Impact assessment...



HIGH degree of change in tasks

A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for preparing customer proposals/tender documents and fulfilling orders, from identifying customer needs, developing proposals, coordinating with relevant departments and processing orders to shipment and delivery of orders to the customers.

Emerging skills


The job holder will potentially play an augmented role in planning and recommending opportunities for improving sales. The job holder will use the following skills going forward:


- Process Improvement and Optimisation
- Advanced Digital Acumen
- Data Interpretation and Analysis
- Data Storytelling and Visualisation
- Customer Behaviour Analysis
- Social Media Management
- Collaboration
- Lateral Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Coordinate for delivery of logistics services that meet customer needs	<p>H</p> <ul style="list-style-type: none"> • Integrated digital platforms that use RPA, AI and cloud computing will enable auto-routing of incoming customer orders to relevant warehousing, transportation and freight forwarding functions, thus minimising manual intervention in order fulfilment processes. • The job holder will be tasked with resolution of hindrances to improve time to delivery and enhance service quality.
Analyse market needs and opportunities in key accounts within assigned verticals	<p>M</p> <ul style="list-style-type: none"> • Customer analytics and big data, using a vast array of datasets, will be used to generate insights on customer needs, market trends and business development opportunities. • The job holder will be tasked with making sense of prevalent trends, dynamics and market movements to recommend potential solutions to grow the business within the assigned vertical.
Research potential customer information to facilitate sales	<p>H</p> <ul style="list-style-type: none"> • RPA and big data analytics will enable collection and synthesis of large customer datasets from various digital channels. • Customer behaviour analytics will help to predict customers' logistics services requirements, revealing the best times for sales outreach versus traditional methods of cold-calling to drive sales generation.
In the next 3 - 5 years...	This role will evolve to interpret data and analytical insights so as to recommend potential solutions to grow the business within assigned verticals. This will also require the job holder to deploy a data-driven approach for enhancing sales performance.

Business Development Manager / Sales and Marketing Manager / Vertical Sales Account Manager / Key Account Manager / Project Cargo Sales Manager / Route Development Manager / Trade Lane Manager


Technology solutions impacting this job...

 Smart Lockers

 Round-the-clock customer service via Virtual Assistants

 Optimised Documentation

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for business development, managing large key accounts, marketing, sales of both broad-based and niche logistics services including performing market research, prospecting, developing relationships with potential customers and meeting sales targets.

Emerging skills


The job holder will continue to exercise judgement, personal influence and stakeholder relationship management skills for success in this role.


- Advanced Digital Acumen
- Automation Management
- Data Interpretation and Analysis
- Data Storytelling and Visualisation
- Customer Behaviour Analysis
- Social Media Management
- Collaboration
- Lateral Thinking
- Personal Influence


Job tasks today	Impact at task-level / Future view of job tasks
Develop co-created solutions with customers to enhance offerings and competitiveness	<p>L</p> <ul style="list-style-type: none"> • Big data analytics and simulation modeling will enable analysis of large customer datasets e.g. seasonal needs, process gaps, service lapses etc., enabling the job holder to develop bespoke solutions and offerings. Technical expertise and industry experience remains critical for consulting on optimal solutions.
Develop vertical business plans to grow the markets of vertical sectors	<p>L</p> <ul style="list-style-type: none"> • Advanced analytics will provide vertical-specific insights on customer profiles, trends and market dynamics. This will enhance the job holder's ability to identify new businesses and grow relationships that assist in revenue generation within assigned verticals. Technical expertise and personal influence remain critical for commercialisation of opportunities.
Develop sales proposals; review sales performance	<p>M</p> <ul style="list-style-type: none"> • AI will synthesise customer profiles to provide targeted opportunities for potential cross-sales and up-sales. This will allow for more tailored sales proposals and conversations to address specific customer needs. Advanced analytics will provide frequent reporting on performance metrics for key accounts.
In the next 3 - 5 years...	<p>This role will continue to be responsible for building and maintaining relationships with customers and other key stakeholders. With advanced analytics, the job holder will be able to better understand customer profiles and develop sales, marketing and business strategies accordingly.</p>

Customer Service Officer / Service Quality Analyst


Technology solutions impacting this job...

 Smart Lockers

 Round-the-clock customer service via Virtual Assistants

 Optimised Documentation

Impact assessment...

 MEDIUM degree of change in tasks

A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for assembling data, analysing processes and systems, identifying gaps and improvement areas. This includes handling complex service recoveries and assisting in developing plans to improve quality of logistics services.

Emerging skills

There will be more focus on analysing data to assess gaps and recommend improvements to customer processes, operations and technologies.


- Process Improvement and Optimisation
- Artificial Intelligence Application
- Data Storytelling and Visualisation
- Technology Application
- User Experience Design
- Customer Behaviour Analysis
- Knowledge Management
- Complex Problem Solving
- Critical Thinking
- Lateral Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Understand customer processes and needs	M <ul style="list-style-type: none"> • Predictive analytics, through data mining and predictive modelling, will provide insights and trends on customer needs and logistics processes. Focus will be on implementing appropriate solutions to address customer queries based on sales and/or customer knowledge.
Analyse trends, dynamics and market movements to grow businesses	M <ul style="list-style-type: none"> • Customer analytics and big data, using a vast array of datasets, will be used to generate insights on market trends and business development opportunities. • The job holder will be tasked with making sense of prevalent trends, dynamics and market movements to recommend potential solutions to grow the business within the assigned vertical.
Document and understand process improvements	M <ul style="list-style-type: none"> • Optimised documentation solutions will be used to create digital records and replace paper-based documentation. The job holder will be tasked with performing workflow analysis and data visualisation for mapping of the customers' logistics processes and support in identification of gaps and improvement opportunities.
In the next 3 - 5 years...	This role will transform from a manual research intensive role to an increased focus on data storytelling and visualisation to present trends, patterns and insights on customer processes and needs, market trends and process improvement opportunities to drive specific business outcomes.

Senior Customer Service Officer / Customer Service Specialist


Technology solutions impacting this job...

 Smart Lockers

 Round-the-clock customer service via Virtual Assistants

 Optimised Documentation

Impact assessment...

 **MEDIUM** degree of change in tasks

A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for analysing and planning overall customer service excellence, developing process and service quality reviews and implementing customer service process review initiatives. This includes measuring results and change management.

Emerging skills

The job holder will tap on customer analytics to recommend solutions for process and quality improvements to customer services.


- Process Improvement and Optimisation
- Artificial Intelligence Application
- Data Storytelling and Visualisation
- Technology Application
- User Experience Design
- Business Advisory
- Customer Behaviour Analysis
- Innovation Management
- Knowledge Management
- Lateral Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Identify lapses in delivery of logistics services to customers	<p>H</p> <ul style="list-style-type: none"> • Smart contracts will help to monitor that customer requirements and contractual obligations are met. Improved data from WMS, TMS, IoT sensors etc. on performance metrics will help identify process gaps and opportunities for service quality improvement. • The focus will shift to utilising predictive insights to preempt delivery lapses and enhance service quality.
Conduct targeted conversations with customers to identify customer needs	<p>M</p> <ul style="list-style-type: none"> • Customer behaviour analysis, sentiment analysis and other advanced analytics techniques will be used to develop personalised customer treatment strategies. Data storytelling and visualisation techniques will enable the job holder to derive trends and patterns to drive specific outcomes with customers.
Suggest process improvement solutions	<p>L</p> <ul style="list-style-type: none"> • Machine learning is seen to develop complex models, such as customer needs, process improvements and workflow analysis. This will enable the job holder to propose process improvements and ensure alignment of operations and technology to customer and business priorities.
In the next 3 - 5 years...	This role will use AI and advanced analytics to obtain real-time tracking of process quality and performance and accelerate market research and competitor benchmarking. The job holder will leverage the insights to inform gap analysis and recommend solutions for quality improvements to services delivered to customers.

Customer Service Manager


Technology solutions impacting this job...

 Smart Lockers

 Round-the-clock customer service via Virtual Assistants

 Optimised Documentation

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for managing customer service excellence, developing process innovation frameworks and leading customer relationship management. He/she is also responsible for managing business resources, internal assets and external vendors.

Emerging skills


The job holder will continue to manage customer service excellence and process innovations. While advanced analytics will inform decision-making, human judgement and technical expertise remain critical.


- Artificial Intelligence Application
- Automation Management
- Data Storytelling and Visualisation
- Technology Application
- Threat Intelligence and Detection
- User Experience Design
- Business Advisory
- Customer Behaviour Analysis
- Innovation Management
- Knowledge Management
- Lateral Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Develop intervention strategies to mitigate gaps in delivery of logistics services	<p>L</p> <ul style="list-style-type: none"> • AI will support identification of the best and optimal solution offerings for customers. Simulation modeling will help to test different solution prototypes to customise solutions based on customer needs and gaps in delivery of logistics services. While this will inform key decisions, technical expertise and business acumen remain critical for this job role.
Drive customer attraction and retention strategies	<p>L</p> <ul style="list-style-type: none"> • Behavioural and social analytics will help to create robust customer profiles and facilitate classification of customers into segments such as retention, migration, expansion, acquisition, and reprioritisation. This will augment the job holder's ability to create robust customer attraction and retention strategies.
Assess effectiveness of processes improvement solutions	<p>L</p> <ul style="list-style-type: none"> • AI and advanced analytics will help job holder conduct "what-if" analyses and scenario testing to evaluate the impact of potential solutions for process improvement. The focus will shift to analysing incoming data from various sources in the customer's logistics value chain to support effectiveness assessments.
In the next 3 - 5 years...	This role will continue to manage customer service excellence and process innovations. The job holder will leverage analytics capabilities, and make use of the richness of the available data to establish or maintain effective relationships, and decide on the best actions to take in response to customer needs.

Business Development Director / Country Route Development Director / Trade Lane Director / Freight Trade Director

Technology solutions impacting this job...

 Smart Lockers

 Round-the-clock customer service via Virtual Assistants

 Optimised Documentation

Impact assessment...



The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, as a department lead, this job role is responsible for developing new strategic business opportunities, client bases and engaging complex key accounts to develop trade development strategies for building strategic customer relationships.

Emerging skills

Strategic decision-making, human judgment and stakeholder management skills remain key.

- Automation Management
- Data Interpretation and Analysis
- Customer Behaviour Analysis
- Collaboration
- Lateral Thinking
- Personal Influence

Job tasks today

Impact at task-level / Future view of job tasks

Lead customer relationship management strategies	L	<ul style="list-style-type: none"> • While advanced analytics will provide insights on customer needs and profiles, potential solutions and customer treatment strategies, stakeholder management skills and personal influence remain critical for building strategic customer relationships.
Develop new businesses and customer relationships	L	<ul style="list-style-type: none"> • Advanced analytics will support formulation of strategies for business development, customer attraction and customer retention. However, strategic thinking, business acumen and personal influence skills remain critical for commercialising service improvement opportunities and business development.
Drive service prices and cost structure approaches for enhancing sales	M	<ul style="list-style-type: none"> • Analytics on industry service pricing and cost structures will inform decisions to enhance price competitiveness of services offered to customers. This will augment strategic planning of the financial aspects to enhance sales performance. Human judgment and experience is required to make sound and well-reasoned strategy decisions based on business needs.

In the next **3 - 5** years...

Technology will have limited impact on this role due to the high level of human judgment, stakeholder management, and bespoke/complex deals. There will be an increasing use of predictive analytics to support strategic decision-making process.

Job Dashboards for Logistics Solutioning and Programme Management

Impact assessment

Within 3 - 5 years

CONTRACT LOGISTICS

Logistics Solutions and Implementation Director / Tailored Supply Chain Director / Channel Operations Director

Logistics Solutions Manager

Logistics Contracts Manager/ Logistics Programme Manager

Vertical Product Manager

Logistics Solutions Specialist/ Logistics Solutions Engineer

Logistics Contracts Executive/Logistics Operations Executive/Logistics Operations Specialist

Vertical Specialist

Logistics Solutions Analyst

Logistics Contract Analyst/ Logistics Operations Analyst

SOLUTIONS DESIGN

Legend:

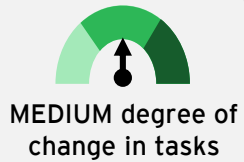
- High degree of change in tasks
- Medium degree of change in tasks
- Low degree of change in tasks
- Undergo displacement
- Require redesign
- Change incrementally
- Job functions within this functional track

Logistics Solutions Analyst

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for analysing customer needs and supporting the development of integrated logistics solutions for customers across warehousing, transportation, freight forwarding solutions and customer service operations.

Emerging skills

The job holder will leverage data visualisation and advanced analytics to play a larger role in proposing logistics solutions that leverage new technologies. This will require reskilling on:

- Artificial Intelligence Application
- Internet of Things Application
- Technology Application
- User Experience Design
- Business Advisory
- Customer Behaviour Analysis
- Knowledge Management
- Systems Thinking
- Complex Problem Solving
- Critical Thinking
- Lateral Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Perform operational documentation for logistics services	<p>M</p> <ul style="list-style-type: none"> • Operational documentation for logistics services will be digitalised by using optimised documentation solutions enabled by RPA, OCR, computer vision, digital data logging etc.
Perform data analysis and research	<p>L</p> <ul style="list-style-type: none"> • AI (NLP) will be applied to research to decode large volumes of data, thus reducing the effort required in data categorisation, reporting and analytics. • Focus will shift to application of research findings to logistics operations. Problem-solving and critical thinking remain crucial.
Analyse customer and market needs and opportunities	<p>M</p> <ul style="list-style-type: none"> • Advanced analytics of customer data e.g. process metrics, WMS/TMS reports, market trends etc. will enable the job holder to identify customer needs. Machine learning is also seen to develop complex predictive models such as customer and market needs based on prevalent trends, dynamics and market movements. This will augment customer needs analysis activities.
Coordinate with stakeholders; estimate resources	<p>M</p> <ul style="list-style-type: none"> • Digital platforms will allow easy exchange of information between stakeholders and business units. • While ML and DL will help in better resource planning, the job role will require human intervention for coordinating workflows and applying operational policies, standards and procedures in work activities.
In the next 3 - 5 years...	The availability of data from multiple sources will improve customer needs analysis, research and stakeholder coordination capabilities required for this role. Moving forward, this role will increasingly leverage data visualisation and advanced analytics coupled with critical thinking to play a larger role in solution design.

Logistics Solutions Specialist / Logistics Solutions Engineer

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for designing and coordinating the development of end-to-end bespoke logistics solutions for customers across warehousing, transportation, freight forwarding solutions and customer service operations.

Emerging skills

As the job holder will continue to require technical expertise and domain knowledge to design and customise logistics solutions to customer needs, the following skills will need to be refined:

Job tasks today	Impact at task-level / Future view of job tasks
Identify gaps and weaknesses in customers' logistics operations	L <ul style="list-style-type: none"> Data visualisation and AI will expedite root cause analysis for reviewing gaps in the supply chain operations of customers. Simulation modeling and analysis will augment creation of alternative logistics solution designs across warehousing, transportation and freight forwarding. Analytical and creative problem-solving remain critical for success in this job role.
Analyse implications of big data analytics on logistics solutions	L <ul style="list-style-type: none"> Big data analytics techniques such as association rule learning will enable the job holder to analyse implications of research on logistics operations of customers. Data science skills remain critical; programming languages like R and Python will become crucial in data mining and modelling.
Determine customer logistics service needs	L <ul style="list-style-type: none"> Modelling with more data points e.g. customer services, transaction activities, price sensitivity, risk, etc. will enhance predictive capabilities of AI algorithms to augment solutioning and business development tasks. Focus will shift to problem-solving and solutioning based on customer and technical knowledge. Technical expertise is required to analyse research and AI insights in the context of customer issues and needs.
Optimise use of allocated resources; supervise teams	L <ul style="list-style-type: none"> Logistics management systems, equipped with advanced data analytics will help in resource optimisation and risk assessment. The job role will continue to require human intervention for people and stakeholder management.

- Artificial Intelligence Application
- Cyber Risk Management
- Internet of Things Application
- Technology Application
- User Experience Design
- Business Advisory
- Customer Behaviour Analysis
- Innovation Management
- Knowledge Management
- Strategic Service Excellence
- Systems Thinking
- Lateral Thinking

In the next 3 - 5 years... This role will **continue to require deep technical expertise**, domain knowledge and creative problem-solving. Data and analytical insights will be leveraged to identify customer pain points augment and design logistics solutions tailored to customer needs.

Logistics Solutions Manager

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for managing the processes of logistics solutions business development, analysing, designing and implementing end-to-end logistics solutions for customers in at least two industries.

Emerging skills

This role requires deep technical knowledge and judgement for design and implementation of bespoke and complex logistics solutions. Going forward, technology-related skills will also need to be honed further.

- Artificial Intelligence Application
- Cyber Risk Management
- Internet of Things Application
- User Experience Design
- Business Advisory
- Customer Behaviour Analysis
- Innovation Management
- Knowledge Management
- Strategic Service Excellence
- Systems Thinking
- Lateral Thinking


Job tasks today	Impact at task-level / Future view of job tasks
Develop innovative logistics solutions for customers	L <ul style="list-style-type: none"> • AI and advanced analytics will support “what-if” analysis and scenario testing for evaluation of logistics solution prototypes. • Design thinking and technical expertise remain critical for solution design e.g. material flow modeling, inventory optimisation, process planning etc.
Propose solutions by analysing data, research and customer needs	L <ul style="list-style-type: none"> • Machine learning will enable forecasting of customer needs and modeling of complex customer-related scenarios e.g. order fulfilment strategy, inventory models and warehouse processes. This will enable the job holder to enhance offerings and competitiveness of logistics solutions. • Technical expertise, experience and human judgment remain critical for proposing appropriate bespoke logistics solutions by analysing data, research outputs and customer needs.
Develop new businesses and relationships	L <ul style="list-style-type: none"> • Advanced analytics will help to create customer profiles and facilitate classification of customers into segments based on their solution needs e.g. inventory optimisation, integrated supply chain, storage layout optimisation etc. to lead to more informed sales and business development conversations.
Manage department resources, risks, and teams	L <ul style="list-style-type: none"> • Predictive analytics will expedite resource management, risk assessment and mitigation planning • However, leveraging personal relationships and influence remains critical for success in this role
In the next 3 - 5 years...	Technology will have limited impact on this role due to the high level of human judgment, deep technical knowledge and expertise required for design and implementation of bespoke and complex logistics solutions. There will be an increasing use of data and analytics to support the decision-making process.

Vertical Specialist

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



MEDIUM degree of change in tasks

A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for identifying customer needs, analysing and planning logistics solutions and managing customers in specific industry verticals, while ensuring that logistics solutions meet vertical specific operation, process, regulatory, quality and safety requirements.

Emerging skills

With more predictive insights on customer needs, the job holder will play a larger role in recommending offerings across multiple verticals, with a focus on advanced technology application.

- Artificial Intelligence Application
- Data Storytelling and Visualisation
- Internet of Things Application
- Threat Intelligence and Detection
- Business Advisory
- Knowledge Management
- Strategic Service Excellence
- Systems Thinking

Job tasks today	Impact at task-level / Future view of job tasks
Analyse customer information and needs	M <ul style="list-style-type: none"> • Advanced analytics and AI will help to synthesise customer profiles and analyse real-time needs. This will allow for more tailored conversations and planning of logistics services that meet customer requirements and enhance relationships.
Analyse logistics solutions to review gaps	M <ul style="list-style-type: none"> • Predictive analytics of customer data e.g. process metrics, WMS/TMS reports, weather, traffic, market trends etc. will enable the job holder to identify and review operational gaps and weaknesses. • Focus will shift to identifying improvements and predicting potential risks in operations.
Propose standard solutions for verticals; support in vertical business tasks	M <ul style="list-style-type: none"> • Advanced analytics will lead to selection of standard solutions for specific verticals and tailored to specific customer profiles, while digital platforms will make it easier for customers to research and compare solutions. • Focus will shift to utilising analytics around customer needs to propose customisation for solutions
Perform project management of logistics solutions	L <ul style="list-style-type: none"> • Logistics management systems, equipped with advanced data analytics will help in resource optimisation and risk assessment. • Human involvement and judgment remain critical for programme management, and people and stakeholder management
In the next 3 - 5 years...	With increased data availability and predictive insights, this role will likely transform to play a larger advisory role across multiple verticals . This involves a shifting focus to customisation of solutions to customer needs, identifying service improvement opportunities and enhancing customer relationships with key accounts.




Vertical Product Manager

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for managing customers and logistics solutions in multiple verticals, while managing department resources and managing relationships with internal and external stakeholders.

Emerging skills

With more insights on customer profiles and vertical needs, the job holder will be better equipped to act in an advisory capacity and grow vertical businesses.

Job tasks today	Impact at task-level / Future view of job tasks
Forecast customer needs to enhance solution offerings	L <ul style="list-style-type: none"> Machine learning will enable forecasting of customer needs and modeling of complex customer-related scenarios e.g. order fulfilment strategy, inventory models and warehouse processes. This will enable the job holder to enhance offerings and competitiveness of logistics solutions.
Lead implementation of logistics solutions for customers	L <ul style="list-style-type: none"> AI and advanced analytics will support "what-if" analysis and scenario testing for evaluating gaps and weaknesses in supply chain operations. Personal influence and leadership skills remain critical for commercialising service improvement opportunities and people management.
Lead vertical business tasks and vertical strategies	L <ul style="list-style-type: none"> Advanced analytics will be used develop personalised customer strategies for custom-built solutions. Predictive analytics will expedite resource management, risk assessment and mitigation planning. Human judgment and expertise remain critical in fostering the close collaboration with different stakeholders.
Program-manage logistics solutions for customers across verticals	L <ul style="list-style-type: none"> While advanced analytics and reporting capabilities of project management tools and platforms will augment resource allocation and cost-optimisation, human experience, technical expertise and judgment remain critical for programme management.

- Artificial Intelligence Application
- Data Storytelling and Visualisation
- Internet of Things Application
- Threat Intelligence and Detection
- Business Advisory
- Knowledge Management
- Strategic Service Excellence
- Systems Thinking


In the next 3 - 5 years... This role will continue to require **human insight and people skills** to manage relationships, negotiate and provide guidance. With more insights on customer profiles and vertical needs, the job holder will be better equipped to act in an advisory capacity and grow vertical businesses in line with the company's strategy.

Logistics Contracts Analyst / Logistics Operations Analyst

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



MEDIUM degree of change in tasks

A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

*Within **3 to 5 years**, the role will potentially...*

REQUIRE REDESIGN

Today, this job role is responsible for analysing customer requirements, supporting the implementation of logistics solutions, and executing logistics programmes / processes / operations on behalf of customers.

Emerging skills

The job holder will need to be adept at end-to-end implementation of advanced I4.0 technology solutions across various logistics functions. This will require reskilling on:

- Advanced Digital Acumen
- Artificial Intelligence Application
- Automation Management
- Internet of Things Application
- Threat Intelligence and Detection
- Business Advisory
- Knowledge Management
- Systems Thinking
- Collaboration
- Complex Problem Solving
- Decision Making

Job tasks today	Impact at task-level / Future view of job tasks
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Execute supply chain operations for customers	<p>M</p> <ul style="list-style-type: none"> • Sensor data coupled with reporting capabilities of digital platforms e.g. WMS / TMS will provide end-to-end visibility to augment the coordination of supply chain operations. I4.0 technology solutions will enable autonomous operations for manual activities. • Focus will shift to exercising oversight and identifying potential risks for supply chain operations using data and analytics.
Perform data analysis and research	<p>M</p> <ul style="list-style-type: none"> • AI (NLP) will be applied to research to decode large volumes of data, thus reducing the effort required in data categorisation, reporting and analytics. • Focus will shift to application of research findings to logistics operations. Problem-solving and critical thinking remain crucial.
Deliver services that meet customer requirements	<p>M</p> <ul style="list-style-type: none"> • Virtual chatbots will augment customer service tasks to maintain the relationship element while driving down the cost-to-serve. It will also empower customers with the tools to self-serve.
Perform administrative support for project management	<p>M</p> <ul style="list-style-type: none"> • Digital platforms will enable transparency and communication of project schedules, quality and risk plans in day-to-day project management. • The job role will continue to require human intervention for people and stakeholder management

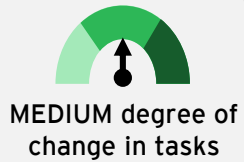
In the next 3 - 5 years... As customers incorporate advanced technologies in logistics operations, this role will need to be adept at **implementing, troubleshooting and leveraging insights from industry 4.0 technology solutions** across warehousing, transportation, and freight forwarding. There will also be more focus on data analytics and research.

Logistics Contracts Executive / Logistics Operations Executive / Logistics Operations Specialist

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

*Within **3 to 5 years**, the role will potentially...*

REQUIRE REDESIGN

Today, this job role is responsible for planning and executing logistics programmes, including designing supply chains and facilities, executing warehouse and transportation operations, processing orders and managing inventory on behalf of customers.

Emerging skills

As customers implement I4.0 technologies, there is high scope for this role to take on more advisory, sales and solutioning related activities using improved customer data analytics.

- Advanced Digital Acumen
- Artificial Intelligence Application
- Automation Management
- Data Storytelling and Visualisation
- Internet of Things Application
- Threat Intelligence and Detection
- Business Advisory
- Knowledge Management
- Strategic Service Excellence
- Systems Thinking

Job tasks today	Impact at task-level / Future view of job tasks
Coordinate logistics services' operational schedules	<p>M</p> <ul style="list-style-type: none"> • Predictive analytics of customer data (e.g. process metrics, WMS/TMS reports, weather, traffic, market trends etc.) will enable the job holder to predict customer needs and suggest real-time adjustments to operational schedules • Focus will shift to identifying improvements and predicting potential risks
Analyse data and research outputs; manage data	<p>L</p> <ul style="list-style-type: none"> • AI (NLP) will be applied to research to decode large volumes of data, thus reducing the effort required in data categorisation, reporting and analytics • Data science skills remain critical; programming languages like R and Python will become crucial in data mining and modelling
Analyse customer needs to improve relationships	<p>M</p> <ul style="list-style-type: none"> • Advanced analytics and AI will help to synthesise customer profiles and analyse real-time needs. This will allow for more tailored conversations and planning of logistics services that meet customer requirements and enhance relationships
Perform project management	<p>M</p> <ul style="list-style-type: none"> • Logistics management systems, equipped with advanced data analytics will help in resource optimisation and risk assessment. • While advanced analytics will augment cost and resource optimisation, human experience, technical expertise and judgment remain critical for project management.

In the next 3 - 5 years... This role will evolve to **advise customers on industry 4.0 technology solutions** as customers continue to adopt advanced technologies in logistics operations. Additionally, there is high scope for this role to take on more sales and solutioning related activities by leveraging improved customer data analytics.

Logistics Contracts Manager / Logistics Programme Manager

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for managing multiple logistics programmes & related customer service activities, managing the contracts to ensure customer requirements are met and managing overall programme resources, including manpower, internal assets and external vendors.

Emerging skills

Business acumen and human judgment remain critical for enhancing customer services. This will further be informed by customer analytics and data.

Job tasks today	Impact at task-level / Future view of job tasks
Evaluate gaps in operations; propose solutions	L <ul style="list-style-type: none"> AI and advanced analytics will support “what-if” analysis and scenario testing for evaluating gaps and weaknesses in supply chain operations. Business acumen and personal influence remain critical for commercialising service improvement opportunities.
Analyse implications of data on operations; highlight risks	L <ul style="list-style-type: none"> Big data analytics techniques such as association rule learning will enable the job holder to analyse implications of research on logistics operations. This will enable the job holder to intimate stakeholders on potential risks in operations.
Forecast customer needs to enhance solution offerings	L <ul style="list-style-type: none"> Machine learning will enable forecasting of customer needs and modeling of complex customer-related scenarios e.g. order fulfilment strategy, inventory models and warehouse processes. This will enable the job holder to enhance offerings and competitiveness of logistics solutions.
Develop strategic project plans	L <ul style="list-style-type: none"> Predictive analytics will expedite resource management, risk assessment and mitigation planning. While advanced analytics and reporting capabilities of project management tools and platforms will augment resource allocation and cost-optimisation, human experience, technical expertise and judgment remain critical for strategic programme management.

- Advanced Digital Acumen
- Artificial Intelligence Application
- Automation Management
- Data Storytelling and Visualisation
- Internet of Things Application
- Threat Intelligence and Detection
- Business Advisory
- Knowledge Management
- Strategic Service Excellence
- Systems Thinking


In the next 3 - 5 years... This role will continue to play a critical role in working closely with customers to manage their logistics operations, programmes and technology implementation. The job holder will incorporate advanced data analytics and AI solutions to improve various logistics processes and delivery, as well as enhance customer experience.

Logistics Solutions and Implementation Director / Tailored Supply Chain Director / Channel Operations Director

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



LOW degree of change in tasks

The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, as a department lead, this job role is responsible for managing the processes of business development and implementing custom-made or tailored end-to-end complex logistics solutions for customers, including managing post implementation optimisation.

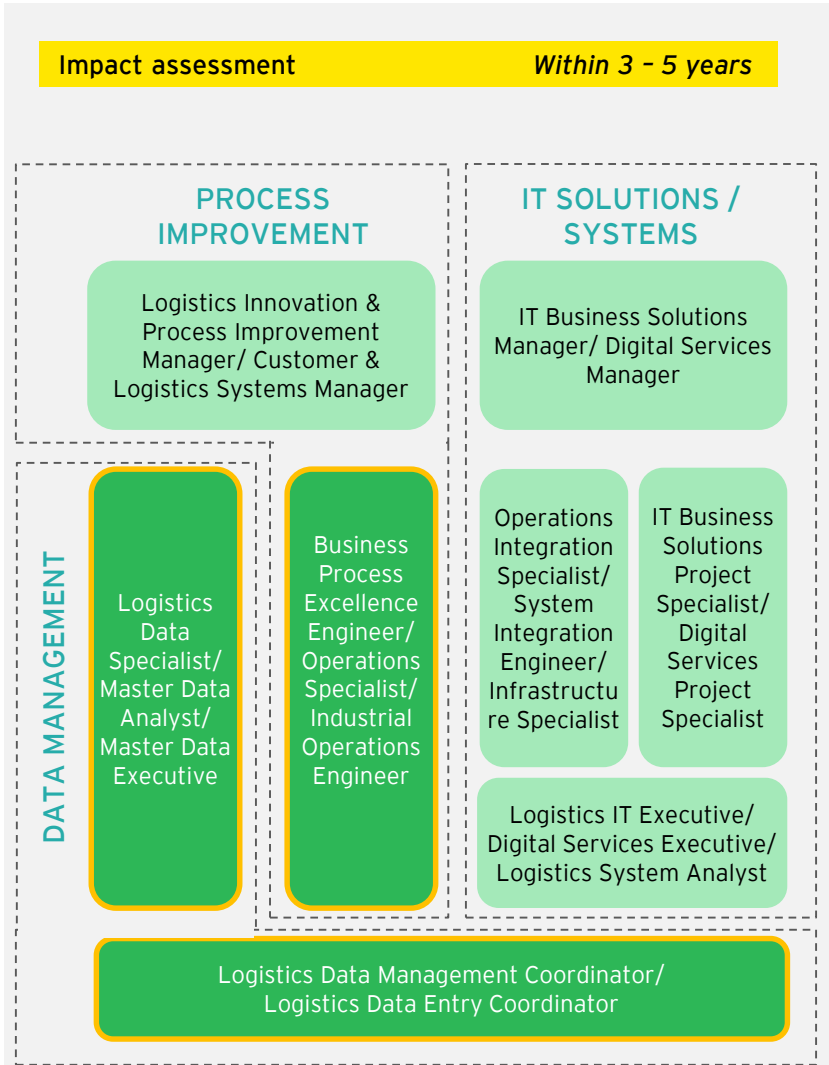
Emerging skills

Technology will have low impact on this role. The job holder will continue to use technical expertise, strategic thinking, and business acumen for decision-making.

Job tasks today	Impact at task-level / Future view of job tasks
Develop measures to mitigate gaps in delivery of logistics services	<p>L</p> <ul style="list-style-type: none"> Insights from data analytics will be used to assess service performance levels and detect early warning of potential crises or issues that could severely affect operations. Data analytics and business intelligence capabilities will help assess gaps and weaknesses in delivery of logistics services. Technical expertise, in-depth domain knowledge and human judgment will remain critical in developing intervention measures and solutions.
Develop supply chain strategies to meet customer requirements	<p>L</p> <ul style="list-style-type: none"> Prescriptive analytics that utilise learning algorithms and dynamic rule engines will provide insights into customer needs. While this will inform decisions, technical expertise, strategic thinking, and business acumen remain critical for making sound and well-reasoned strategy decisions based on business needs.
Drive customer attraction and retention strategies	<p>L</p> <ul style="list-style-type: none"> Machine learning algorithms using a vast array of datasets will be used to generate customer profiles for more targeted outreach, and tailoring of customer attraction and retention strategies. Leveraging personal relationships and influence will remain critical for success in this role.
In the next 3 - 5 years...	<p>This role is highly strategic in nature. While technology will augment decision-making for some activities, it will not have a significant impact on the way day-to-day work is performed. Technical expertise, strategic thinking, and business acumen remain critical for making sound and well-reasoned strategy decisions based on business and customer needs.</p>

- Artificial Intelligence Application
- Automation Management
- Internet of Things Application
- Threat Intelligence and Detection
- Business Advisory
- Knowledge Management
- Strategic Service Excellence

Job Dashboards for Logistics Process Improvement & Information Systems



Legend:

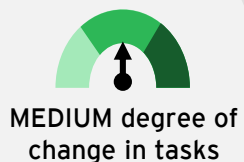
- High degree of change in tasks
- Medium degree of change in tasks
- Low degree of change in tasks
- Undergo displacement
- Require redesign
- Change incrementally
- Job functions within this functional track

Logistics Data Management Coordinator / Logistics Data Entry Coordinator

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for the input and extraction of data from a range of sources from every stage of logistics, knowledge management and data integrity, accuracy and completeness of data knowledge assets.

Emerging skills

With shifting focus on big data and cognitive automation, going forward the job holder will need to build these skills while improving data management processes.

- Artificial Intelligence Application
- Big Data Analytics
- Knowledge Management
- Complex Problem Solving
- Critical Thinking

Job tasks today

Impact at task-level / Future view of job tasks

Support data entry and management; perform data analysis and research	M	<ul style="list-style-type: none"> • A combination of IoT, RPA, cloud and blockchain will automate data capture and data processing tasks based on a range of sources from every stage of logistics, from order receipt to point of sales terminals, as well as cash receipt cycles. • Big data streaming and processing skills will become critical e.g. use of platforms such as BigQuery, Hadoop, Apache Spark etc. The job holder will need to be adept at administration of logistics management systems (e.g. WMS, TMS, CTS)
Gather information on reputable sources and technology partners	M	<ul style="list-style-type: none"> • Cognitive automation will expedite research on latest technology by scanning reports, news and other sources. • Focus will shift to exercising judgment in analysing technology trends in the context of customer and business needs.
Coordinate with stakeholders; perform resource estimation	M	<ul style="list-style-type: none"> • Digital platforms will allow easy exchange of information between stakeholders and business units. data and advanced analytics will help in better resource planning and basic risk assessments. • Focus will shift to coordinating workflows and applying operational policies, standards and procedures in day-to-day work activities.

In the next **3 - 5** years...

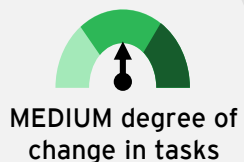
This role will be **augmented by technology** given automation opportunities for data gathering and processing tasks. This will allow for higher order thinking and analysis for improving the data management processes. It will become increasingly necessary to make sense of big data and advanced analytics to communicate insights across the company.

Logistics Data Specialist / Master Data Analyst / Master Data Executive

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

Within 3 to 5 years, the role will potentially...

REQUIRE REDESIGN

Today, this job role is responsible for executing all business intelligence and data-related activities including setting up databases, obtaining and managing data, performing data analysis, validating data, and managing data and knowledge management projects.

Emerging skills

This role will potentially be redesigned to leverage data science techniques to build business intelligence insights and manage the data architecture for the company.

- Artificial Intelligence Application
- Big Data Analytics
- Cyber Risk Management
- Data Strategy
- Innovation Management
- Knowledge Management
- Critical Thinking

Job tasks today

Impact at task-level / Future view of job tasks

Analyse data; develop data management systems	M	<ul style="list-style-type: none"> • Big data analytics techniques such as association rule learning will enable the job holder to analyse implications of data and research to draw inferences on logistics operations. • Data science skills remain critical; programming languages like R and Python will become crucial in data mining and modelling.
Review technology trends for application to logistics business	L	<ul style="list-style-type: none"> • Big data and AI will provide insights on latest technology trends in the market. • Job holder will still be required to facilitate implementation of latest technology in customer operations and support in post-implementation optimisation.
Identify gaps and propose logistics solutions	M	<ul style="list-style-type: none"> • AI and simulation analysis will enable modeling of the customer's logistics operations. This will inform gap analysis and process improvement activities. • The focus will shift to analysing customer needs and requirements and offering creative logistics solutions to meet the needs.
Facilitate team / department projects	M	<ul style="list-style-type: none"> • Logistics management systems, equipped with advanced data analytics will help in resource optimisation and risk assessment . • The job role will continue to require human intervention for people and stakeholder management.

In the next **3 - 5** years...

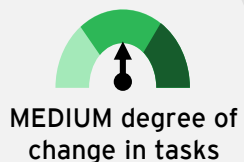
This role will evolve to combine **data and machine learning capabilities with operations knowledge**, leading to enhanced data visualisation capabilities to serve the needs of business. As companies have access to more data analytics, this role will collaborate more with various business units to derive models and solutions for the company.

Business Process Excellence Engineer/ Operations Specialist/Industrial Operations Engineer

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



A small proportion of the job tasks will be substituted by technology solutions, with human intervention required only for high value-adding tasks instead of routine, repetitive tasks

*Within **3 to 5 years**, the role will potentially...*

REQUIRE REDESIGN

Today, this job role is responsible for using analytical and quantitative methods to carry out business process reengineering, analysing performance, identifying problems, and developing proposals and recommendations

Emerging skills

The job holder will need to be reskilled on leveraging advanced I4.0 technologies such as AI, simulation analysis, big data, IoT etc. to drive process improvements in logistics.

Job tasks today	Impact at task-level / Future view of job tasks
Identify gaps and propose logistics solutions	<p>M</p> <ul style="list-style-type: none"> AI and simulation analysis will enable modeling of the customer's logistics operations. This will inform gaps analysis and process improvement activities. The focus will shift to analysing customer needs and requirements and offering creative logistics solutions to meet the needs.
Analyse performance of current logistics processes	<p>M</p> <ul style="list-style-type: none"> IoT-enabled devices will provide data on key performance metrics of machines, systems and facilities for warehousing, transportation and freight forwarding processes. AI and scenario testing will augment risks analysis and solution testing for process improvements.
Adapt latest technology to improve operations	<p>L</p> <ul style="list-style-type: none"> Big data and AI will provide insights on latest technology trends in the market. The job holder will still be required to identify opportunities for digitalisation/automation to enhance logistics planning, streamline processes, and improve efficiency to achieve cost savings.
Recommend allocation of resources for business activities	<p>M</p> <ul style="list-style-type: none"> Logistics management systems, equipped with advanced data analytics will help in resource optimisation and risk assessment . The job role will continue to require human intervention for people and stakeholder management.

- Artificial Intelligence Application
- Cyber Risk Management
- Data Storytelling and Visualisation
- Technology Application
- Business Process Re-engineering
- Innovation Management
- Strategic Service Excellence
- Sustainability Management
- Systems Thinking
- Critical Thinking
- Lateral Thinking

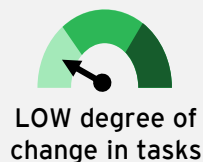
In the next 3 - 5 years... Moving forward, this **role will transform from reactive to proactive process engineering**. The job holder will increasingly leverage data to predict potential pain points across logistics operations and strategically deploy resources and solutions to address anomalies as well as prioritise processes for automation.

Logistics Innovation and Process Improvement Manager / Customer and Logistics Systems Manager

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for managing innovation and process improvement projects and multiple IT systems to support customer service and logistics operations business needs. This includes analysing system effectiveness, cost-benefit models, and performance.

Emerging skills

Technology will enable solution prototyping and customising to tailor processes and solutions to forecasted customer needs. This will allow for more proactive and strategic innovations.

- Artificial Intelligence Application
- Cyber Risk Management
- Data Storytelling and Visualisation
- Business Process Re-engineering
- Innovation Management
- Strategic Service Excellence
- Sustainability Management
- Systems Thinking
- Lateral Thinking

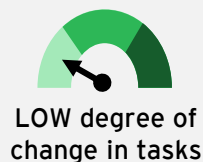
Job tasks today	Impact at task-level / Future view of job tasks
Recommend logistics solutions that address customer needs	<p>L</p> <ul style="list-style-type: none"> • Big data analytics techniques such as association rule learning and machine learning models will enable the job holder to identify customer needs and best-fit solutions. • The role will continue to require technical expertise and creative problem-solving to offer creative and bespoke logistics solutions to meet customer needs.
Drive continuous process improvements	<p>L</p> <ul style="list-style-type: none"> • AI and advanced analytics will help job holder conduct “what-if” analyses and scenario testing to evaluate the impact of potential solutions for process improvement. • While this will inform operational decisions, strategic thinking, personal influence and leadership qualities remain critical.
Drive technology application and integration	<p>L</p> <ul style="list-style-type: none"> • Predictive analytics based on self-reported performance metrics will provide insights on impact of technology solutions on business performance. • The job holder will require technical expertise to assess risks and exercise change management in order to successfully implement new solutions.
Manage team and department activities	<p>L</p> <ul style="list-style-type: none"> • Behavioural and social analytics will help inform stakeholder management and communications. Predictive and prescriptive analytics will expedite resource management, risk assessment and mitigation planning. • However, leveraging personal relationships and influence remains critical for success in this role.
In the next 3 - 5 years...	<p>This role will continue to be responsible for the ideation, creation and execution of strategic innovation and process improvement initiatives. Advanced analytics will be incorporated to improve gap analysis, solution prototyping and post-implementation effectiveness assessment.</p>

Logistics IT Executive / Digital Services Executive / Logistics System Analyst

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for providing IT technical support for logistics operations systems including planning, setting up, troubleshooting and implementation. This includes small scale project management of logistics IT applications, networks and infrastructure.

Emerging skills

This role will continue to utilise specialist IT knowledge for development, customisation and maintenance of logistics IT solutions.

Job tasks today	Impact at task-level / Future view of job tasks
Support in data management initiatives	<p>M</p> <ul style="list-style-type: none"> A combination of IoT, RPA, cloud and blockchain will automate data capture and data processing tasks. There will be continued human involvement for intermittent check-ins for data integrity and quality, ensuring accuracy of data management processes, and addressing lapses and issues.
Implement IT systems for logistics	<p>L</p> <ul style="list-style-type: none"> Cognitive automation will expedite research on latest technology by scanning reports, news and other sources. RPA will be able to automate data gathering and research through the different management systems. However, human involvement remains critical for exercising judgment in analysing technology trends in the context of business needs and implementing IT applications, networks and infrastructure.
Provide technical support for IT troubleshooting	<p>L</p> <ul style="list-style-type: none"> Virtual assistants i.e. chatbots will provide round-the-clock support for customers. ML will pick up key words and provide standard solutions to customers, but escalated cases and complex queries will be routed to human specialists.
Coordinate with stakeholders; support risk assessment	<p>L</p> <ul style="list-style-type: none"> Digital platforms will allow easy exchange of information between stakeholders and business units. The role will increasingly use data and analytics to augment risk assessments. The focus will shift to evaluating the effectiveness of IT processes and systems.

- Applications Development
- Artificial Intelligence Application
- Internet of Things Application
- User Experience Design
- Systems Thinking
- Complex Problem Solving
- Critical Thinking
- Lateral Thinking

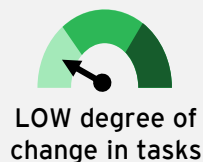
In the next 3 - 5 years... This role will continue to be responsible for application and software implementation as technology implementation advances. The technical knowledge of the job holder will need to evolve to remain relevant, including working more **collaboratively** with customers and other business units.

Operations Integration Specialist / System Integration Engineer / Infrastructure Specialist

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for development or project management of complex logistics IT systems including assessing and integrating IT applications, networks and infrastructure solutions with logistics business operation needs.

Emerging skills

The job holder will need to stay abreast of latest developments and technology trends in IT. The focus will be on end-to-end systems integration aligned to business operations.

- Applications Development
- Artificial Intelligence Application
- Cyber Risk Management
- Internet of Things Application
- User Experience Design
- Business Advisory
- Systems Thinking
- Critical Thinking
- Lateral Thinking

Job tasks today	Impact at task-level / Future view of job tasks
Support in data management initiatives	M <ul style="list-style-type: none"> • A combination of IoT, RPA, cloud and blockchain will automate data capture and data processing tasks. • There will be continued human involvement for intermittent check-ins for data integrity and quality, ensuring accuracy of data management processes, and addressing lapses and issues.
Analyse latest technology	L <ul style="list-style-type: none"> • AI is able to scan a wide range of sources to draw insights on the latest technology trends in the market. • The job holder will continue to analyse trends and insights to facilitate key activities and milestones in implementing technology projects and solutions in logistics operations.
Review customer needs to determine suitability of IT solutions	L <ul style="list-style-type: none"> • AI and advanced analytics will provide trends and insights for identification of customer needs. Customer analytics will enable modelling of IT solutions to customer requirements. • However, human involvement remains critical for identifying IT process and system improvements and enhancing customer experience.
Coordinate with stakeholders; support risk assessment	L <ul style="list-style-type: none"> • Digital platforms will allow easy exchange of information between stakeholders and business units. The role will increasingly use data and analytics to augment risk assessments. The focus will shift to evaluating the effectiveness of IT processes and systems.

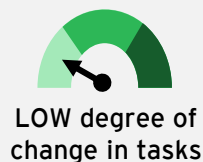
In the next **3 - 5** years... This role will continue to facilitate the integration of IT systems for smooth operations and governance for the IT infrastructure. In addition, the rise of cloud computing will require that this role will move away from managing on-premise applications and will increasingly focus on cyber security aspects.

IT Business Solutions Project Specialist / Digital Services Project Specialist

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for providing consultancy and executing logistics IT business solutions including analysing customer needs, communicating and seeking endorsements for potential solutions, and designing and implementing logistics system solutions for customers.

Emerging skills

With increasing focus on technology transformations, the job holder will assume more advisory responsibilities to drive integration of technology with operations.

- Applications Development
- Artificial Intelligence Application
- Cyber Risk Management
- Data Interpretation and Analysis
- Internet of Things Application
- User Experience Design
- Business Advisory
- Systems Thinking
- Critical Thinking
- Lateral Thinking

Job tasks today

Impact at task-level / Future view of job tasks

Apply latest technology to improve operations	L	<ul style="list-style-type: none"> • AI is able to scan a wide range of sources to draw insights on the latest technology trends in the market. • The job holder will be required to analyse trends and insights to facilitate key activities and milestones in implementing technology projects and solutions in logistics operations.
Review customer needs to determine suitability of IT solutions	L	<ul style="list-style-type: none"> • AI and advanced analytics will provide trends and insights for identification of customer needs. Virtual assistants and chatbots will provide round-the-clock support for customers. • The job holder will continue to focus on evaluating the effectiveness of IT processes and systems. With rise in use of cloud and data-sharing platforms, there will increased focus on cyber-security.
Facilitate delivery of key outcomes within IT projects	L	<ul style="list-style-type: none"> • Logistics management systems, equipped with advanced data analytics will help in resource optimisation and risk assessment. • While advanced analytics will augment resource optimisation, human experience, technical expertise and judgment remain critical for programme management

In the next

3 - 5 years...

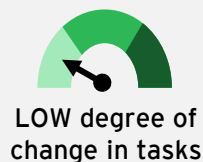
This role will assume more **advisory responsibilities for integration of industry 4.0 technologies** to improve logistics operations. The job holder will adopt new methodologies in the delivery of IT projects, and will continue to rely on stakeholder engagement, project management skills, and technical expertise to deliver top quality IT projects.

IT Business Solutions Manager / Digital Services Manager

Technology solutions impacting this job...

This job role is impacted by **all 13 technology solutions** identified across warehousing, transportation, freight forwarding, and sales and customer service.

Impact assessment...



The job tasks will remain largely unchanged due to technology solutions, and will continue to have a high dependence on human intervention

Within 3 to 5 years, the role will potentially...

CHANGE INCREMENTALLY

Today, this job role is responsible for managing business development processes and implementing logistics IT business solutions for customers, including managing post implementation optimisation.

Emerging skills

The job holder will continue to play a larger role in strategising, recommending and management the company's technology innovation roadmap in line with business strategy and goals.

- Artificial Intelligence Application
- Cyber Risk Management
- Data Interpretation and Analysis
- Internet of Things Application
- User Experience Design
- Business Advisory
- Systems Thinking
- Lateral Thinking

Job tasks today

Impact at task-level / Future view of job tasks

Perform technology application and Integration tasks	L	<ul style="list-style-type: none"> • Predictive analytics based on self-reported performance metrics will provide insights on impact of technology solutions on business performance • The job holder will require technical expertise to assess risks and exercise change management in order to successfully implement new solutions
Manage integrated IT solutions to serve complex customer needs	L	<ul style="list-style-type: none"> • Advanced analytics and AI will provide insights on future customer needs and allow more automated solutions and personalised services to be offered to customers • Technical expertise, business acumen and judgment remain critical for aligning company IT strategies with customer and market needs. Personal influence and leadership skills are essential for effective stakeholder management
Manage team and department activities	L	<ul style="list-style-type: none"> • Behavioural and social analytics will help inform stakeholder management and communications. Predictive and prescriptive analytics will expedite resource management, risk assessment and mitigation planning. • While advanced analytics and reporting capabilities of project management tools and platforms will augment resource allocation and cost-optimisation, human experience, technical expertise and judgment remain critical for programme management

In the next **3 - 5** years...

This role will continue to apply business acumen and technical expertise in innovating IT business solutions and providing advice on the alignment of digital services / IT strategy with their business strategy.

Appendix IV

SKILLS LIBRARY



The better the question. The better the answer.
The better the world works.

Adaptability	Ability to effectively respond to diverse situations and undertake lifelong learning to adapt to changes impacting the workplace
Change Management¹	Manage people, processes, tools and techniques to help company make successful transitions, resulting in adoption and realisation of changes
Collaboration	Working cooperatively with others, virtually and physical, to build consensus and to take collective action to achieve common objectives
Complex Problem Solving	Incorporate related information and past experience into the evaluation of options and development of solutions
Compliance Mindset Development	Design and deliver training materials on regulatory compliance topics to spread awareness and encourage adoption of a compliance mindset and behaviours
Critical Thinking	Apply reasoning to evaluate statements, separating truth from falsehoods, and assess the strengths and weakness of different options of solution, conclusion and approach
Decision Making	Assemble information to form a well-rounded understanding of complex situations
Global Perspective	Display openness to and awareness of diversity across global culture and market trends
Lateral Thinking	Identify opportunities by interpreting information and connect insights from various sources, incorporate a creative approach to develop actions
Personal Influence	Ability to leverage personal influence and charisma to convince stakeholders to take appropriate actions or to reach a mutually beneficial agreement

Business Advisory	Apply a strategic, long-range view on business issues and use in-depth knowledge and technical expertise to advise on optimal solutions in line with business goals
Business Continuity Management¹	Manage plans to establish processes and procedures so as to minimise interruptions to critical business functions and to re-establish full functionality to company as soon as possible
Business Development¹	Identify new business opportunities to better meet the needs of existing markets and bring benefits to the company
Business Negotiation¹	Manage end to end business negotiations, decide whether and how to engage as well as translate defining processes and procedures in order to support business requirements
Business Process Re-engineering	Analyse business processes and workflows within the company and identify new approaches to redesign business activities so as to optimise performance, quality and speed of services or processes. This includes the exploration of automating and streamlining processes, evaluation of associated costs and benefits of redesigning business processes, as well as the identification of the potential impact on the change management activities and resources required
Contract Preparation, Evaluation, Negotiation and Tendering¹	Manage contract creation, evaluation, negotiation, and tendering to maximise operation and financial performance of an company
Contract/Vendor Management¹	Manage contract creation, execution and analysis to maximise financial and operational performance and minimise risks
Corporate Governance¹	Establish guide and endorse organisation's corporate governance and compliance policies. This includes being aware of the regulatory frameworks and global leading practices in similar companies
Customer Behaviour Analysis	Devise customer behaviour analysis tools and approaches and perform analysis on information pertaining to customer behaviours
Customer Management¹	Manage customers across the customer lifecycle to guide customer interactions, with the goal of improving business relationships with customers, assisting in customer retention and driving sales growth
Financial Management¹	Manage organisation's short-term and long-term financial needs. This involves reviewing organisation's financial risk position and refining the finance and financial risk philosophy of the company

Innovation Management¹	Manage decisions, activities and practices that transit ideas to realisation for purpose of generating business value
Intellectual Property (IP) Management¹	Establish company IP goals, manage and implement collation of IP materials to support IP reviews and registration processes
Knowledge Management	Develop and deploy systematic management of information within databases, documents, policies and procedures, as well as promote knowledge as a strategic company asset and key enabler of company learning
Market Research¹	Establish procedures in gathering, analysing and interpreting information about markets, products or services to be offered in a particular market and present findings to relevant stakeholders
Public Relations Management¹	Manage organisation's strategic direction in the management of the company's corporate reputation. It also includes setting the communications agenda, identifying opportunities and threats, prioritising the issues relating to these, building upon corporate ethics and governance, incorporating these into the company's policies and communicating strategies to all stakeholders
Public-Private-Individual Partnership Collaboration¹	Manage contracts between private entities and public agencies to maximise financial and operational performance and minimise risks
Risk Management and Administration¹	Identify, assess and prioritise risks and apply resources to mitigate risks and impact of incidents
Social Media Management	Leverage various social networking platforms to deliver the company's value propositions as well as contextual and targeted messaging based on real-time customer insights to engage in two-way communication with prospects and customers
Stakeholder Management¹	Monitor and maintain constructive relationships with stakeholders by influencing their expectations appropriately to help a business move toward its stated goals
Strategic Human Resource Management¹	Establish strategies, policies and principles aligned to business objectives and leverage on company culture to enhance integration and maximisation of employee contributions

Strategic Service Excellence¹	Establish strategies and operating principles to consistently meet and manage customer's expectations in order to support business requirements
Strategy Implementation¹	Evaluate the impact of critical business functions, conduct situational analysis and formulate, review and refine business function strategies
Strategy Planning¹	Develop company strategies and policies by analysing impact of internal and external influencing factors and seeking consultations from relevant stakeholders
Sustainability Management	Plan, develop and roll out of a company-wide sustainability strategy. This includes the assessment of the company's utilisation and/or consumption of energy and other resources, vis-a-vis the availability and stability of supply sources and external best practices and standards in sustainability. This also includes the on-going monitoring and tracking of energy and/or resource-consumption over time, to identify impact on the company's internal and external environment as well as potential improvements in energy- or resource-efficiency
Systems Thinking	Understand complexity of cause-and-effect relationships of systems and processes across the company, as well as evaluate systems based on value-creation and contribution to specific issues
Workplace Safety and Health Audit System Management	Establish the policies and work procedures to ensure organisation's compliance to audit requirements

Advanced Digital Acumen	Sophisticated understanding of technology and software features used to analyse and manipulate data and use technology to organise and share information clearly
Applications Development	Develop applications based on design specifications; encompassing coding, testing, debugging, documenting and reviewing and/or refining it across the application development stages in accordance with defined standards for development and security. The complexity of the application may range from a basic application to a context-aware and/or augmented reality application that incorporates predictive behaviour analytics, geo-spatial capabilities and other appropriate algorithms. The technical skill includes the analysis and possibly the reuse, improvement, reconfiguration, addition or integration of existing and/or new application components
Artificial Intelligence Application	Identify use cases for application of heuristic algorithms and artificial intelligence in operations to enable systems or software agents to learn, improve, adapt and produce desired outcomes or tasks.
Augmented Reality Application	Facilitate the design and implementation of augmented reality applications to increase efficiency of work processes
Automation Design¹	Manage control systems and information technology to reduce the need for human work in the production of goods and services in order to streamline operations in terms of speed, reliability and product output
Automation Management	Oversee automation systems to ensure operation requirements are met as well as propose strategies for the automation systems performance improvement
Autonomous Logistics Design and Application¹	Identify suitable models in the design and implementation of autonomous machines in existing operations, as well as formulate and present validating strategies for management's approval and review and refine them on a continuous basis
Big Data Analytics	Analyse and validate significant volumes of data to discover and quantify patterns and trends to improve logistics operations and processes
Cloud Computing Application¹	Manage supply chains through cloud computing technologies in order to offer a collaborative framework with centralised storage and contact points, fewer visibility barriers, and opportunities to enact simplified, standardised processes
Cyber Risk Management	Develop cyber risk assessment and treatment techniques that can effectively pre-empt and identify significant security loopholes and weaknesses, demonstration of the business risks associated with these loopholes and provision of risk treatment and prioritisation strategies to effectively address the cyber-related risks, threats and vulnerabilities identified to ensure appropriate levels of protection, confidentiality, integrity and privacy in alignment with the security framework

Data and Statistical Analytics¹	Identify data sets for application of statistical techniques to analyse and interpret large complex data to uncover trends or patterns in order to locate and define new process improvement opportunities
Data Interpretation and Analysis	Extract, analyse and make sense of information to form a holistic perspective and generate insights
Data Storytelling and Visualisation	Combine data insights, and dynamic visual displays with illustrative and interactive graphics and narrative representative formats to present patterns, trends, meanings, messages and analytical insights from data or new concepts in a strategic manner
Data Strategy	Develop a robust and coherent data strategy and support architectures, policies, practices and procedures that enable the company to manage and utilise data in an effective manner. This includes introduction of innovative ways of organising, managing and integrating the data of the company to ensure their viability and ability to drive business value. It also includes the setting of information storage, sharing, handling and usage protocols to support alignment with relevant legislation and business strategies
e-Logistics IT Solutioning¹	Integrate internet-based technologies with back-end processes to improve logistics operations and develop new logistic management practices to support technological advances
Engineering Installation Design¹	Produce engineering plans for the installation and assembly of new products using a systematic approach to design. It also includes seeking endorsement from key stakeholders
Enterprise Database System Administration¹	Manage database design, architecture, optimisation, deployment, troubleshooting as well as capacity planning, refinement of logical design, handling of back-up and recovery plans, in order to support business requirements
Information Technology and Network Security¹	Manage organisation's network and data security, ensuring an ongoing rigorous review of the company's digital, cyber and application security and IT network infrastructures, to ensure multiple layers of defences to protect proprietary data from attack and the company's reputation
Integrated System Design and Application¹	Manage systems of interrelated computing devices and systems, mechanical and digital machines, objects and people to allow transfer of data over the network so as to support business requirements
Internet of Things Application	Implement Internet of Things (IoT) technologies to drive efficiency and effectiveness of operations
Robotic and Automation System Maintenance	Maintain robotic and automation systems to meet operation requirements and propose strategies for improvements to the automation system's performance

Technology Application¹	Apply and integrate evaluated technologies into company operations or processes to achieve desired outcomes
Technology Infrastructure Management and Integration¹	Evaluate latest available technologies to integrate into existing operations so as to improve customer service, reduce costs and streamline supply chains
Technology Troubleshooting	Ability to problem solve basic technical issues and identify root cause of problems, including determining when to escalate issues
Threat Intelligence and Detection	Monitor intelligence-gathering and anticipate potential threats to a technology system proactively, this involves the pre-emptive analysis of potential perpetrators, anomalous activities and evidence-based knowledge and inferences on perpetrators' motivations and tactics
User Experience Design	Conceptualise, project and make enhancement of the user's interaction and engagement with an IT product and/or service based on a robust analysis and understanding of the product and/or service's performance vis-a-vis the user's desired experience and outcomes. This involves creating wire frames to adequately guide and inform subsequent planning and development processes, and making enhancements to optimise the user's experience of the product and/or service

Bulk Cargo Administration	Manage and administer transportation for unpacked commodity cargo (both liquid and dry) in large quantities
Cargo and Receipt Inspection	Conduct cargo operations associated with the instructions, procedures and labels relevant to the processing of the receipt and delivery of containers and cargo
Cargo Issuance and Dispatch	Maintain conditions and stipulated requirements for compliance before issuance and dispatch of imported cargo
Cargo Lifting	Conduct cargo operations associated with heavy lift freight including oversized loads
Cargo Security Control	Maintain security in cargo environment including legislations and regulatory requirements
Cargo Tracking System Administration	Perform processes in tracking of cargo movement via various forms of transport
Cold Chain Operations Administration	Perform processes involved in cold chain management which include packaging and material handling equipment for storage and during transportation
Container Loading and Unloading Administration	Conduct cargo operations associated with interpretation and application of instructions, regulations, procedures and information associated with loading, unloading, stuffing, unstuffing, stowage and care of cargo
Cross Docking	Transfer inbound materials, goods and products from receiving docks to shipment docks for outbound deliveries
Dangerous Goods Management	Perform specialised services covering dangerous goods operations for regulatory compliance and customer requirements
Environmental Protection Management	Establish policies and procedures for sustainable environment practices covering green procurement, gas emissions, disposal methods, product quality standards and regulatory compliance
Equipment Maintenance	Perform equipment maintenance including preparation, preventive and breakdown maintenance
Event Logistics Administration	Manage and administer activities through deployment and withdrawal of resources according to schedule to ensure efficient supply of customer to the product and the supply of facilities to and from event sites

Freight and Cargo Claim Administration	Perform claim documentation and procedures including filing and monitoring of claims and claim resolution
Freight Insurance Administration	Perform freight insurance documentation covered for goods during shipment including cargo insurance purchased directly from shippers or third-party insurers
Hazardous Materials Identification System (HMIS) Administration	Establish procedures and documentation using Hazardous Materials Identification System (HMIS) for control and audit
Import and Export Documentation Administration	Administer shipping documents associated with the import and export of goods
International Trade Legislation Compliance	Identify all aspects of international trade processes and foreign and multilateral trade laws for regulatory compliance
Livestock Cargo Administration	Arrange transportation of livestock cargo including documentation, cargo inspection and compliance with regulatory requirements
Logistics Operations Research and Planning	Adopt advanced quantitative methods to analyse, design, plan and control logistics systems in order to support business requirements
Logistics Process Quality Management	Apply processes to align all components of business to quality requirements of the company in order to maximise quality and reduction of waste
Logistics Solution Design Thinking	Construct solutions based upon logic, imagination, intuition and systemic reasoning to explore possibilities of what can be and create desired outcomes that benefit the company and customers when designing logistics solution
Logistics Solution Product/Project Management	Manage activities to meet project requirements and translate to plans that deliver on time, on-budget learning and integration that companies need
Logistics Solutions Marketing	Plan, implement and control business activities to conduct buying and selling of product offerings or services between buyers and sellers of logistics services
Logistics Solutions Sales	Identify customer needs, evaluate these needs and identify probable solutions so as to sell logistics solutions and services to solve the needs of customers
Material Flow Modelling	Analyse the inflow and outflow of material, substance or product flows across different industrial sectors or within ecosystems to achieve optimisation

Material Handling Equipment (MHE) Handling	Operate mechanised material handling equipment including the movement, storage, control and protection of materials, goods and products
Material Management (Planning, Sourcing, Use, Disposal)	Establish plans, company procedures and controls of flow of materials from the point of origin to the point of consumption and disposal
Order Fulfilment Administration	Administer receiving, processing, delivery and optimisation processes for orders in order to support business and customer requirements
Pricing for Cargo Services and Operations	Apply knowledge in cargo rating together with understanding needs of shippers and consignees for developing reliable and affordable transportation solutions
Pricing for Transportation Services and Operations	Apply knowledge in transportation services and operations together with understanding of needs of shippers and consignees to develop reliable and affordable transportation pricing models
Pricing for Warehouse Services and Operations	Provide open or closed-book pricing based on warehouse fixed and variable costs, financials, and profit and loss requirements of company
Process Improvement and Optimisation	Adopt process mining tools to discover critical processes and maximise these processes to achieve maximum efficiency in accordance with company procedures
Retail Logistics Administration	Manage and administer modern distribution systems, create movement plans, manage availability of infrastructure in order to ensure profitability is maximised by the logistics systems
Shipment Load Planning and Palletisation/Consolidation	Optimise pallet load configuration and consolidation for shipments
Supply Chain Solutioning/Modelling/Planning/Strategising	Develop new operating models and solutions for customers to manage their supply chain needs as well as improve inventory levels, delivery time and cost saving
Time Sensitive Cargo Delivery Management	Plan and manage transportation of cargo with time-sensitive delivery window
Transport Management System Administration	Manage and administer process enforcement, analytics, and optimization of Transport Management System (TMS) for moving freight in all modes, including intermodal movements
Transportation Equipment Handling	Operate different types of transport equipment including conveyors, cranes and industrial trucks for the movement and storage of materials

Transportation Hub/Control Centre Administration	Optimise logistics operations including provision of transportation services and optimal use of resources
Transportation Route and Schedule Planning	Optimise transportation resources for route scheduling and dispatching using vehicle fleet management systems
Vertical Programme Management	Manage logistics/supply chain programmes and customers in niche areas
Warehouse Administration	Execute warehouse task scheduling, record maintenance and information coordination with internal and external stakeholders
Warehouse Automation Application	Apply computer software and/or automated equipment to improve efficiency of warehouse operations
Warehouse Facility Management	Manage policies and procedures for warehouse facility operations, including budgeting, security, safety and health requirements
Warehouse Facility Security Control	Establish risk analysis, physical and personal security, access control, emergency response and disaster recovery in warehousing operations
Warehouse Inventory Control/Audit	Regulate outflows and inflows of stocked items as well as shipment, loading and storage activities using inventory control systems, methodologies and tools
Warehouse Layout Design	Develop warehouse locations, designs and layouts for storage area segregation with consideration for the characteristics and capabilities of different load handling and storage equipment
Warehouse Maintenance and Housekeeping	Maintain Material Handling Equipment (MHE) and tools in warehouse operations
Warehouse Management System Administration	Apply Warehouse Management System (WMS) methodology, covering technical deliverables and business processes for internal controls, as well as provide user guides and trainings
Warehouse Performance Measurement	Identify key performance indicators and performance benchmarking in warehouses for optimal processes, customer relations activities, quality levels, asset usage and costs
Warehouse Space Utilisation	Optimise spaces for storage of items in warehouses
Warehousing / Cargo-related Occupational Health and Safety Management	Manage warehouse or cargo-related workplace safety and health objectives and targets in compliance to regulatory requirements

Appendix V

GUIDELINES TO JOB REDESIGN



The better the question. The better the answer.
The better the world works.

Appendix V

(a) Guide to Analysing the Business Case for Job Redesign

Guide to Analysing the Business Case for Job Redesign

Overview

DESCRIPTION:

This template will help Human Resource practitioners summarise the key details of a Job Redesign exercise and assess its business viability, to assist in obtaining stakeholder buy-in.

In addition to the provided template, an effective business case would identify viable alternatives for the Job Redesign effort and assess the risks and mitigation options for each alternative.

TEMPLATES PROVIDED IN THIS TOOLKIT

EXECUTIVE SUMMARY		
BUSINESS DIRECTION <i>Current State</i>	GAP / CHALLENGE	JOB REDESIGN SOLUTION
<i>Desired State</i>	COST	EXECUTION TIMELINE
TARGET AREAS / AUDIENCE	BENEFITS	
PROJECT TEAM		

INSTRUCTIONS

To build the business case for Job Redesign, gather and summarise the following insights in the provided template:

- The current and desired state of the business and its direction
- Key gaps and challenges to be addressed
- Broad Job Redesign interventions to address these gaps
- Broad estimates of the necessary costs and resulting benefits
- Planning of the stakeholders involved (including target functional areas and project team members)
- A brief estimate of the execution timeline

OUTCOME

- Alignment of Job Redesign effort with business goals
- Initial but comprehensive summary of the Job Redesign value proposition
- Stakeholder buy-in for the Job Redesign effort

Guide to Analysing the Business Case for Job Redesign

Instructions

INSTRUCTIONS

Gather and summarise the following insights, as shown in the template below (template available on the next page):

- The current and desired state of the business direction
- Key gaps and challenges to be addressed
- Broad Job Redesign interventions to address these gaps
- Approximate estimates of the necessary costs and resulting benefits
- Planning of the stakeholders involved (including target functional areas and project team members)
- A brief estimate of the execution timeline

EXECUTIVE SUMMARY		
BUSINESS DIRECTION <i>Current State</i>	GAP / CHALLENGE	JOB REDESIGN SOLUTION
<i>Desired State</i>	COST	EXECUTION TIMELINE
TARGET AREAS / AUDIENCE	BENEFITS	
PROJECT TEAM		

Guide to Analysing the Business Case for Job Redesign

Template

EXECUTIVE SUMMARY		
BUSINESS DIRECTION <i>Current State</i>	GAP / CHALLENGE	JOB REDESIGN SOLUTION
<i>Desired State</i>	COST	EXECUTION TIMELINE
TARGET AREAS / AUDIENCE	BENEFITS	
PROJECT TEAM		

Guide to Analysing the Business Case for Job Redesign

Template (Sample)

SAMPLE

EXECUTIVE SUMMARY

- Identify opportunities to cross-train employees across functions for a more flexible and agile staffing pool
- Identify opportunities to leverage technology and digitalise warehouse operations for increased productivity and efficiency

BUSINESS DIRECTION

Current State

- Revenue centric operating model
- Limited technology usage in labour-intensive processes

Desired State

- Customer centric operating model
- Lean and agile workforce
- Optimised processes through technology implementation

TARGET AREAS / AUDIENCE

- Warehouse Officers
- Warehouse Supervisors

PROJECT TEAM

- Human Resources Specialist
- Warehouse Operations Manager
- Head of Operations

GAP / CHALLENGE

- Teams working in silos in the warehouse and limited talent in the market have resulted in a large number of employees with focused competencies
- Lack of technology implementation resulted in manual warehouse planning and storage utilization processes

COST

Item	Current	After Job Redesign
Headcount	30	15 operators
Labour hours	8 hrs/day/staff	8 hrs/day/staff
Technology implementation cost	Nil	\$300,000
Training and development cost	\$200 / staff	\$600 / staff

BENEFITS

Item	Current	After Job Redesign
Time required for day-to-day warehouse operation planning	4 hours	2 hours
Manpower required to monitor	8 pax	4 pax
Quality of products
Process improvements

JOB REDESIGN SOLUTION

Restructuring and capability development

- Cross-train employees across functions to collapse redundant roles and create a more flexible and agile staffing pool

Technology integration and digitalisation

- Implement new technologies to enhance productivity, efficiency and quality of output

EXECUTION TIMELINE

Milestone	Jan	Feb	Mar	Apr	May	Jun	Jul
Kickoff and stakeholder buy-in	█						
Diagnosis (Stakeholder interviews, Job shadowing)	█	█					
Diagnosis (Operational diagnostics, prioritisation and recommendation)		█	█				
Design (action plan, change agenda, performance metrics)			█	█			
Implementation (project roll out and change management interventions)				█	█		
Post Job Redesign monitoring and iterations						█	
Analysis and final report							█

Appendix V

(b) Guide to Job Shadowing

Guide to Job Shadowing

Overview

DESCRIPTION:

This template will help Human Resource (HR) practitioners record and summarise observations obtained from job shadowing as part of a "Diagnose" activity within a Job Redesign exercise.

Job shadowing offers an opportunity for HR practitioners to identify parts of a job role that can be changed and/or supplemented by technology to improve workflow. Job shadowing can also be conducted after a new technology has been implemented, to guide required Job Redesign efforts.

TEMPLATES PROVIDED IN THIS TOOLKIT

	Job Roles	Processes	New Tasks	Remarks
Observations				

INSTRUCTIONS

To identify opportunities for improvement in an existing workflow, the day-to-day work of a job incumbent can be observed by conducting job shadowing. To do so, an HR practitioner (or equivalent) should shadow a job incumbent and take note of:

- Job roles that appear to be most impacted (or can be impacted) by implementation of technology
- Key tasks being carried out by the job incumbent within the job role
- The changes in processes based on the implementation of technology, or ways in which work processes can be further improved
- Other tasks that can be conducted by the job incumbent in the event of time being freed up due to the impact of technology and process changes

OUTCOME

- Identify which job roles are most impacted by the implementation of technology, and how they are impacted.
- Identify ways in which work processes can be made more efficient.
- Identify what else the job incumbent can work on if their time is freed up through process changes.

Guide to Job Shadowing

Instructions

INSTRUCTIONS

To identify opportunities for improvement in an existing workflow, the day-to-day work of a job incumbent can be observed by conducting job shadowing. To do so, a Human Resource practitioner (or equivalent) should shadow a job incumbent and take note of:

- Job roles that appear to be most impacted (or can be impacted) by implementation of technology.
- Key tasks being carried out by the job incumbent within the job role.
- The changes in processes based on the implementation of technology, or ways in which work processes can be further improved.
- Other tasks that can be conducted by the job incumbent in the event of time being freed up due to the impact of technology and process changes.

	Job Roles	Processes	New Tasks	Remarks
Observations				

Guide to Job Shadowing

Template

	Job Roles	Processes	New Tasks	Remarks
Observations				

Guide to Job Shadowing

Template (Sample)

SAMPLE

	Job Roles	Processes	New Tasks	Remarks
Observations	Warehouse Supervisor	Manually records inventory count and monitor warehouse operations.	<p>Actively uses RFID-logging, barcode scanning and sensor technology to records inventory count.</p> <p>Uses advanced analytics to gain insights on warehouse processes and areas for improvement.</p>	<p>Reduction in time spent conducting manual recording. Time can be diverted to value-add tasks such process improvement.</p> <p>Tap on advanced analytics for more accurate reporting with less human errors to enhance overall warehouse operations efficiency.</p>
		Uses conventional tools (e.g. paper and pen) to conduct warehouse quality, safety and risk assessment	Uses dashboards quality, safety and risk monitoring tool to generate investigation reports.	

Appendix V

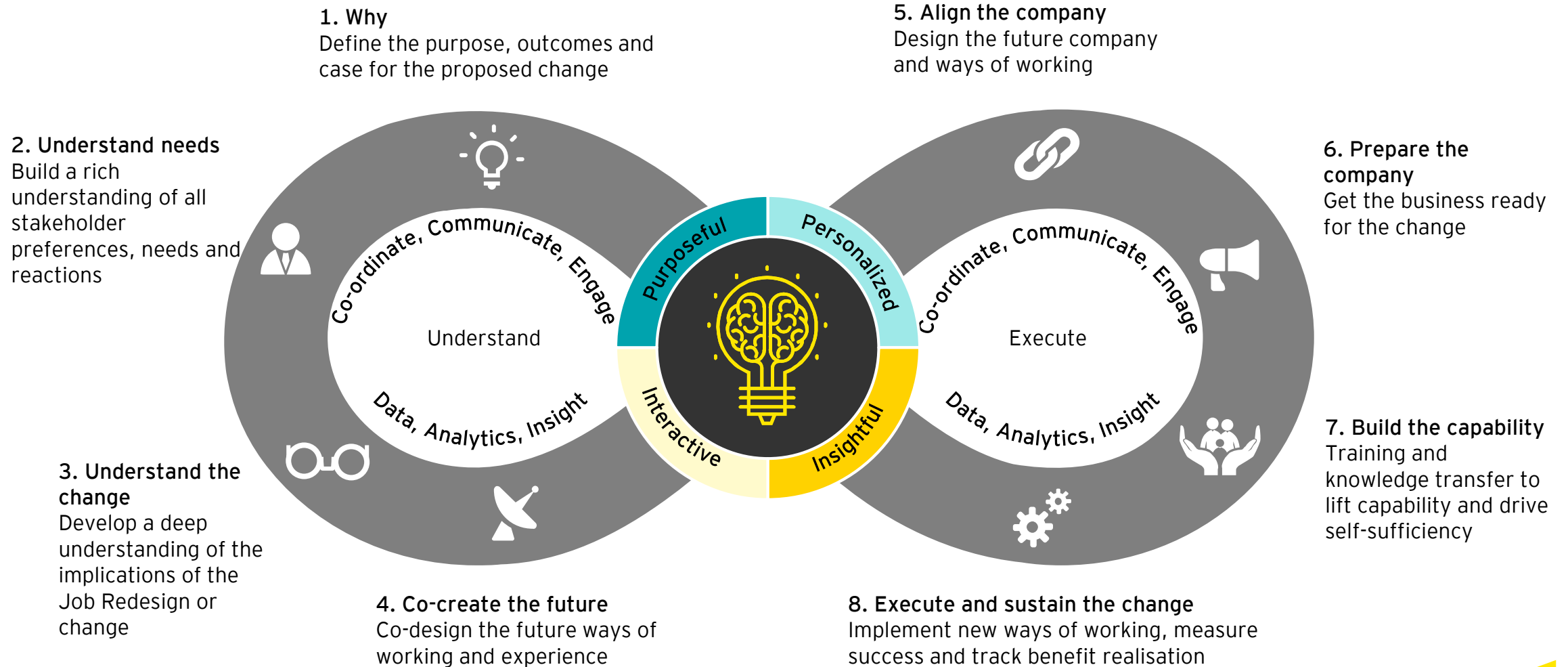
(c) Guide to Change Management Plan and Approach

Change Management

Overview

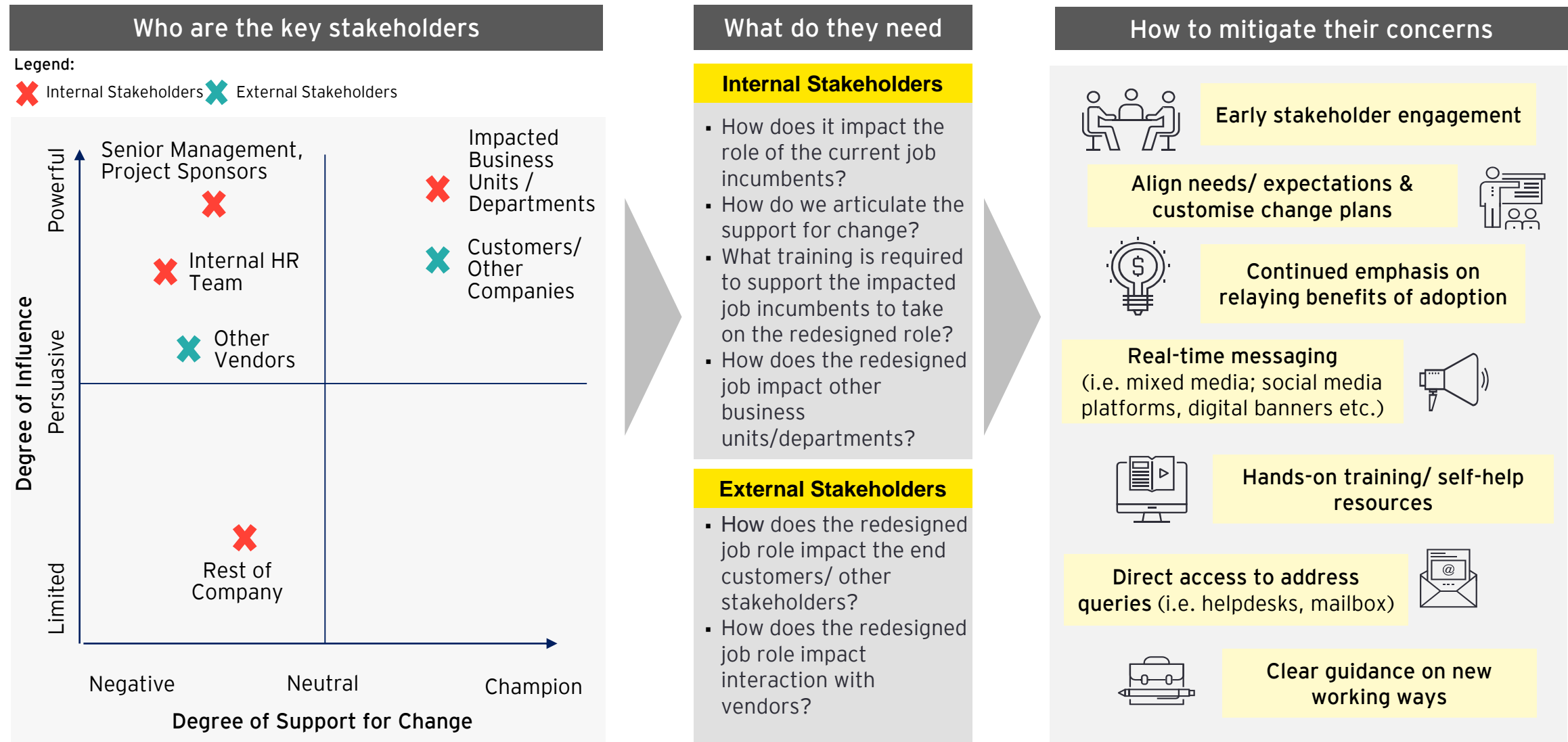
It is important to design an effective Change Management plan to combat potential pitfalls in Job Redesign.

Apply the 8 steps in your planning process for implementing change.



Guide to Change Management Plan and Approach

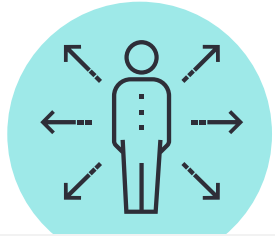
Key Stakeholders to engage in the Change Management process



Guide to Change Management Plan and Approach

Successful Job Redesign requires collaboration between a diverse set of stakeholders

Key roles in a Job Redesign team include...



LEADERS

- Advocate the importance of change agenda of Job Redesign across the company
- Partner with HR to obtain buy-in from stakeholders across the company
- Chart out transition planning of change implementation
- Cascade value proposition of Job Redesign for each division and how the initiative contributes to company goals
- Coach direct reports through the changes that impact their day-to-day work

Examples of Job Roles

- Senior Management
- Head of Department
- Business Unit Managers

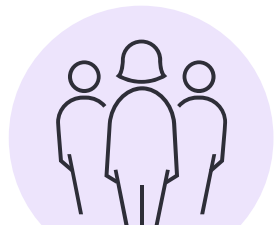


CHANGE CHAMPIONS

- Support change initiatives and relationships
- Initiate dialogue to build trust and communication between stakeholders and change agents
- Foster sponsorship and ownership of coming changes
- Promote visibility and build support ahead of the coming changes
- Pilot Job Redesign implementation
- Assess effectiveness of post Job Redesign implementation

Examples of Job Roles

- Business Unit Managers
- Employees



IMPACTED EMPLOYEES

- Receive instructions from change agents and leaders
- Find out what change means to employees by attending town halls, keep track of communications and actively seeking advice from change agents within teams
- Provide feedback on change initiatives
- Attend training and learning sessions to learn about how to adopt the changes in your day-to-day job

Examples of Job Roles

- Business Unit Managers
- Employees

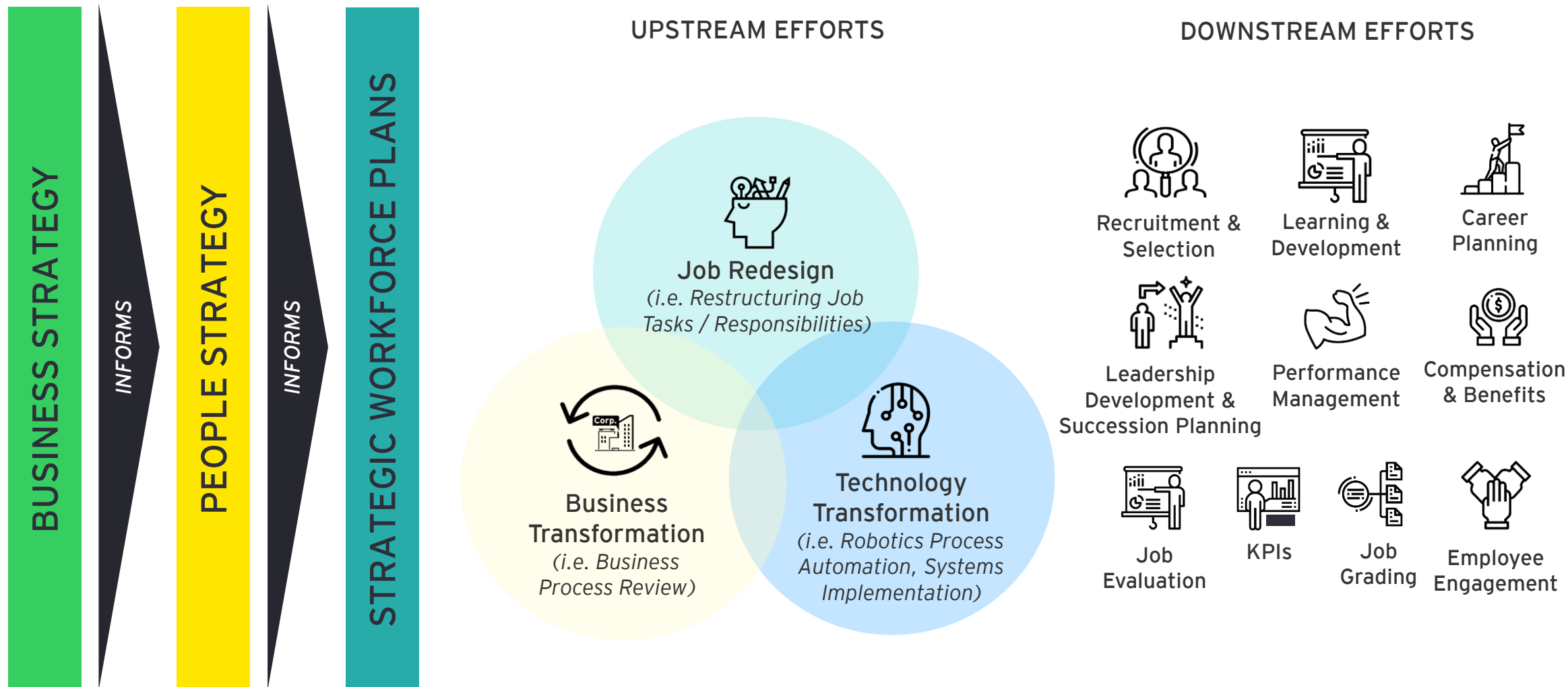
Appendix V

(d) Guide to Implications of Job Redesign on HR Processes

Guide to Implications of Job Redesign on HR Processes

Overall workforce transformation

Job Redesign is only one component in the overall workforce transformation process and should not be considered in isolation

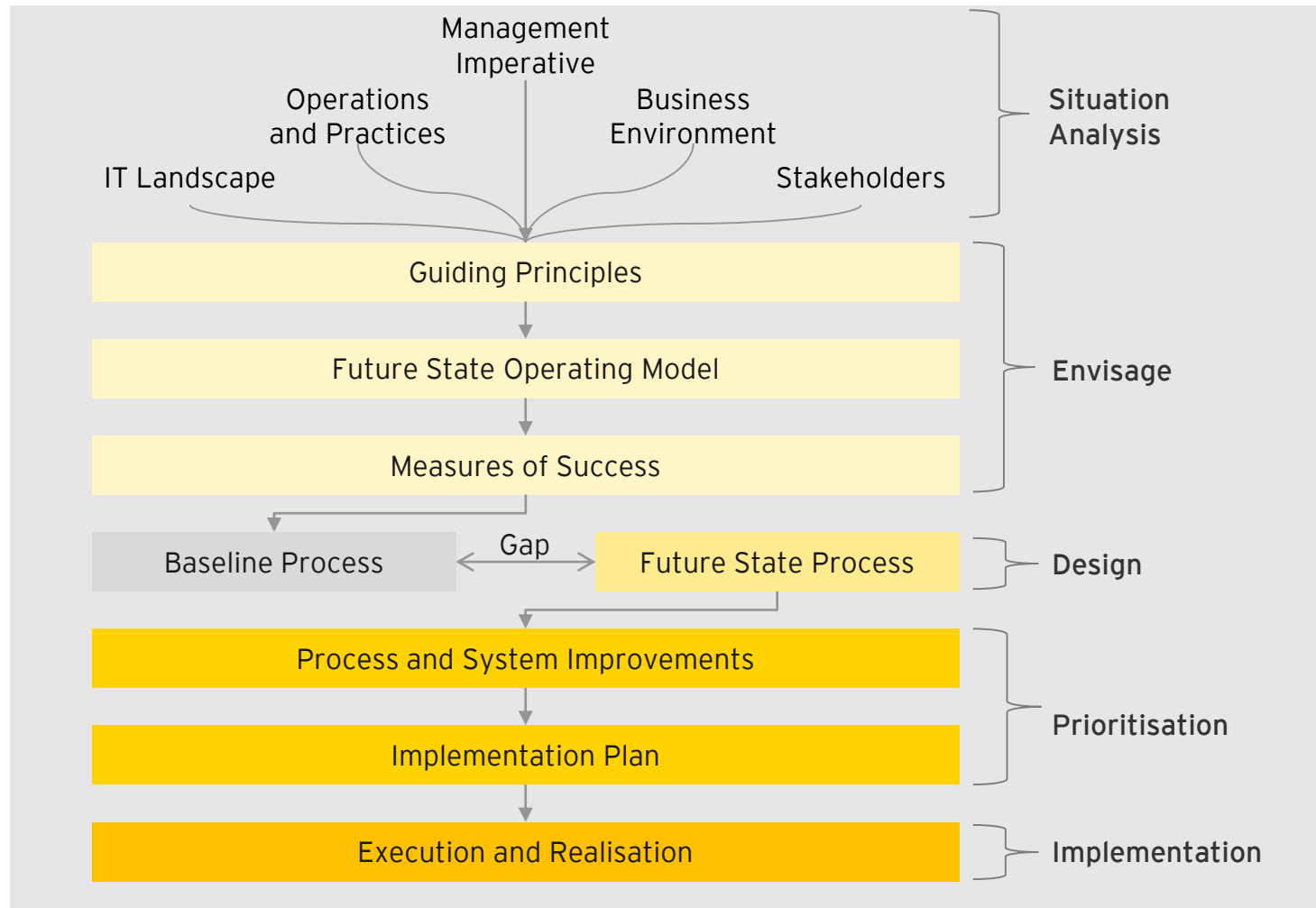


Guide to Implications of Job Redesign on HR Processes

Business Transformation

Job Redesign is part of the larger Workforce Transformation agenda, which must consider the Business Transformation angle.

BUSINESS PROCESS REVIEW METHODOLOGY



- 1. Situational Analysis:** Involves consideration of five key aspects (Management Imperatives, Operations and Practices, Business Environment, Stakeholders, and IT Landscape) to be taken into consideration when building a desired future state.
- 2. Envisage:** Involves creating the vision of the future state, the guiding principles as well as the measurable indicators for the future design
- 3. Design:** Define the baseline processes, identifying gaps between the current state and the desired state. From the view of the desired future state, transformation principles are then developed to guide Job Redesign/business transformation efforts.
- 4. Prioritisation:** Recommend the process and system improvements and prioritise initiatives.
- 5. Implementation:** The Execution and Realisation where detailed 'desired state' process designs and system requirements can commence. This is followed by validation with stakeholders and subject matter advisors for feasibility and risks before deployment.

Guide to Implications of Job Redesign on HR Processes

Technology Transformation on roles

Job Redesign should also consider how Technology Transformations can change roles, or support the changing of roles

PROCESSES WHICH CAN BE AUTOMATED WILL CHANGE HOW THE WORKFORCE IS INVOLVED



- Data intensive
- Repetitive in nature
- Rule-driven
- Electronic trigger to the process
- Have electronic start-points and endpoints
- Involve manual calculation
- High error rates
- Sensitive content
- Can be performed out of office hours
- Complex IT landscape

EXAMPLE OF TECHNOLOGY TRANSFORMATIONS THAT CAN OCCUR ALONGSIDE WORKFORCE TRANSFORMATIONS

IT Services

- Installation
- FTP download, upload and backup
- Server application and monitoring
- Synchronising, deleting and emptying folders
- File management
- Email processing
- Batch processing

HR Services

- Payroll
- Benefits admin
- Pay slip management
- Time and attendance management
- Recruiting process
- Onboarding
- Education and training

Supply Chain

- Work order management
- Demand and supply planning
- Quote, invoice and contract management
- Returns processing
- Freight management

Finance and Accounting

- Sales order
- Order to cash
- Collection
- Procure to pay
- Incentive claim
- Record to report
- Supply chain vendor setup
- Trend tracking
- Closing procedures

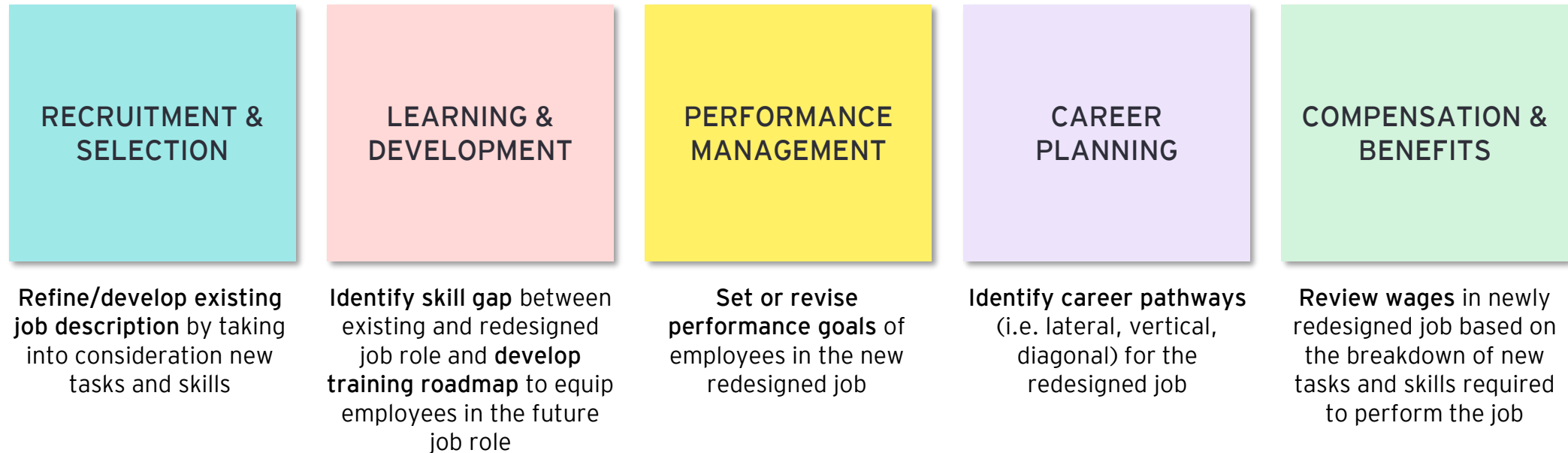
Guide to Implications of Job Redesign on HR Processes

Impact to human resource processes

Together with other upstream efforts, Job Redesign initiatives can have certain downstream implications on Human Resource Processes

Job Redesign has downstream impacts on the following HR functions...

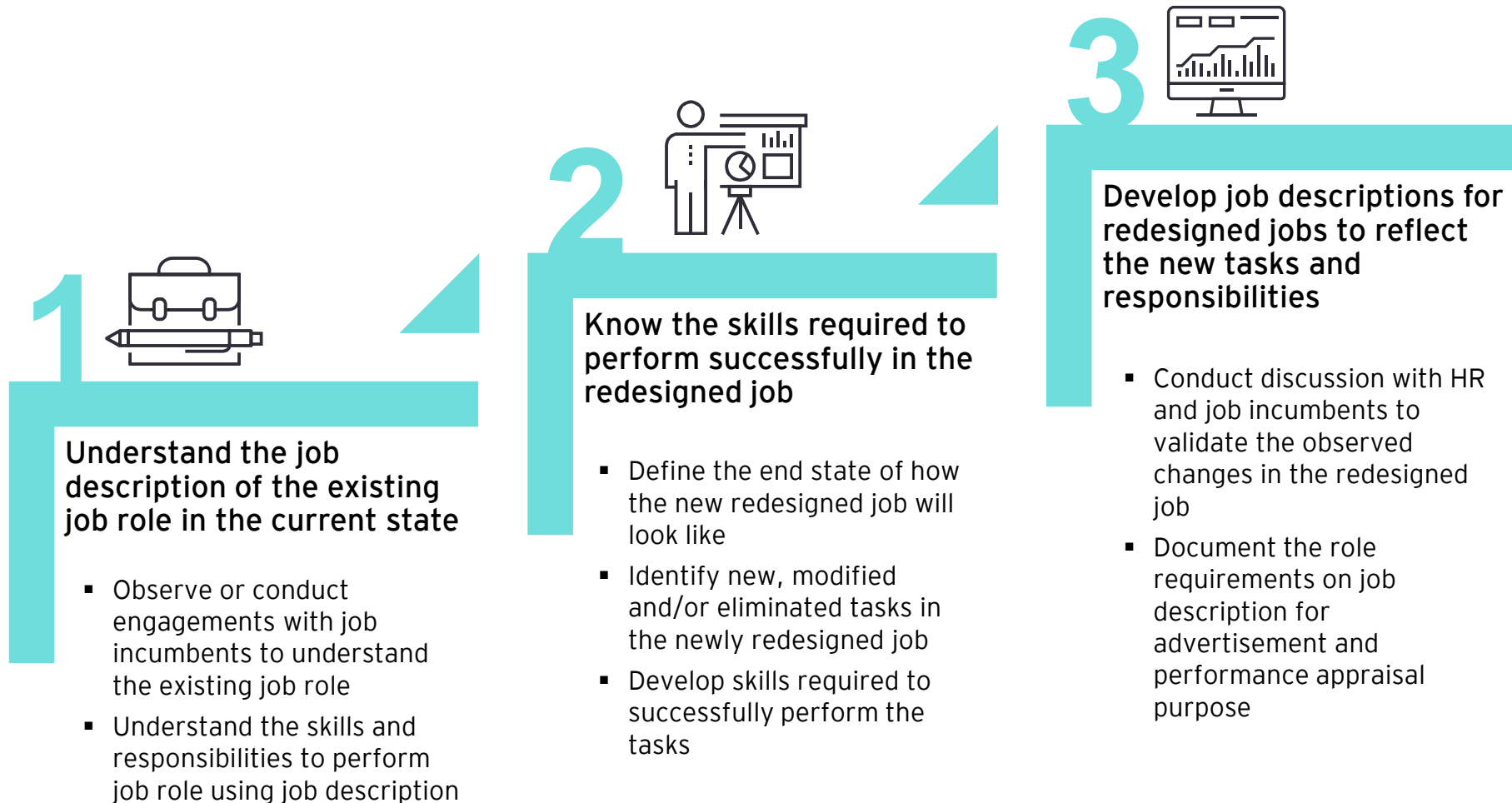
It becomes pertinent for organisations to consider these when planning Job Redesign interventions:



Guide to Implications of Job Redesign on HR Processes

Downstream human resource efforts impacted by job redesign initiatives (1/5)

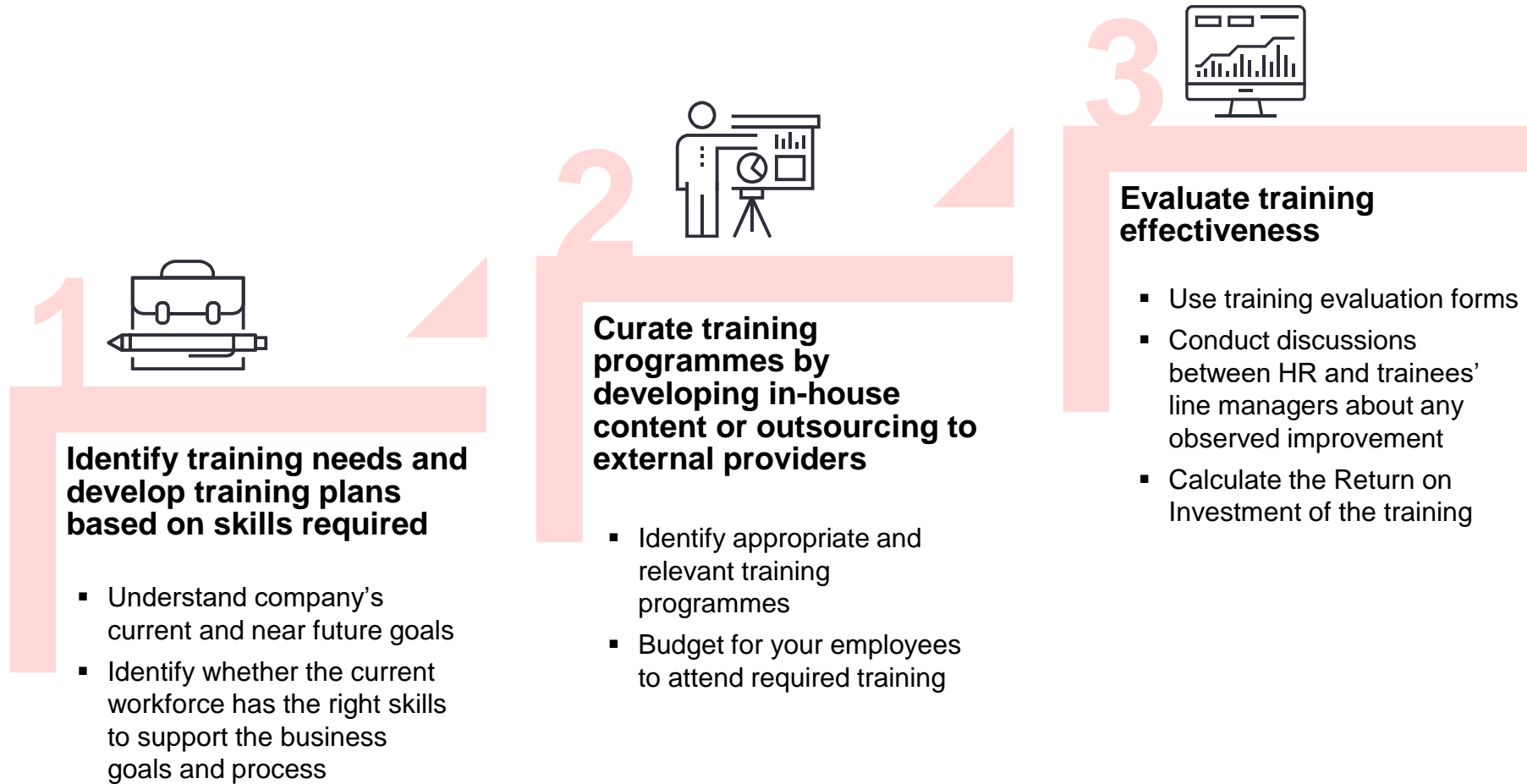
RECRUITMENT AND SELECTION



Guide to Implications of Job Redesign on HR Processes

Downstream human resource efforts impacted by job redesign initiatives (2/5)

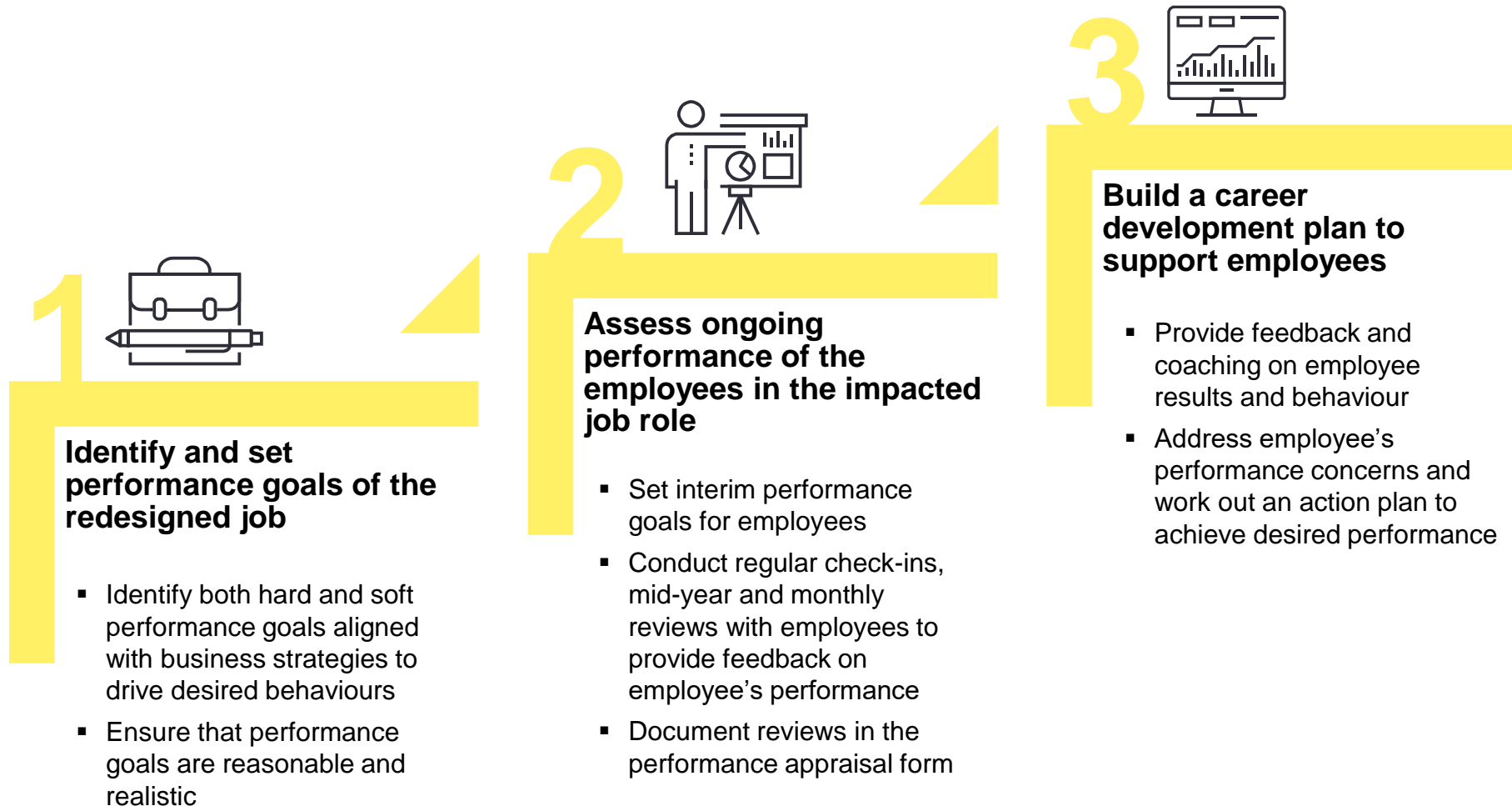
TRAINING & DEVELOPMENT



Guide to Implications of Job Redesign on HR Processes

Downstream human resource efforts impacted by job redesign initiatives (3/5)

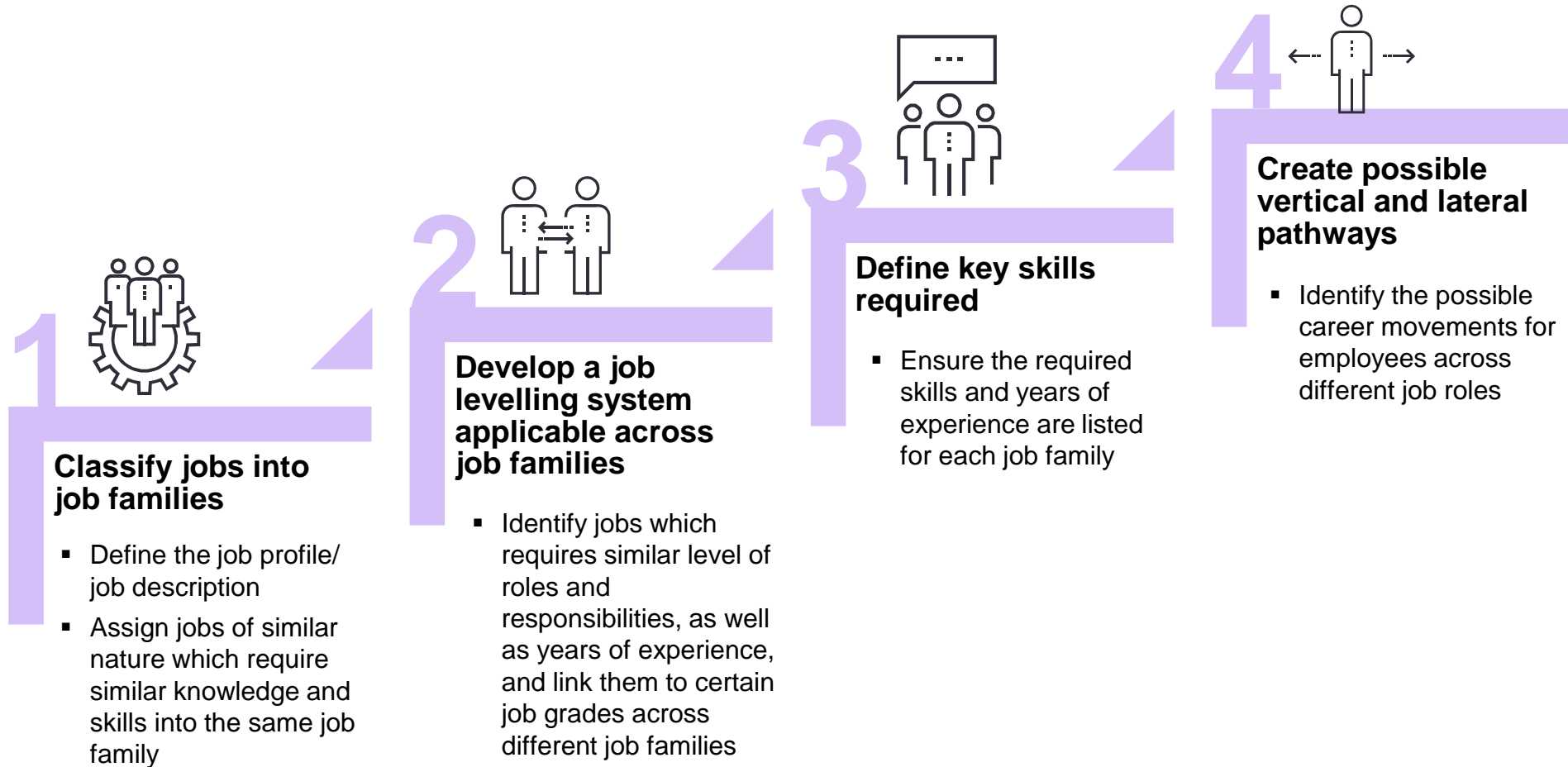
PERFORMANCE MANAGEMENT



Guide to Implications of Job Redesign on HR Processes

Downstream human resource efforts impacted by job redesign initiatives (4/5)

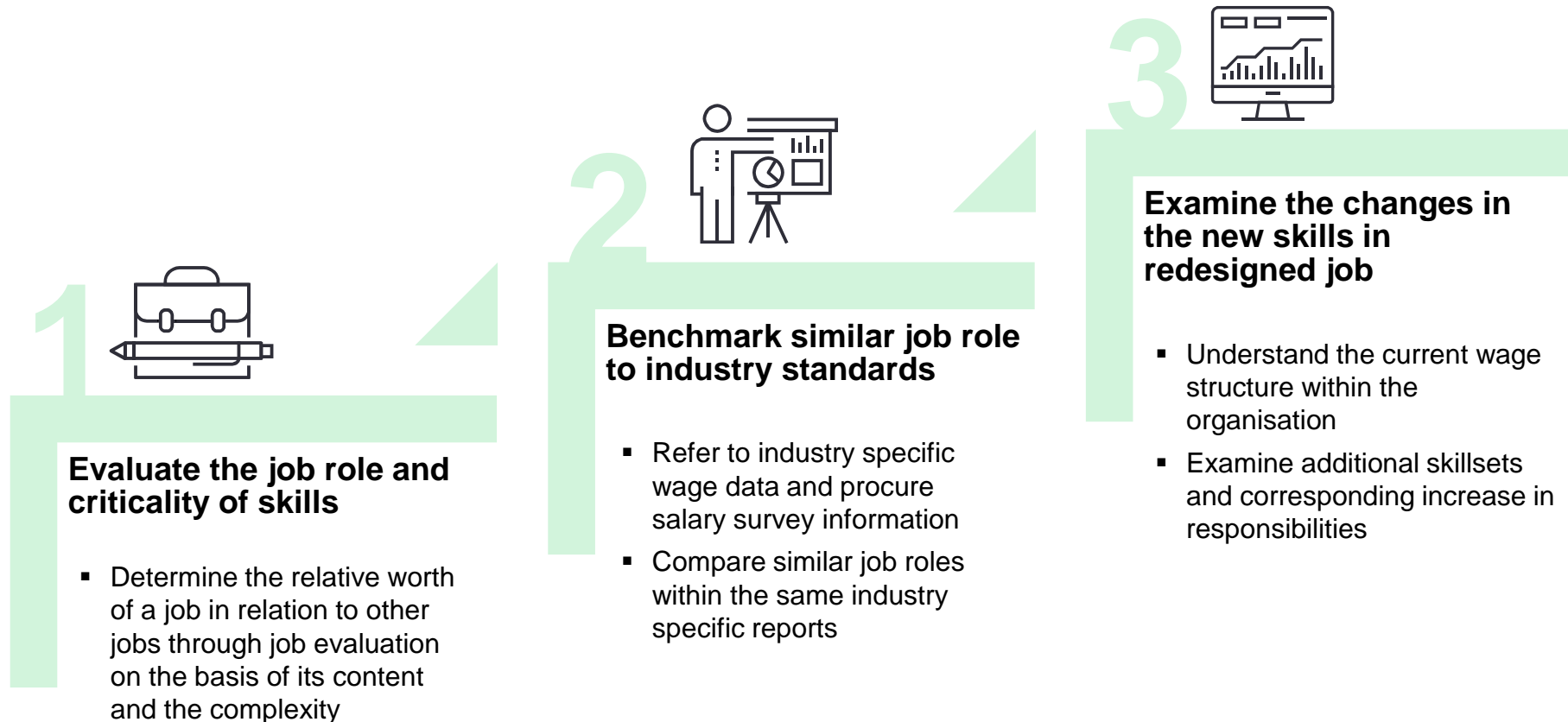
CAREER MANAGEMENT



Guide to Implications of Job Redesign on HR Processes

Downstream human resource efforts impacted by job redesign initiatives (5/5)

COMPENSATION & BENEFITS



Appendix V

(e) Post-Job Redesign Implementation Analysis

Post-Job Redesign Implementation Analysis

Overview

DESCRIPTION

Following the implementation of your Job Redesign interventions, it is crucial to monitor and assess their effectiveness through key metrics and Key Performance Indicators, such as:

- Increase in productivity:
 - Decrease in manning ratio
 - Increase in sales per employee
 - Increase in value-add per worker
- Improved customer experience
- Improved employee satisfaction

This template will help Human Resources practitioners evaluate the impact of your Job Redesign interventions and identify next steps for continuous improvement.

TEMPLATES PROVIDED IN THIS TOOLKIT

Job Redesign Intervention	IMPACT ANALYSIS				Adjustments required / Next Steps
	Key Performance Indicators	Before Job Redesign	After Job Redesign	Other outcomes	

INSTRUCTIONS

- Following the roll out of Job Redesign interventions, monitor the effectiveness using the Post Job Redesign Impact Analysis template.
- For each Job Redesign intervention, populate the template with the key performance indicators (i.e. success metrics), as previously identified in the *Recommendation Report*.
- Monitor the quantitative and qualitative impact of each Job Redesign intervention using the Impact Analysis section of the template.
- Identify any necessary iterations under the Next Steps section of the template.

OUTCOME

- Tracking of success metrics and reception of Job Redesign intervention.
- Outlining of required adjustments or next steps.

Post-Job Redesign Implementation Analysis

Instructions

INSTRUCTIONS

- Monitor the effectiveness of each Job Redesign intervention using the Post-Job Redesign Impact Analysis template shown below (available on the next page).
- For each Job Redesign intervention, populate the template with the key performance indicators (i.e. success metrics), as previously identified in the *Recommendation Report*.
- Monitor the quantitative and qualitative impact of each Job Redesign intervention using the Impact Analysis section of the template.
- Identify any necessary iterations under the Next Steps section of the template.

Job Redesign Intervention	IMPACT ANALYSIS			Adjustments required / Next Steps
	Key Performance Indicators	Before Job Redesign	After Job Redesign	

Post-Job Redesign Implementation Analysis

Template

Job Redesign Intervention	IMPACT ANALYSIS				Adjustments required / Next Steps
	Key Performance Indicators	Before Job Redesign	After Job Redesign	Other outcomes	



Post-Job Redesign Implementation Analysis

Template (sample)

Sample job role: Warehouse Officer

SAMPLE

Job Redesign Intervention	IMPACT ANALYSIS				Adjustments required / Next Steps
	Key Performance Indicators	Before Job Redesign	After Job Redesign	Other outcomes	
Introduce RFID, Barcode, sensor technology, robotic sorting system <ul style="list-style-type: none"> To support planning, utilisation of warehouse storage and inspection of cargo 	Time taken for planning and monitoring of inventory level and storage utilization	4 hours	2 hours	<ul style="list-style-type: none"> Positive customer feedback - faster response and processing of customer orders Positive employee feedback - less labour intensive job scope Increase in productivity by 5% with less human error 	Consider enlarging existing job scope to fill waiting gaps
	Time taken to inspect cargo handling activities	2 hours	0.5 hour		
	Number of staff required on the ground	8 officers	4 officers		
	...				

Appendix VI

ECOSYSTEM STAKEHOLDERS



The better the question. The better the answer.
The better the world works.



Ecosystem stakeholders

Associations, Government agencies, Employee and trade unions

Associations	Government Agencies	Employee and Trade Unions
<ul style="list-style-type: none">• Container Depot Association,• Singapore Aircargo Associations,• Singapore Logistics Association,• International Federation of Freight Forwarders Association,• Singapore Transport Association	<ul style="list-style-type: none">• Employment and Employability Institute,• Economic Development Board• Enterprise Singapore,• Inland Revenue Authority of Singapore• Ministry of Trade and Industry• SkillsFuture Singapore• Workforce Singapore	<ul style="list-style-type: none">• Employees Union:<ul style="list-style-type: none">• Air Transport Executive Staff Union• Supply Chain Employees' Union• Employers Union:<ul style="list-style-type: none">• Singapore National Employers Federation• Federation of Unions<ul style="list-style-type: none">• National Trade Union Congress

Ecosystem stakeholders

Educational institutions

Education Institutions

Tertiary Education Institutions:

- Institute of Technical Education
- Nanyang Polytechnic
- Ngee Ann Polytechnic
- Temasek Polytechnic
- Republic Polytechnic
- Singapore Polytechnic
- Singapore University of Social Sciences

Private Education Institutions:

- A2V Construction Services Pte Ltd
- Aa International Consultancy Pte. Ltd.
- Aat Training Hub Pte. Ltd.
- Absolute Kinetics Consultancy Pte Ltd
- Ace Ehs Singapore Pte. Ltd.
- Acts System Methodologies Pte. Ltd.
- Anzen Training Academy Pte. Ltd.
- Anzenet Pte. Ltd.
- Arise Services Pte. Ltd.
- Ascendo Consulting Pte. Ltd.
- Asretec Pte. Ltd.
- Associates Consulting Pte Ltd
- August International Pte. Ltd.
- Avanta Global Pte. Ltd.
- BCS International College Pte. Ltd.
- Bond International Consultants Pte Ltd
- Building And Construction Authority
- Capelle Academy Pte. Ltd.
- Ccis Singapore Pte Ltd
- Centre of Innovation for Supply Chain Management

- Certification International (Singapore) Pte Ltd
- Comat Training Services Pte Ltd
- Concord Associates Pte. Ltd
- Eduquest International Institute Pte. Ltd.
- Electronics Industries Training Centre
- Eqs Asia Pte Ltd
- Esis Academy Pte. Ltd.
- Ever Safe Consultants Pte. Ltd.
- Flexi Industrial Safety Training Pte. Ltd.
- Global School Of Technology and Management
- Gourmet Food Safety Consultancy
- Greencross Safety Fire And Equipment Consultants Pte. Ltd.
- Greensafe International Pte. Ltd.
- Hong Tech Consultant Pte Ltd
- Institute Of Process Industry (Ipi) - A Division Of Aspri
- Integrated Training Consultants Pte. Ltd.
- International Safety Resource Centre Pte. Ltd.
- Kaplan Professional
- Kba Training Centre Pte. Ltd.
- Learners Hub Pte. Ltd.
- Lloyd Mcgill Pte Ltd
- Loyal Reliance Pte. Ltd.
- Mass Education Institute Pte. Ltd.
- Morning Star Resources Private Limited
- Neville-Clarke (Singapore) Pte Limited
- NTUC LearningHub Pte Ltd
- Propel Consultants Pte. Ltd.
- PSA Corporation Limited
- Public Utilities Board
- Quebee Safety Training Hub Pte. Ltd.
- Qesh Consultants (Pte.) Ltd.
- Service Quality Centre Pte. Ltd.
- She Audit and Consulting At Pandan Loop
- Simply Safety Pte. Ltd.
- Singapore Institute Of Materials Management
- Singapore Institution Of Safety Officers (SISO) The
- Singapore Manufacturing Federation
- Singapore National Employers Federation
- SMF Centre For Corporate Learning Pte. Ltd.
- SSA Consulting Group Pte. Ltd.
- ST Electronics (E-Services) Pte. Ltd.
- Supply Chain and Logistics Academy Pte. Ltd.
- Supply Chain Asia Community Ltd.
- Tat Hong Training Services Pte Ltd
- Team-6 Safety Training and Consultancy (S) Pte. Ltd.
- The Logistics Academy Pte. Ltd.
- The Singapore Contractors Association Limited
- The Turning Point Business School
- Training Vision Institute Pte. Ltd.
- Ubts Pte Ltd
- Wong Fong Academy Pte. Ltd.

Appendix VII

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The better the question. The better the answer.
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