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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**Abbreviations**

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| I4.0 | Internet of Everything (IoE)  
| AI | Artificial Intelligence  
| ML | Machine Learning  
| VR | Virtual Reality  
| AR | Augmented Reality  
| IoT | Internet of Things  
| ERP | Enterprise Resource Planning  
| CRM | Customer Relationship Management  
| SCM | Supply Chain Management  
| WMS | Warehouse Management System  
| TMS | Transportation Management System  
| POS | Point of Sale  

**In brief**

- Overview
- Logistics I4.0 landscape
- Jobs and skills impact
  - New I4.0 job roles
  - Impact on job roles and skills
- Talent management strategies
  - Best practices in talent development
  - Best practices in talent retention
  - Best practices in talent recruitment
  - Safeguarding employment & employability of logistics workers
- Manpower capability-building ecosystem

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**Methodology**

- Overview
- Logistics I4.0 landscape
- Jobs and skills impact
- Talent management strategies
- Manpower capability-building ecosystem

**Appendix**

- I4.0 technology solutions
- New I4.0 job roles
- Job dashboards: Future view of jobs and skills
- Skills library
- Guidelines for job redesign
- Ecosystem stakeholders
- References
In this study, a company’s adoption of industry 4.0 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.
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<th>Abbreviation</th>
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<tr>
<td>AI</td>
<td>Artificial Intelligence</td>
<td>ICR</td>
<td>Intelligent Character Recognition</td>
<td>PME</td>
<td>Professionals, Managers and Executives</td>
</tr>
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<td>AS/RS</td>
<td>Automated Storage and Retrieval System</td>
<td>ICT</td>
<td>Information and Communication Technology</td>
<td>RFID</td>
<td>Radio Frequency Identification</td>
</tr>
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<td>AV</td>
<td>Autonomous Vehicles</td>
<td>IHCI</td>
<td>Industry 4.0 Human Capital Initiative</td>
<td>ROE</td>
<td>Return on Equity</td>
</tr>
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<td>CAGR</td>
<td>Compound Annual Growth Rate</td>
<td>IMDA</td>
<td>Infocomm Media Development Authority</td>
<td>ROI</td>
<td>Return on Investment</td>
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<td>CCN</td>
<td>Cargo Community Network</td>
<td>IoT</td>
<td>Internet of Things</td>
<td>RPA</td>
<td>Robotic Process Automation</td>
</tr>
<tr>
<td>CTP</td>
<td>Connected Trade Platform</td>
<td>IP</td>
<td>Intellectual Property</td>
<td>SCALA</td>
<td>Supply Chain and Logistics Academy</td>
</tr>
<tr>
<td>DRC</td>
<td>Dependency Ratio Ceiling</td>
<td>L&amp;D</td>
<td>Learning and Development</td>
<td>SCT</td>
<td>Sector Coordination Team</td>
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<tr>
<td>e2i</td>
<td>Employment and Employability Institute</td>
<td>LLE</td>
<td>Large Local Enterprise</td>
<td>SFw</td>
<td>Skills Framework</td>
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<td>EDB</td>
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<td>MHE</td>
<td>Material Handling Equipment</td>
<td>SME</td>
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<td>ESG</td>
<td>Enterprise Singapore</td>
<td>ML</td>
<td>Machine Learning</td>
<td>SNEF</td>
<td>Singapore National Employers Federation</td>
</tr>
<tr>
<td>ETA</td>
<td>Estimated Time of Arrival</td>
<td>MNC</td>
<td>Multinational Corporation</td>
<td>SSG</td>
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<td>EY</td>
<td>Ernst &amp; Young Singapore</td>
<td>MOE</td>
<td>Ministry of Education</td>
<td>TAC</td>
<td>Trade Associations &amp; Chambers</td>
</tr>
<tr>
<td>FTE</td>
<td>Full Time Employee</td>
<td>MOM</td>
<td>Ministry of Manpower</td>
<td>UAV</td>
<td>Unmanned Aerial Vehicles</td>
</tr>
<tr>
<td>HSE</td>
<td>Health, Safety and Environment</td>
<td>OCR</td>
<td>Optical Character Recognition</td>
<td>WMS</td>
<td>Warehouse Management System</td>
</tr>
<tr>
<td>I4.0</td>
<td>Industry 4.0</td>
<td>OJT</td>
<td>On-the-job Training</td>
<td>WSG</td>
<td>Workforce Singapore</td>
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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.

### NEW I4.0 Job Roles

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

**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

### IMPACT OF I4.0 on job 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
  - High data and technology quotient
  - Multi-disciplinary expertise for business advisory
  - Adaptability, agility and cultural sensitivity

- **Industry 4.0 skills**
  - Demanding...

- **Business skills**

- **Foundational skills**

### IMPACT OF I4.0 on existing job roles

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

- **11 job roles will experience a high degree of change in job tasks**
  - 1 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**

### 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

### IMPACT OF I4.0 on existing job roles

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

- **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

### 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

- Industry 4.0 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 Industry 4.0 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 Industry 4.0 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 Industry 4.0 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 Industry 4.0 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.
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 Logistics.

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.

1 Source: [https://www.skillsfuture.sg/skills-framework/logistics](https://www.skillsfuture.sg/skills-framework/logistics)
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.

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.

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**Exponential Customer Centricity**

Changing customer/consumer patterns are pushing companies to compete against each other to understand, and deliver against current and future customer specific needs and expectations at exponential scale.

**Agile & Resilient Ecosystems**

From the US-China trade war and Brexit to most recent Covid-19 pandemic and oil crisis, these simultaneous events will continue to drive uncertainty and volatility globally. Companies need to build an agile and resilient ecosystem, capable of withstanding shocks and adapting quickly.

**Dynamic Venturing**

With non-traditional players entering traditional markets, companies need to innovate and pivot continuously to sustain and build new competitive advantage. Part of getting this right is knowing what’s out there and investing to establish the required capabilities.

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Research\(^2\) indicates that **79%** out of 1,219 companies surveyed are **investing to be a digital business by 2025**.

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\(^1\) Source: EY thought leadership  
\(^2\) Source: 2019 Gartner Future of Supply Chain Survey
I4.0 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.

I4.0 has tremendous potential to drive productivity improvements and higher outputs, thus enhancing the sector’s ability to accommodate increasingly higher demands in the region. I4.0 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, I4.0 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.

• I4.0 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 I4.0 adoption will give rise to new, higher-paying employment opportunities in the form of I4.0 job roles. This results from the historical trend, that as the I4.0 maturity of companies increases, they build dedicated in-house teams and full-time roles to drive tighter integration between technology and operations.

• Additionally, I4.0 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 I4.0 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 I4.0 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 I4.0 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.
Logistics companies can use a four-step approach to build I4.0 and workforce capabilities

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.

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

**I4.0 Technology Adoption**

Identify your company’s strategic priorities and adopt a purpose-led approach to digital transformation. This entails implementing relevant i4.0 technologies and solutions.

- Click here for more information on the logistics I4.0 landscape

**STEP 1: EMBARK ON DIGITAL TRANSFORMATION**

**I4.0 Technology Adoption**

**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 technology I4.0 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.

- Click here for best practices in talent management

**STEP 4: GARNER ECOSYSTEM SUPPORT**

Leverage available 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

**Workforce Impact Assessment**

**Talent Development**

**Talent Recruitment**

**Talent Retention**

**Leveraging Ecosystem Support**
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).

1. A typical digitalisation journey for companies starts from the fundamental bedrock of having the right systems in place to record data digitally e.g. WMS, TMS, ERPs. These legacy systems are not necessarily I4.0 technologies, but they will underpin the development of future digital capabilities.

2. Using IoT, companies will be able to use connected sensors to capture real-time data. This is further enhanced with AR/VR wearables to augment performance of tasks. Cloud and Blockchain will allow for captured data to be shared securely cross various systems.

3. Robotics and automation technologies will allow for manual tasks and repetitive processes to be fully/semi automated. Thereby reducing human effort for non value add tasks, and allowing greater focus to perform more complex jobs.

4. With the vast amounts of data captured, “Big Data” analytics will be used to make sense of it and gain insights. Artificial Intelligence / Machine Learning will further enhance the decision making process through predictive and prescriptive capabilities.
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**

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.

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.

**Digital Player**

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.

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.

**Digital Leader**

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.

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.
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

<table>
<thead>
<tr>
<th>I4.0 technology solution</th>
<th>I4.0 technology enablers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Inventory Counting</td>
<td>Unmanned Aerial Vehicles, Artificial Intelligence, Machine Learning, Big Data</td>
<td>Autonomous drones or robotics, coupled with advanced optical, RFID and barcoding sensor capabilities, that can automate inventory tracking, cycle-counting, stocktaking and inspections</td>
</tr>
<tr>
<td>Picker to Parts &amp; Parts to Picker Automated Storage and Retrieval Systems (AS/RS)</td>
<td>Advanced Robotics, Internet of Things</td>
<td>Intelligent robotics systems which can be configured to automate the storage and retrieval of products</td>
</tr>
<tr>
<td>Intelligent Robotic Sorting</td>
<td>Artificial Intelligence, Machine Learning, Advanced Robotics, Big Data</td>
<td>Robots or autonomous guided vehicles, powered by computer vision, laser technology and machine learning, which can automate sorting operations for incoming or outgoing cargo</td>
</tr>
<tr>
<td>Predictive &amp; Prescriptive Maintenance</td>
<td>Internet of Things, Predictive Analytics, Machine Learning, Big Data</td>
<td>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</td>
</tr>
<tr>
<td>Predictive Fleet Management</td>
<td>Internet of Things, Predictive Analytics, Machine Learning, Big Data</td>
<td>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</td>
</tr>
<tr>
<td>Dynamic Route Optimisation</td>
<td>Artificial Intelligence, Prescriptive Analytics, Machine Learning, Big Data</td>
<td>Application of artificial intelligence and prescriptive analytics for dynamic route planning and identifying the most optimal delivery route for cost effectiveness, timely delivery etc.</td>
</tr>
<tr>
<td>Autonomous Last Mile Delivery</td>
<td>Autonomous Vehicles</td>
<td>Use of autonomous vehicles to perform last mile deliveries</td>
</tr>
<tr>
<td>Autonomous Last Yard Delivery</td>
<td>Unmanned Aerial Vehicles</td>
<td>Use of drones to perform last yard and time critical deliveries</td>
</tr>
<tr>
<td>Smart Billing, Costing &amp; Reconciliation</td>
<td>Blockchain, Cybersecurity, Robotics Process Automation, Artificial Intelligence</td>
<td>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</td>
</tr>
<tr>
<td>Connected Trade Platforms</td>
<td>Blockchain, Cloud Computing, Big Data, Cybersecurity</td>
<td>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</td>
</tr>
<tr>
<td>Freight Forwarding</td>
<td>Internet of Things</td>
<td>Storage solutions with technologies such as IoT, software robotics, computer vision, biometrics etc. allowing automated package notification and distribution for last-mile deliveries</td>
</tr>
<tr>
<td>Sales &amp; Customer Service</td>
<td>Artificial Intelligence, Machine Learning, Big Data</td>
<td>Chatbots equipped with self-learning algorithms that can address customers queries and offer templatised solutions</td>
</tr>
<tr>
<td>Optimised Documentation</td>
<td>Artificial Intelligence, Machine Learning, Big Data, Computer Vision, Robotics Process Automation</td>
<td>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</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Enhanced business and process performance</th>
<th>Improved customer experience</th>
<th>Greater collaboration for value-adding partnerships</th>
<th>Better environmental sustainability</th>
<th>Enhanced job and sector appeal for the workforce</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>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.</td>
<td>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 &amp; 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.</td>
<td>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.</td>
<td>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.</td>
</tr>
</tbody>
</table>

² Source: Strategy Analytics forecast
³ Source: Gartner, ‘Supply Chain 2029: Disruptions Impacting Future Innovation’
### Exhibit E3: I4.0 technology solutions and their adoption timelines in Singapore

<table>
<thead>
<tr>
<th>Technology Solutions</th>
<th>Adoption Timelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated Storage and Retrieval Systems (AS/RS)</td>
<td></td>
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<tr>
<td>Predictive and Prescriptive Fleet Management</td>
<td></td>
</tr>
<tr>
<td>Optimised Documentation</td>
<td></td>
</tr>
<tr>
<td>Connected Trade Platforms</td>
<td></td>
</tr>
<tr>
<td>Smart Inventory Counting</td>
<td></td>
</tr>
<tr>
<td>Smart Lockers</td>
<td></td>
</tr>
<tr>
<td>Predictive and Prescriptive Maintenance</td>
<td></td>
</tr>
<tr>
<td>Dynamic Route Optimisation</td>
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<tr>
<td>Smart Billing, Costing &amp; Reconciliation</td>
<td></td>
</tr>
<tr>
<td>Intelligent Robotic Sorting</td>
<td></td>
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<tr>
<td>Virtual Assistants</td>
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<tr>
<td>Autonomous Last Mile Delivery</td>
<td></td>
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<tr>
<td>Autonomous Last Yard Delivery</td>
<td></td>
</tr>
</tbody>
</table>

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

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New I4.0 job roles in demand

What are the new employment opportunities in the logistics sector?
I4.0 adoption has spurred the emergence of new I4.0 job roles

Technology adoption has spurred the emergence of I4.0 job roles in the logistics sector globally. We observe a similar trend in the logistics sector in Singapore - logistics companies that are implementing I4.0 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 I4.0 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 I4.0 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 I4.0 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.
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 roles 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.

1 Source: JobTech data on global and local online job postings between January 2019 and February 2020
## Snapshot of new I4.0 job roles in the logistics sector

<table>
<thead>
<tr>
<th>Data analysis and management job roles</th>
<th>Software development job roles</th>
<th>Digitalisation and automation job roles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Typical job roles in demand:</strong></td>
<td><strong>Typical job roles in demand:</strong></td>
<td><strong>Typical job roles in demand:</strong></td>
</tr>
<tr>
<td>• Data Analyst</td>
<td>• Software Developer</td>
<td>• Digital Innovation Lead</td>
</tr>
<tr>
<td>• Data Scientist</td>
<td>• Mobile Developer</td>
<td>• Machine Learning Engineer</td>
</tr>
<tr>
<td>• Data Architect/Engineer</td>
<td>• Software Engineer</td>
<td>• Automation Engineer</td>
</tr>
<tr>
<td></td>
<td>• Solution/Application Architect</td>
<td>• I4.0 Maintenance Specialist; ASRS/</td>
</tr>
<tr>
<td></td>
<td>• UI/UX Designer</td>
<td>Drone/AGV Operator; Automation</td>
</tr>
<tr>
<td><strong>Typical skills required:</strong></td>
<td><strong>Typical skills required:</strong></td>
<td><strong>Typical skills required:</strong></td>
</tr>
<tr>
<td>• Data programming and scripting languages</td>
<td>• Software development and implementation</td>
<td>• Digital acumen and innovation</td>
</tr>
<tr>
<td>• Database management and distribution systems</td>
<td>• Front-end, back-end, mobile, API development</td>
<td>• Business intelligence tools</td>
</tr>
<tr>
<td>• Data infrastructure and migration</td>
<td>• Programming and coding</td>
<td>• Big data tools and data management</td>
</tr>
<tr>
<td>• Data modeling and machine learning</td>
<td>• Testing, integration and deployment of systems</td>
<td>• AI and machine learning techniques</td>
</tr>
<tr>
<td>• Quantitative analysis and statistics</td>
<td>• Software architecture and product roadmapping</td>
<td>• Robotic process automation tools</td>
</tr>
<tr>
<td>• Big data analysis</td>
<td>• Agile software development practices</td>
<td>• Programming and query languages</td>
</tr>
<tr>
<td>• Data visualisation and storytelling</td>
<td>• UI/UX design</td>
<td>• Hardware automation and robotics</td>
</tr>
<tr>
<td></td>
<td>• Design and illustrative tools</td>
<td>• Electrical, mechanical or maintenance skills</td>
</tr>
</tbody>
</table>

### Hiring trends between Q1 2019 and Q2 2020

<table>
<thead>
<tr>
<th>Total job postings: 138</th>
<th>Total job postings: 303</th>
<th>Total job postings: 36</th>
</tr>
</thead>
<tbody>
<tr>
<td>108 global, 30 local postings</td>
<td>206 global, 97 local postings</td>
<td>20 global, 16 local postings</td>
</tr>
</tbody>
</table>

**Top 5 hiring companies:**

3. FedEx

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

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

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1. Source: JobTech data on global and local online job postings between January 2019 and February 2020
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)

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.

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1 Source: JobTech data on global and local online job postings between January 2019 and February 2020.
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?
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.
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

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

<table>
<thead>
<tr>
<th>HIGH DEGREE OF CHANGE IN JOB TASKS</th>
<th>MEDIUM DEGREE OF CHANGE IN JOB TASKS</th>
<th>LOW DEGREE OF CHANGE IN JOB TASKS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ROLES WILL UNDERGO DISPLACEMENT</strong></td>
<td><strong>ROLES WILL REQUIRE REDESIGN</strong></td>
<td><strong>ROLES WILL CHANGE INCRENTALLY</strong></td>
</tr>
<tr>
<td>1. MHE/Forklift Operator / Warehouse/Inventory Assistant</td>
<td>1. Warehouse Officer / Inventory Controller / Quality/Facilities Management Officer</td>
<td>1. Warehouse Operations/Inventory Management Manager / Capacity Management Manager</td>
</tr>
<tr>
<td>2. Warehouse Storekeeper / Inventory/Logistics Coordinator</td>
<td>2. Warehouse Operations/Inventory Management/Warehouse Assistant Manager</td>
<td>2. Health, Safety and Environmental Officer</td>
</tr>
<tr>
<td>4. Import Export Administrative/Shipping Assistant</td>
<td>4. Rigger / Signalman</td>
<td>4. Project Engineer ★</td>
</tr>
<tr>
<td>5. Permit/Shipping/Custom Clearance Coordinator</td>
<td>5. Lifting Supervisor</td>
<td>5. Project Supervisor ★</td>
</tr>
<tr>
<td>8. Warehouse/Inventory Control/Quality Control Supervisor</td>
<td>8. Incoming Quality Coordinator / Tally Assistant</td>
<td>8. Project Manager ★</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Technology will AUTOMATE transactional tasks such as...</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Manual, labour-intensive tasks</td>
</tr>
<tr>
<td>• Goods sorting, routing and quality checks</td>
</tr>
<tr>
<td>• Inventory tracking, stocktaking, cycle counting and inspection</td>
</tr>
<tr>
<td>• Transportation and freight route planning</td>
</tr>
<tr>
<td>• Scheduling and tracking of orders</td>
</tr>
<tr>
<td>• Customer support and query resolution</td>
</tr>
<tr>
<td>• Payment calculation and tracking</td>
</tr>
<tr>
<td>• Order assignment and coordination</td>
</tr>
<tr>
<td>• Communication of status updates</td>
</tr>
<tr>
<td>• Documentation and administrative tasks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technology will AUGMENT the role with new tasks such as...</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Overseeing and configuring I4.0 solutions</td>
</tr>
<tr>
<td>• Customisation of I4.0 solutions</td>
</tr>
<tr>
<td>• Exception-handling and troubleshooting</td>
</tr>
<tr>
<td>• Data-driven planning and forecasting</td>
</tr>
<tr>
<td>• Simulation modelling</td>
</tr>
<tr>
<td>• Trend analysis for process enhancement</td>
</tr>
<tr>
<td>• Data visualisation and insights generation</td>
</tr>
<tr>
<td>• Cross-functional integration</td>
</tr>
<tr>
<td>• Advisory on operations and solutions</td>
</tr>
<tr>
<td>• Stakeholder management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technology will SUPPLEMENT the performance of tasks such as...</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Strategic planning and policy formulation</td>
</tr>
<tr>
<td>• Business advisory and solutioning</td>
</tr>
<tr>
<td>• Innovation management</td>
</tr>
<tr>
<td>• Continuous process improvement</td>
</tr>
<tr>
<td>• Business development</td>
</tr>
<tr>
<td>• Customer needs analysis</td>
</tr>
<tr>
<td>• Logistics solutions customisation</td>
</tr>
<tr>
<td>• Business continuity planning</td>
</tr>
<tr>
<td>• Proactive risk management</td>
</tr>
<tr>
<td>• Safety, compliance and sustainability</td>
</tr>
</tbody>
</table>
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.

▲ 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.

▪ 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.
### Exhibit E8: Evolution of skills due to adoption of industry 4.0 technology solutions

*(For more, see Appendix IV: Skills Library)*

<table>
<thead>
<tr>
<th>TECHNICAL SKILLS</th>
<th>INDUSTRY 4.0 SKILLS</th>
<th>BUSINESS SKILLS</th>
<th>FOUNDATIONAL SKILLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decline in demand for manual, administrative, documentation skills due to automation and cognitive technologies</td>
<td>Increase in demand for data and industry 4.0 technology-related skills for design and implementation of I4.0 solutions</td>
<td>Increase in demand for business and people management skills with focus shifting to high value-adding activities</td>
<td>Increase in demand for soft skills required for personal excellence to adapt to the pace of change in the sector</td>
</tr>
<tr>
<td>Cargo handling and administration</td>
<td>Data skills</td>
<td>Business performance enhancement</td>
<td>Interpersonal and influencing skills</td>
</tr>
<tr>
<td>- Cargo Issuance and Dispatch</td>
<td>▲ Big Data Analytics</td>
<td>▲ Business Advisory</td>
<td></td>
</tr>
<tr>
<td>- Cargo Lifting</td>
<td>▲ Data Interpretation and Analysis</td>
<td>▲ Business Process Re-engineering</td>
<td></td>
</tr>
<tr>
<td>- Cargo Receipt and Inspection</td>
<td>▲ Data Storytelling and Visualisation</td>
<td>▲ Knowledge Management</td>
<td></td>
</tr>
<tr>
<td>- Container Loading and Unloading Administration</td>
<td>▲ Data Strategy</td>
<td>▲ Systems Thinking</td>
<td></td>
</tr>
<tr>
<td>- Livestock Cargo Administration</td>
<td>I4.0 technology application</td>
<td>Risk, safety and sustainability</td>
<td></td>
</tr>
<tr>
<td>- Freight and Cargo Claim Administration</td>
<td>▲ Artificial Intelligence Application</td>
<td>▲ Sustainability Management</td>
<td></td>
</tr>
<tr>
<td>- Import and Export Documentation Administration</td>
<td>▲ Augmented Reality Application</td>
<td>▲ Workplace Safety and Health Audit System Management</td>
<td></td>
</tr>
<tr>
<td>- Transportation Route and Schedule Planning</td>
<td>▲ Internet of Things Application</td>
<td>Stakeholder and customer management</td>
<td></td>
</tr>
<tr>
<td>- Order processing and scheduling</td>
<td>Software development</td>
<td>▲ Customer Behaviour Analysis</td>
<td></td>
</tr>
<tr>
<td>- Order Fulfilment Administration</td>
<td>▲ Applications Development</td>
<td>▲ Social Media Management</td>
<td></td>
</tr>
<tr>
<td>- Transportation Route and Schedule Planning</td>
<td>▲ User Experience Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Warehousing and housekeeping</td>
<td>Automation design and management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Warehouse Administration</td>
<td>▲ Automation Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Warehouse Maintenance and Housekeeping</td>
<td>▲ Robotic &amp; Automation System Maintenance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Technology Troubleshooting</td>
<td>Technology risk management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Cyber Risk Management</td>
<td>▲ Threat Intelligence and Detection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Technology usage and integration</td>
<td>Technology usage and integration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Advanced Digital Acumen</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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.
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**

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level</th>
<th>Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform loading, unloading, moving, arranging of warehouse cargo</td>
<td>H</td>
<td>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.</td>
</tr>
<tr>
<td>Perform container stuffing / unstuffing, cargo and material handling</td>
<td>H</td>
<td>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.</td>
</tr>
<tr>
<td>Assist in quality improvement activities</td>
<td>H</td>
<td>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.</td>
</tr>
<tr>
<td>Highlight safety and health risks, report incidents</td>
<td>M</td>
<td>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.</td>
</tr>
</tbody>
</table>

**Impact assessment...**

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

**Technology solutions impacting this job...**

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

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

**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 4.0 Maintenance Specialist/ASRS Operator/ Drone Operator/AGV Operator/Automation Technician or converge with Coordinator role.

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

**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
- Robotics 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
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.

**Talent management strategies**

- **Talent Development**
  - Establish STRATEGIC PARTNERSHIPS
  - Use INNOVATIVE and scientific approaches to recruitment
  - Identify and tap into NON-TRADITIONAL demographics
  - Leverage the GIG ECONOMY

- **Talent Recruitment**

- **Talent Retention**
  - REDESIGN job roles to create a future-ready workforce
  - REDEPLOY staff to other job roles or RELOCATE staff
  - Invest in CULTURE and CHANGE MANAGEMENT

**Deploy strategies to safeguard employability and future-readiness of staff.**

- Invest in building the RIGHT SKILLS for the future
- Leverage the WHOLE ECOSYSTEM of interventions and trainings
- Use a HYBRID APPROACH for holistic talent development

**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
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 these 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

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)

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

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

- Knowledge sharing
- Coaching and mentoring

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
Best practices in talent development | Guidelines for skills development

<table>
<thead>
<tr>
<th>Which type of skills should logistics companies prioritise for learning and development programmes?</th>
</tr>
</thead>
</table>
| **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
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 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.

- 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
- **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
## Best practices in talent retention | Guidelines for job redesign

<table>
<thead>
<tr>
<th>Step 1: Needs Analysis</th>
<th>Step 2: Job Analysis &amp; Redesign</th>
<th>Step 3: Transition Planning &amp; Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess impact of I4.0 adoption on job roles</td>
<td>Analyse and prioritise job roles for redesign</td>
<td>Plan and implement job redesign interventions</td>
</tr>
<tr>
<td>Understand strategic business goals, I4.0 adoption plans and subsequent impact on job roles</td>
<td>Select job redesign methods or external interventions</td>
<td>Assess post-implementation effectiveness</td>
</tr>
</tbody>
</table>

- 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)

- 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

- 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)

- 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)

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

**NON-TECHNOLOGY**

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

- Uncoupling
  - Separating tasks into two job roles at the same level.

- Unstacking
  - Separating tasks into two job roles at different levels.

- Segmenting
  - Combining portions of other job roles into new job roles.

- Emergent
  - Merging of tasks that had not been previously performed or that had been outsourced into new job roles, such as introducing a new role.
Job redesign involves 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 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 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 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.
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 are 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
Best practices in talent recruitment

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 exercises.

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’. 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.

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1 Source: JobDoh
2 Source: Ministry of Manpower Labour Force in Singapore 2018 report
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

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**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.

<table>
<thead>
<tr>
<th>Warehouse Management &amp; Operations</th>
<th>Transportation Management &amp; Operations</th>
<th>Freight Forwarding &amp; Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sector exposure: Low</td>
<td>• Sector exposure: Low</td>
<td>• Sector exposure: High</td>
</tr>
<tr>
<td>• Functional experience: Low for non-PME roles; Medium for PME roles</td>
<td>• Functional experience: Low for non-PME roles; Medium for PME roles</td>
<td>• Functional experience: High</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales And Customer Service</th>
<th>Logistics Solutioning &amp; Programme Management</th>
<th>Logistics Process Improvement &amp; Information System</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sector exposure: Low</td>
<td>Sector exposure: High</td>
<td>Sector exposure: Medium for process improvement; Low for data and IT roles</td>
</tr>
<tr>
<td>• Functional experience: Low for order fulfilment and sales; Medium for business development and service quality analysis roles</td>
<td>Functional experience: High</td>
<td>• Functional experience: High</td>
</tr>
</tbody>
</table>

¹ Source: MOM Data Lab and insights from sector experts
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
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?
Safeguarding employment & employability of logistics workers

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.

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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?

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

Job redesign will define new and evolved roles and tasks for the workers to be able to use technology in their day-to-day work while focusing on more value-adding tasks. The current logistics workers will need to be re-trained, re-deployed or re-located to safeguard their employment and employability.

• UPSKILLING/RESKILLING: to equip workers with new and evolved skills required to perform the future job roles they take on
• REDEPLOYMENT: to new or redesigned job roles within the sector, or jobs in similar functions in other sectors
• RELOCATION: to different locations or work sites as a temporary strategy to retain the displaced workers
Safeguarding employment & employability of workers in roles that will undergo displacement or be redesigned

**Today**
- Warehouse Supervisor/Inventory/Quality Control Supervisor
- Warehouse Storekeeper; Inventory/Logistics Coordinator
- MHE/Forklift Operator; Warehouse/Inventory Assistant

**Future**
- Warehouse/Inventory/Quality Control Supervisor
- Warehouse/Inventory/Quality Control Supervisor
- AS/RS; Smart Inventory counting; Robotic sorting
- I4.0 Maintenance Specialist/ASRS Operator/Drone Operator/AGV Operator/Automation Technician

**Redeployment opportunities within the logistics sector**

<table>
<thead>
<tr>
<th>Mobility to newly created job role</th>
<th>Vertical mobility within the same function</th>
<th>Horizontal/diagonal mobility to different job function (top 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHE/Forklift Operator; Warehouse/Inventory Assistant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warehouse Storekeeper; Inventory/Logistics Coordinator</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Redeployment opportunities outside the logistics sector**

- Project Supervisor
- Rigger / Signalman / Lifting Supervisor
- Dispatch Operator / Transport Operator / Last Mile Delivery Driver / Container Driver

**Legend:**
- Undergo displacement
- Require redesign
- Replacement role / technology
- Converged role

**Dashboard 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 redesign and upskilling/reskilling will prepare workers to take on the future job roles**
Safeguarding employment & employability of workers in roles that will undergo displacement or be redesigned

**Transportation Management and Operations**

**Dashboards for future view of job roles:**
- Traffic/Dispatch Coordinator
- Depot/Traffic/Dispatch/Hub Operations Supervisor

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

**Dynamic route optimisation; Predictive and Prescriptive Fleet Management**

**Legend:**
- Undergo displacement
- Require redesign
- Replacement role/technology
- Converged role

**Job roles that will undergo displacement**
- **Traffic/Dispatch Coordinator**
  - Depot Supervisor / Traffic Supervisor / Dispatch Supervisor / Hub Operations Supervisor + Traffic/Dispatch Coordinator
  - Traffic Controller / Transport Officer / Line Haul Operations Officer

**Redeployment opportunities within the logistics sector**
- Vertical mobility within the same function
- Horizontal/diagonal mobility to different job function (top 3)
- Warehouse Supervisor / Inventory Control Supervisor / Quality Control Supervisor
- Health, Safety and Environmental Coordinator
- Project Supervisor

**Redeployment opportunities outside the logistics sector**
- 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

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

**Future**
- Brokerage/ Freight Supervisor + Permit/ Shipping/ Custom Clearance Coordinator

**Legend:**
- Undergo displacement
- Require redesign
- Replacement role / technology
- Converged role

**Redeployment opportunities within the logistics sector**
- Vertical mobility within the same function
- Horizontal/diagonal mobility to different job function (top 3)

**Job roles that will undergo displacement**

<table>
<thead>
<tr>
<th>Role</th>
<th>Redeployment opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import Export Administrative/ Shipping Assistant</td>
<td><strong>Brokerage Supervisor/ Freight Supervisor + Permit/ Shipping/ Custom Clearance Coordinator</strong>&lt;br&gt;<strong>Freight Officer</strong>&lt;br&gt;** Incoming Quality Coordinator/ Tally Assistant**</td>
</tr>
<tr>
<td>Permit/ Shipping/ Custom Clearance Coordinator</td>
<td><strong>Brokerage Supervisor/ Freight Supervisor + Permit/ Shipping/ Custom Clearance Coordinator</strong>&lt;br&gt;** Freight officer**&lt;br&gt;<strong>Incoming Quality Coordinator/ Tally Assistant</strong>&lt;br&gt;** Freight Inspector/ Incoming Quality Inspector**</td>
</tr>
</tbody>
</table>

**Redeployment opportunities outside the logistics sector**

- Mobility to similar job functions or job roles requiring similar skills in other sectors

**Dashboards for future view of job roles:**
- Import Export Administrative/ Shipping Assistant
- Permit/ Shipping/ Custom Clearance Coordinator
- Brokerage/ Freight Supervisor

**JOB REDESIGN and UPSKILLING/RESKILLING will prepare workers to take on the future job roles**
Safeguarding employment & employability of workers in roles that will undergo displacement or be redesigned

**TODAY**

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

**FUTURE**

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

**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

---

**Legend:**
- Undergo displacement
- Require redesign
- Replacement role / technology
- Converged role

---

**Redeployment opportunities within the logistics sector**

<table>
<thead>
<tr>
<th>Job roles that will undergo displacement</th>
<th>Vertical mobility within the same function</th>
<th>Horizontal/diagonal mobility to different job function (top 3)</th>
<th>Redeployment opportunities outside the logistics sector</th>
</tr>
</thead>
</table>
| Order Fulfilment/ Sales Operations Management/ Customer Service Assistant | • Order Management Executive/ Quote Desk Executive/ Order Fulfilment Officer/ Inside Sales Officer + Coordinator  
  • Field Sales Executive/ Key Account Executive/ Sales Operations Management Specialist | • Freight Officer  
  • Brokerage Supervisor/ Freight Supervisor  
  • Customer Service Officer/ Service Quality Analyst | • Mobility to similar job functions or job roles requiring similar skills in other sectors |
| Order Fulfilment/ Sales Operations Management/ Customer Service Coordinator | • Order Management Executive/ Quote Desk Executive/ Order Fulfilment Officer/ Inside Sales Officer + Coordinator  
  • Field Sales Executive/ Key Account Executive/ Sales Operations Management Specialist | • 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
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).

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

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

Source: Executive Interview with Thomas Chee, Allied Container
‘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.

**Initiative-taking, adaptability and continuous learning are key determinants of future success and longevity of workers in their occupations. This calls for a mindset shift amongst workers to cope with the realities of shifting skills needs.**

For older workers in the logistics sector, while these are essential attributes, their change readiness is influenced by strategies put in place by companies and other ecosystem stakeholders to enable their growth.

**EMPLOYEE INITIATED JOURNEY**

**COMPANY STRATEGIES**

**ECOSYSTEM INTERVENTIONS**

**Upskilling and Reskilling**
- Structured programmes and train-the-trainer approaches for building I4.0 skills
- Knowledge transfer sessions for exchange of knowledge, skills and experience between older and younger workers
- Assignment of a younger buddy to aid older workers in navigating technology

**Flexible Work Arrangements**
- Opportunities for contract work, consulting assignments and other temporary work arrangements
- Opportunities for part-time employment
- Opportunities for flexible hours and time-off
- Enhanced redeployment and re-employment support

**Conducive Workspaces**
- Ergonomically designed work spaces and environments to reduce health and safety risks
- Use of collaborative/assistance robots to overcome physical or fitness related barriers
- Personalised strategies to provide attractive working conditions and facilities to older workers

- Ecosystem interventions and grants may be tailored to the specific needs of older workers. A closer analysis of older worker needs and best practices across sectors will be useful going forward
- Upskilling and reskilling interventions and trainings may be planned to ensure early intervention for driving longevity of older workers in sector
- Ecosystem stakeholders may play an enhanced, advisory role to educate employers on the above company strategies, as well as educate older workers to drive a mindset shift and change-readiness
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 programmes. 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.

- **Government agencies** that support and develop the logistics sector
- **Institutes of higher learning** that provide training programmes
- **Private education providers** that provide training programmes
- **Trade associations and chambers (TACs) and SME Centres** that drive excellence and growth in the sector
- **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.

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

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

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1 For full list of ecosystem stakeholders, see Appendix VI: Ecosystem stakeholders.
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 below:\(^1\):

<table>
<thead>
<tr>
<th>Packaged Transformative</th>
<th>Manpower Upskilling</th>
<th>Recruitment and Career Support</th>
</tr>
</thead>
</table>
| 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:  
  • Technology-centric interventions supporting digital innovation  
  • Manpower-centric interventions supporting people capability building  
  • Market-centric interventions supporting companies to penetrate foreign markets | 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:  
  • 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 | 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:  
  • **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 |

\(^1\) Source: Government websites, validated by government agencies
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 below:

<table>
<thead>
<tr>
<th>Package: Transformative</th>
<th>Manpower Upskilling</th>
<th>Recruitment and Career Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training Grant for Company (EDB)</td>
<td>SkillsFuture for Digital Workplace (SSG)</td>
<td>Tech@SG (EDB)</td>
</tr>
<tr>
<td>ASEAN LEADERSHIP Programme (APL) (ESG)</td>
<td>SkillsFuture Credit (SSG)</td>
<td>Global Ready Talent (GRT) (ESG)</td>
</tr>
<tr>
<td>Business China Advanced Leadership Programme (BCALP) (ESG)</td>
<td>SkillsFuture Enterprise Credit (SSG)</td>
<td>Singapore Govt-Industry Scholarship (SGis)</td>
</tr>
<tr>
<td>Overseas Market Workshop (OMW) (ESG)</td>
<td>SkillsFuture Series (SSG)</td>
<td>Wage Credit Scheme (IRAS)</td>
</tr>
<tr>
<td>Study Awards for International Business (ESG)</td>
<td>Work Study Programmes/ Certificate (SSG)</td>
<td>Senior Worker Support Package (MOM)</td>
</tr>
<tr>
<td>Company Led Training (IMDA)</td>
<td>National Centre of Excellence for Workplace Learning (NACE) (SSG / NYP)</td>
<td>Additional SkillsFuture Credit Mid-Career Support (SSG)</td>
</tr>
<tr>
<td>Critical Information Technology Resource Programme Plus (IMDA)</td>
<td>GO Programmes (SSG / RP)</td>
<td>Mid Career Support Package (SSG)</td>
</tr>
<tr>
<td>Tech Immersion &amp; Placement (IMDA)</td>
<td>Enhanced Training Support for SMEs (SSG / WSG)</td>
<td>Mid Career Enhanced Subsidy (SSG)</td>
</tr>
<tr>
<td>Advanced Executive Programme in Supply Chain Innovation (SSG)</td>
<td>Workforce Training Support (WTS) Scheme for Employers (SSG / WSG)</td>
<td>Work-Study Certificate (SSG)</td>
</tr>
<tr>
<td>Advanced Manufacturing Lead Programme (SSG)</td>
<td>Career Trial (WSG)</td>
<td>Work-Study Programmes (SSG)</td>
</tr>
<tr>
<td>Internationalisation Skills (iSkills) Talent Development Programme (SSG)</td>
<td>Career Support Programme (WGS)</td>
<td>Career Support Programme (WSG)</td>
</tr>
<tr>
<td>Mid-Career Enhanced Subsidy (SSG)</td>
<td>Capability Transfer Programme (WGS)</td>
<td>Career Trial (WGS)</td>
</tr>
<tr>
<td>Operations Management Innovation Programme (OMNI) (SSG)</td>
<td>P-Max Programme (WGS)</td>
<td>Hiring Incentive (WGS)</td>
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<tr>
<td></td>
<td>Place-and-Train (PnT) Programme (WGS)</td>
<td>P-Max Programme (WGS)</td>
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<tr>
<td></td>
<td>Professional Conversion Programme (WGS)</td>
<td>Professional Conversion Programme (WGS)</td>
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<tr>
<td></td>
<td>Redeployment Professional Conversion Programme and Redeployment Programme (WGS)</td>
<td>SGL United Traineeships Programme for Trainees (WGS)</td>
</tr>
</tbody>
</table>

1 Source: Government websites, validated by government agencies
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.

<table>
<thead>
<tr>
<th>Functional Tracks</th>
<th>463 full-time training programmes</th>
<th>1007 part-time training programmes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warehouse Management and Operations</td>
<td>96</td>
<td>313</td>
<td>409</td>
</tr>
<tr>
<td>Transportation Management and Operations</td>
<td>105</td>
<td>403</td>
<td>508</td>
</tr>
<tr>
<td>Freight Forwarding and Operations</td>
<td>79</td>
<td>149</td>
<td>228</td>
</tr>
<tr>
<td>Sales and Customer Service</td>
<td>80</td>
<td>14</td>
<td>94</td>
</tr>
<tr>
<td>Logistics Solutioning and Programme Management</td>
<td>66</td>
<td>113</td>
<td>179</td>
</tr>
<tr>
<td>Logistics Process Improvement and Information System</td>
<td>37</td>
<td>15</td>
<td>52</td>
</tr>
</tbody>
</table>

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

**DIGITAL NOVICE**

- **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

**DIGITAL PLAYER**

- **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

**DIGITAL LEADER**

- **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**

| 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 |
| **4.0 job roles:** | Outsourced or contract hires, if any; high dependence on technology vendors for future focus activities |

**DIGITAL PLAYER**

| Scale of impact: | Differing impact on job roles across different functions, depending on type of 4.0 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 4.0 skills e.g. technology application, automation management, data analytics, robotics, software and hardware skills |
| **4.0 job roles:** | In-house 4.0 personnel to support solution development, customisation, and maintenance; high collaboration with external vendors |

**DIGITAL LEADER**

| Scale of impact: | Organisation-wide impact on job roles on account of large scale 4.0 transformations; huge potential for reduction in headcount with advanced 4.0 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 |
| **4.0 job roles:** | 4.0 talent embedded within operations teams to drive synergies in technology solutions and operations |

**STEP 2: ASSESS IMPACT ON JOB ROLES AND SKILLS**

**STEP 3: DEVISE TALENT MANAGEMENT STRATEGIES**

| Drive a mindset shift, among leaders as well as the mass employee population, to kick-start 4.0 adoption |
| Upskill employees on digital leadership and technology-savviness |
| 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 4.0 job roles |
| Culture and change management |

**STEP 4: GARNER ECOSYSTEM SUPPORT**

| Interventions to support 4.0 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 4.0 journey e.g. Company-Led Training Programme (IMDA) |
| 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. |
| 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.

### Step 1:
**Embark on Digital Transformation**

### Step 2:
**Assess Impact on Job Roles and Skills**

### Step 3:
**Devise Talent Management Strategies**

### Step 4:
**Garner Ecosystem Support**

**Legend:**
- **Digital Novice**
- **Digital Player**
- **Digital Leader**

*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
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.

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

<table>
<thead>
<tr>
<th>Job Functions</th>
<th>WAREHOUSE MANAGEMENT AND OPERATIONS</th>
<th>TRANSPORTATION MANAGEMENT AND OPERATIONS</th>
<th>FREIGHT FORWARDING AND OPERATIONS</th>
<th>SALES AND CUSTOMER SERVICE</th>
<th>LOGISTICS SOLUTIONING AND PROGRAMME MANAGEMENT</th>
<th>LOGISTICS PROCESS IMPROVEMENT AND INFORMATION SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOB ROLES</td>
<td>WAREHOUSE OPERATIONS</td>
<td>PROJECT MANAGEMENT</td>
<td>TRANSPORT OPERATIONS</td>
<td>FREIGHT INSPECTION &amp; OPERATIONS</td>
<td>ORDER FULFILMENT / SALES / BD</td>
<td>CONTRACT LOGISTICS</td>
</tr>
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<td></td>
<td>Health, Safety and Environment</td>
<td>Project Manager; Senior Project Engineer; Project Executive; Project Engineer; Project Supervisor;</td>
<td>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;</td>
<td>Import Export Manager / Freight Allocation Manager / Freight Shipping Manager / Freight Documentation Manager / Freight Pricing Manager;</td>
<td>Business Development Director / Country Route Development Director / Trade Lane Director / Freight Trade Director;</td>
<td>Logistics Solutions Manager; Logistics Solutions Specialist / Logistics Solutions Engineer; Logistics Solutions Analyst; Logistics Solutions Manager; Logistics Solutions Specialist / Logistics Solutions Engineer; Logistics Solutions Analyst; Logistics Solutions Manager; Logistics Solutions Specialist / Logistics Solutions Engineer; Logistics Solutions Analyst; Logistics Solutions Manager; Logistics Solutions Specialist / Logistics Solutions Engineer; Logistics Solutions Analyst; Logistics Solutions Manager; Logistics Solutions Specialist / Logistics Solutions Engineer; Logistics Solutions Analyst;</td>
</tr>
<tr>
<td></td>
<td>Warehouse Operations Executive / Inventory Management Executive / Warehouse Assistant Manager; Warehouse Operations Supervisor / Inventory Control Supervisor / Quality Control Supervisor; Warehouse Officer / Inventory Control / Quality Control Officer / Warehouse Facilities Management Officer;</td>
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<td></td>
<td>Warehouse Stacker / Inventory Coordinator / Logistics Coordinator; MHE Operator / Forklift Operator / Warehouse Assistant / Inventory Assistant;</td>
<td>Lifting Supervisor; Traffic Coordinator / Dispatch Coordinator; Rigger / Signalman; Dispatch Operator / Transport Operator / Delivery / Container Driver;</td>
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<tr>
<td></td>
<td>Warehouse Stacker / Inventory Coordinator / Logistics Coordinator;</td>
<td>Incoming Quality Coordinator / Tally Assistant; Permit Coordinator / Shipping Coordinator / Custom Clearance Coordinator;</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Order Fulfiffment Coordinator / Sales Operations Management Coordinator / Customer Service Coordinator;</td>
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</table>
As a first step, we defined the I4.0 technology stack in the form of 13 unique technology solutions prominently used by logistics companies. These 13 technology solutions formed the basis for subsequent impact analysis. The technology stack was defined based on comprehensive desktop research and EY thought leadership, and further refined based on inputs from sector practitioners and subject-matter experts.

To assess the impact of I4.0 adoption on job roles, we utilised qualitative and quantitative techniques to identify:
- Job roles at risk of displacement and future view of job tasks
- Future skills required to perform the evolving job roles
- Emerging industry 4.0 job roles in demand
- Talent strategies to respond to the changing talent needs
- Mobility of job roles from logistics to other sectors

As a final step, insights generated through the job impact analysis culminated into a comprehensive analysis of the capability building ecosystem in Singapore. This entailed a stocktaking of existing interventions, grants and trainings, gap analysis and recommendations to strengthen the ecosystem so as to prepare individuals and companies for I4.0 adoption in the future.

**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.

### 1. TECHNOLOGY SCOPING

- **As a first step**, we defined the I4.0 technology stack in the form of 13 unique technology solutions prominently used by logistics companies. These 13 technology solutions formed the basis for subsequent impact analysis. The technology stack was defined based on comprehensive desktop research and EY thought leadership, and further refined based on inputs from sector practitioners and subject-matter experts.

### 2. JOB IMPACT ANALYSIS

- **To assess the impact of I4.0 adoption on job roles**, we utilised qualitative and quantitative techniques to identify:
  - Job roles at risk of displacement and future view of job tasks
  - Future skills required to perform the evolving job roles
  - Emerging industry 4.0 job roles in demand
  - Talent strategies to respond to the changing talent needs
  - Mobility of job roles from logistics to other sectors

### 3. ECOSYSTEM ANALYSIS

- **As a final step**, insights generated through the job impact analysis culminated into a comprehensive analysis of the capability building ecosystem in Singapore. This entailed a stocktaking of existing interventions, grants and trainings, gap analysis and recommendations to strengthen the ecosystem so as to prepare individuals and companies for I4.0 adoption in the future.

**RESEARCH TECHNIQUES**

#### EY THOUGHT LEADERSHIP AND DESKTOP RESEARCH

- EY global thought leadership
- Academic publications
- Research papers

#### INSIGHTS FROM INDUSTRY EXPERTS

- Executive interviews
- Focus group discussions
- Company survey
- Subject-matter-expert advice

#### DATA MINING FROM LOCAL AND GLOBAL ONLINE JOB POSTINGS

- Web crawling and data mining for jobs, skills and hiring trends from local and global online job postings

#### MISCELLANEOUS DATA SOURCES

- Government agency websites
- Skills frameworks for adjacent sectors

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For detailed reference sources, see Appendix VII: References.
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 RESEARCH**

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.

For detailed reference sources, see Appendix VII: References
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 Skills
- 26 Industry 4.0 Skills
- 27 Business Skills
- 10 Foundational Skills

1Technical Skills were referenced from the Skills Framework for Logistics

For detailed list of skills and definitions, see Appendix IV: Skills library

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

I4.0 TECHNOLOGY SOLUTIONS
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**
- Warehouse Operations
- Contract Logistics
- Data Management
- Process Improvement
- Health, Safety & Environment
- Solutions Design
- IT Solutions / Systems

**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.

Source: Executive interviews, focus group discussions, survey and EY analysis.

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Source: Executive interviews, focus group discussions, survey and EY analysis.
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
- Warehouse Operations
- Contract Logistics
- Data Management
- Process Improvement
- Health, Safety & Environment
- Solutions Design
- IT Solutions / Systems

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.

Source: Executive interviews, focus group discussions, survey and EY analysis.
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

- Warehouse Operations
- Contract Logistics
- Data Management
- Process Improvement
- Health, Safety & Environment
- Solutions Design
- IT Solutions / Systems
- Solutions Design

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.

Source: Executive interviews, focus group discussions, survey and EY analysis.
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

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### KEY JOB FUNCTIONS IMPACTED

- Warehouse Operations
- Contract Logistics
- Health, Safety & Environment
- Solutions Design
- Data Management
- Process Improvement
- IT Solutions / Systems

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### 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.

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Source: Executive interviews, focus group discussions, survey and EY analysis.
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.

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

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

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.

Adoption Timeline: Between 3-5 years

Source: Executive interviews, focus group discussions, survey and EY analysis.
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
Process Improvement
Transportation Project Management
Solutions Design
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.

Source: Executive interviews, focus group discussions, survey and EY analysis.
I4.0 technology solutions stack

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

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.

Source: Executive interviews, focus group discussions, survey and EY analysis.
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

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

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.

Source: Executive interviews, focus group discussions, survey and EY analysis.
4.0 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
- Freight Forwarding Operations
- Contract Logistics
- Solutions Design
- Data Management
- Process Improvement
- IT Solutions / Systems

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 shippers 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

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 compared 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.

KEY JOB FUNCTIONS IMPACTED

- Freight Forwarding Operations
- Contract Logistics
- Solutions Design
- Data Management
- Process Improvement
- IT Solutions / Systems

Source: Executive interviews, focus group discussions, survey and EY analysis.
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
- Order Fulfilment / Sales / Business Development
- Contract Logistics
- Data Management
- Process Improvement
- Service Quality Analysis
- Solutions Design
- IT Solutions / Systems

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.

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

- Order Fulfilment / Sales / Business Development
- Contract Logistics
- Data Management
- Process Improvement
- IT Solutions / Systems
- Service Quality Analysis
- Solutions Design

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.

Adoption Timeline: Within 2 years

Source: Executive interviews, focus group discussions, survey and EY analysis.
I4.0 technology solutions stack

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

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.

Adoption Timeline: Between 3-5 years

Source: Executive interviews, focus group discussions, survey and EY analysis.
Appendix II

NEW I4.0 JOB ROLES
Contents

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.

\(^1\) Source: JobTech data on global and local online job postings between January 2019 and February 2020
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 postings¹ 5
Number of global job postings¹ 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.

¹ Source: JobTech data on global and local online job postings between January 2019 and February 2020
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)

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.

---

1 Source: JobTech data on global and local online job postings between January 2019 and February 2020
Industry 4.0 job roles in demand
Software development job roles

**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)

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.

---

1. Source: JobTech data on global and local online job postings between January 2019 and February 2020
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
- Hualio
- Parcel Santa

*(The above list is not exhaustive)*

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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.

---

1 Source: JobTech data on global and local online job postings between January 2019 and February 2020
Industry 4.0 job roles in demand

Software development job roles

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

(The above list is not exhaustive)

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.

Number of local job postings\(^1\) 18
Number of global job postings\(^1\) 31

\(^1\) Source: JobTech data on global and local online job postings between January 2019 and February 2020
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

(Number of local job postings1 9
Number of global job postings1 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.

1 Source: JobTech data on global and local online job postings between January 2019 and February 2020
Industry 4.0 job roles in demand

Software development job roles

**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
- Hualio
- DHL
- Lazada

*(The above list is not exhaustive)*

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**

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

(The above list is not exhaustive)

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

**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)*

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.

---

(Number of local job postings = 3)
(Number of global job postings = 2)

*Source: JobTech data on global and local online job postings between January 2019 and February 2020*
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, Automic, 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
- DHL
- DB Schenker
- Ninja Logistics
- Lazada
- ST Logistics

(The above list is not exhaustive)

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.

---

1 Source: JobTech data on global and local online job postings between January 2019 and February 2020
Industry 4.0 job roles in demand
Digitalisation and automation job roles

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

(The above list is not exhaustive)

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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.

---

1. Source: JobTech data on global and local online job postings between January 2019 and February 2020
Job Dashboards for

Warehouse Management and Operations

Impact assessment

Within 3 - 5 years

WAREHOUSE OPERATIONS

- Warehouse Operations Manager/Inventory Management Manager/Capacity Management Manager
- Warehouse Operations Executive/Inventory Management Executive/Warehouse Assistant Manager
- Warehouse/Inventory Control/Quality Control/Logistics Supervisor
- Warehouse Storekeeper/Inventory Coordinator/Logistics Coordinator
- MHE Operator/Forklift Operator/Warehouse Assistant/Inventory Assistant

HSE

- HSE Manager
- HSE Officer
- Health, Safety, Environment (HSE) Coordinator

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
## Technology solutions impacting this job...

<table>
<thead>
<tr>
<th>Technology Solution</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Inventory Counting</td>
<td>HIGH degree of change in tasks</td>
</tr>
<tr>
<td>Intelligent Robotic Sorting</td>
<td></td>
</tr>
<tr>
<td>Automated Storage and Retrieval Systems (AS/RS)</td>
<td>A significant proportion of the job tasks will be substituted by technology solutions, thus minimising or eliminating the need for human intervention</td>
</tr>
<tr>
<td>Predictive &amp; Prescriptive Maintenance</td>
<td></td>
</tr>
</tbody>
</table>

### Impact assessment...

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

**UNDERGO DISPLACEMENT**

### Emerging skills

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

### Mobility options for displaced workers

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

---

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

**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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform loading, unloading, moving, arranging of warehouse cargo</td>
<td>Tasks for stacking, moving and arranging of items on pallets will be automated through use of AGVs, AS/RS &amp; 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.</td>
</tr>
<tr>
<td>Perform container stuffing / unstuffing, cargo and material handling</td>
<td>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.</td>
</tr>
<tr>
<td>Assist in quality improvement activities</td>
<td>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.</td>
</tr>
<tr>
<td>Highlight safety and health risks, report incidents</td>
<td>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.</td>
</tr>
</tbody>
</table>

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.**
Technology solutions impacting this job...

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

Impact assessment...

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.

### Job tasks today

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinate stock checks, arrangement and rotation of warehouse cargo</td>
<td>• 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.</td>
</tr>
<tr>
<td>Coordinate cargo handling schedules, monitor special needs cargo</td>
<td>• 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.</td>
</tr>
<tr>
<td>Perform documentation and quality improvement</td>
<td>• 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 shortfalls and quality issues.</td>
</tr>
<tr>
<td>Support safety and health risk assessments</td>
<td>• 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.</td>
</tr>
</tbody>
</table>

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.

Emerging skills

- 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

Mobility options for displaced workers

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

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
</table>
| Monitor warehouse and inventory operations | • 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 | • 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 | • 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 | • 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. |

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

**REQUIRE REDESIGN**

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

Emerging skills

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
- Automated Storage and Retrieval Systems (AS/RS)
- Intelligent Robotic Sorting
- 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.

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
</table>
| Execute warehouse storage and layout plans | M
  - 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
  - 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
  - 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
  - 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. |

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

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.

Emerging skills
- Advanced Digital Acumen
- Data Interpretation and Analysis
- Technology Application
- Threat Intelligence and Detection
- Business Advisory
- Systems Thinking
- Complex Problem Solving
- Decision Making
Technology solutions impacting this job...

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

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.

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.

Job tasks today | Impact at task-level / Future view of job tasks
--- | ---
Develop warehousing and inventory management plans | M
Manage cargo operations including documentation | M
Analyse process improvements and associated risks | L
Review WSH report to manage solutioning | M

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

**REQUIRE REDESIGN**

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.

Emerging skills

- 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

In the next 3 – 5 years...

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

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategise warehousing and inventory operations</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Review cargo operations and performance</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Manage business process improvement solutions</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Drive WSH activities to ensure compliance</td>
<td>L • 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.</td>
</tr>
</tbody>
</table>

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.

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

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

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...**

<table>
<thead>
<tr>
<th>Solution</th>
<th>Impact assessment...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Inventory Counting</td>
<td></td>
</tr>
<tr>
<td>Automated Storage and Retrieval Systems (AS/RS)</td>
<td></td>
</tr>
<tr>
<td>Intelligent Robotic Sorting</td>
<td></td>
</tr>
<tr>
<td>Predictive &amp; Prescriptive Maintenance</td>
<td></td>
</tr>
</tbody>
</table>

**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.

**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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess HSE risks, highlight incidents, generate reports</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Perform sustainability activities, monitor environmental impact</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Perform quality and compliance checks</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Communicate with stakeholders, plan resource allocation</td>
<td>L • 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.</td>
</tr>
</tbody>
</table>

**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.

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

**REQUIRE REDESIGN**

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
Health, Safety and Environmental (HSE) Officer

Technology solutions impacting this job...

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

Impact assessment...

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.

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

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
</table>
| Propose solutions to improve HSE processes | L  
  • 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  
  • 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  
  • 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  
  • 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. |

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

**CHANGE INCREMENTALLY**

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

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

**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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
</table>
| Set company HSE strategy and manage compliance | • 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 | • 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 | • 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 | • 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.

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

**CHANGE INCREMENTALLY**

**Emerging skills**

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

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 Dashboards for
Transportation Management and Operations

Impact assessment
Within 3 - 5 years

Legend:
- High degree of change in tasks: Undergo displacement
- Medium degree of change in tasks: Require redesign
- Low degree of change in tasks: Change incrementally

PROJECT MANAGEMENT
- Project Manager
- Senior Project Engineer
- Project Executive
- Project Engineer
- Project Supervisor
- Lifting Supervisor
- Rigger/Signalmann

TRANSPORT OPERATIONS
- 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
- Traffic Coordinator/Dispatch Coordinator
- Dispatch/Transport Operator
- Delivery/Container Driver

Job functions within this functional track
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.

### 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**

### Job tasks today

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set-up, operate and maintain rigging and lifting equipment</td>
<td>M</td>
</tr>
<tr>
<td>Prepare cargo for transfer operations</td>
<td>M</td>
</tr>
<tr>
<td>Perform equipment quality checks &amp; sustainability support</td>
<td>M</td>
</tr>
<tr>
<td>Highlight safety and health risks, report incidents</td>
<td>M</td>
</tr>
</tbody>
</table>

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.

### 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
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.

### Job tasks today

<table>
<thead>
<tr>
<th>Task</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
</table>
| Troubleshoot equipment, determine maintenance needs                  | • 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                      | • 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            | • 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                            | • 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. |

### 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**

With the focus shifting to supervising, troubleshooting and maintaining advanced technology solutions with inputs form 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
**Project Engineer**

**Technology solutions impacting this job...**

- **Predictive & Prescriptive Fleet Management**
- **Dynamic Route Optimisation**
- **Autonomous Last Mile Delivery**
- **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.

**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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
</table>
| Coordinate with stakeholders, estimate resources for project activities | M  
  - 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  
  - 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  
  - 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  
  - 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...**

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.**

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

**CHANGE INCREMENTALLY**

**Emerging skills**

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

### Job tasks today

<table>
<thead>
<tr>
<th>Job task</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
</table>
| Coordinate resolution of breakdowns to minimise downtime               | • 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                       | • 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           | • 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                         | • 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.

**Technology solutions impacting this job...**

- **Predictive & Prescriptive Fleet Management**
- **Dynamic Route Optimisation**
- **Autonomous Last Mile Delivery**
- **Autonomous Last Yard Delivery**

**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

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

**Emerging skills**

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

<table>
<thead>
<tr>
<th>Job tasks today</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Lead delivery of key project outcomes within team or departmental projects</td>
<td>• 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.</td>
</tr>
<tr>
<td>Plan key activities and milestones in technology projects</td>
<td>• 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.</td>
</tr>
<tr>
<td>Review better ways to approach business problems</td>
<td>• 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.</td>
</tr>
<tr>
<td>Analyse WSH reports and suggest solutions to improve WSH processes</td>
<td>• 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.</td>
</tr>
</tbody>
</table>

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

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

**CHANGE INCREMENTALLY**

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

Emerging skills
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.

### Job tasks today

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide administrative support for project management</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Analyse level of technology usage and efficiency</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Define project scope and objectives aligned to business requirements</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Review WSH reports to determine impact on work processes</td>
<td>L • 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.</td>
</tr>
</tbody>
</table>

### 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.

### 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

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

CHANGE INCREMENTALLY
Project Manager

Technology solutions impacting this job...

- Predictive & Prescriptive Fleet Management
- Dynamic Route Optimisation
- Autonomous Last Mile Delivery
- Autonomous Last Yard Delivery

Impact assessment...

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

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop strategic project plans to align projects with business strategies</td>
<td>L</td>
</tr>
<tr>
<td>Drive the successful completion of technology projects</td>
<td>L</td>
</tr>
<tr>
<td>Manage business process improvement solutions</td>
<td>L</td>
</tr>
<tr>
<td>Drive WSH activities to ensure compliance</td>
<td>L</td>
</tr>
</tbody>
</table>

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.

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

CHANGE INCREMENTALLY

Emerging skills

- Artificial Intelligence Application
- Internet of Things Application
- Threat Intelligence and Detection
- Knowledge Management
- Systems Thinking
- Critical Thinking
Dispatch Operator / Transport Operator / Last Mile Delivery Driver / Container Driver

Technology solutions impacting this job...

| Predictive & Prescriptive Fleet Management |
| Dynamic Route Optimisation |
| Autonomous Last Mile Delivery |
| 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 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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
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</thead>
<tbody>
<tr>
<td>Operate transportation vehicles, lifting and rigging equipment</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Perform cargo and material handling and delivery tasks</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Assist in quality improvement activities</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Highlight safety and health risks, report incidents</td>
<td>M • 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.</td>
</tr>
</tbody>
</table>

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

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...

<table>
<thead>
<tr>
<th>Technology Solutions</th>
<th>Impact at task level/Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictive &amp; Prescriptive Fleet Management</td>
<td>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.</td>
</tr>
<tr>
<td>Autonomous Last Mile Delivery</td>
<td>• 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.</td>
</tr>
<tr>
<td>Dynamic Route Optimisation</td>
<td>• 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.</td>
</tr>
<tr>
<td>Autonomous Last Yard Delivery</td>
<td>• 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.</td>
</tr>
</tbody>
</table>

### 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**

#### 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

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.

<table>
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<tr>
<th>Job tasks today</th>
<th>Impact at task-level/Future view of job tasks</th>
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<tbody>
<tr>
<td>Coordinate transportation operation schedules</td>
<td>• 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.</td>
</tr>
<tr>
<td>Track cargo-handling schedules and routes</td>
<td>• 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.</td>
</tr>
<tr>
<td>Perform documentation and quality improvement</td>
<td>• 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.</td>
</tr>
<tr>
<td>Support safety and health risk assessments</td>
<td>• 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.</td>
</tr>
</tbody>
</table>

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.
Depot Supervisor / Traffic Supervisor / Dispatch Supervisor / Hub Operations Supervisor

Technology solutions impacting this job...

- Predictive & Prescriptive Fleet Management
- Dynamic Route Optimisation
- Autonomous Last Mile Delivery
- Autonomous Last Yard Delivery

Impact assessment...

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

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.

Job tasks today | Impact at task-level / Future view of job tasks
--- | ---
Develop and track transportation operation schedules and plans | H  • 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 | H  • Cloud-based trade platforms and blockchain will streamline the sharing of cargo documentation.
Identify continuous improvement opportunities | H  • 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 | M  • 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.

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

REQUIRE REDESIGN

Emerging skills

- 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
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.

### Job tasks today

<table>
<thead>
<tr>
<th>Job tasks today</th>
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<tbody>
<tr>
<td>Review effectiveness of transportation operation schedules and plans</td>
<td>M • 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).</td>
</tr>
<tr>
<td>Plan cargo or material handling activities</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Support continuous improvement; assess situational factors that inhibit change</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Analyse level of technology usage and conduct training</td>
<td>M • 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.</td>
</tr>
</tbody>
</table>

### 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**

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

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
- Autonomous Last Yard Delivery

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 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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Optimise resources and cost of transportation operations</td>
<td>L</td>
</tr>
<tr>
<td>Optimise space, cost and efficiency in cargo handling</td>
<td>M</td>
</tr>
<tr>
<td>Propose environmental protection procedures</td>
<td>L</td>
</tr>
<tr>
<td>Optimise use of technology and other resources</td>
<td>L</td>
</tr>
</tbody>
</table>

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.

Emerging skills

- Advanced Digital Acumen
- Automation Management
- Data Interpretation and Analysis
- Threat Intelligence and Detection
- Business Advisory
- Strategic Service Excellence
- Sustainability Management
- Systems Thinking
- Lateral Thinking
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.

**Job tasks today**

<table>
<thead>
<tr>
<th>Job tasks today</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Strategise transportation and fleet management operations</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Manage complex cargo operations including dangerous goods</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Manage continuous improvement for transportation</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Manage technology application, resources and teams</td>
<td>L • 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.</td>
</tr>
</tbody>
</table>

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

**CHANGE INCREMENTALLY**

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

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
- 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...**

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.

<table>
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</thead>
<tbody>
<tr>
<td>Inspect materials received and cargo acceptance documentation</td>
<td>M  • 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.</td>
</tr>
<tr>
<td>Perform compliance checks and report non-compliances</td>
<td>M  • 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.</td>
</tr>
<tr>
<td>Perform safety and health risk assessments</td>
<td>M  • 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.</td>
</tr>
<tr>
<td>Support resource estimation and allocation</td>
<td>M  • 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.</td>
</tr>
</tbody>
</table>

**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

**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.
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.

**Job tasks today**

<table>
<thead>
<tr>
<th>Task</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead freight quantity, quality and documentation inspection</td>
<td>M  • 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.</td>
</tr>
<tr>
<td>Drive compliance internal audit activities</td>
<td>L  • 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.</td>
</tr>
<tr>
<td>Generate WSH reports, suggest solutions</td>
<td>L  • 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.</td>
</tr>
<tr>
<td>Optimise use of resources and supervise teams</td>
<td>L  • 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.</td>
</tr>
</tbody>
</table>

**In the next 3 – 5 years...**

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.

**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

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
**Import Export Administrative Assistant / Shipping Assistant**

**Technology solutions impacting this job...**
- Smart Billing, Costing & Reconciliation
- Connected Trade Platforms
- Optimised Documentation

**Impact assessment...**

*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.**

<table>
<thead>
<tr>
<th>Job tasks today</th>
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</thead>
</table>
| Perform data entry for freight services | H  
- 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 | H  
- 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 | H  
- 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 | M  
- 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.

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**Emerging skills**
- 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
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.

<table>
<thead>
<tr>
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</table>
| Coordinate with stakeholders for freight services; resolve queries | • 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 | • 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 | • 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   | • 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.
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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepare freight performance reports and status updates</td>
<td>H</td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td>• The job holder will be tasked with resolving escalated customer concerns and issues on freight services and identifying performance improvement opportunities.</td>
<td></td>
</tr>
<tr>
<td>Apply rating principles, state and operator variations for freight; track cargo</td>
<td>H</td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td>Perform compliance-related administrative activities</td>
<td>M</td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td>Optimise use of allocated resources; evaluate risks</td>
<td>M</td>
</tr>
<tr>
<td>• Machine learning is seen to model complex scenarios for resource allocation and risk evaluation. This will inform decision-making for this job role.</td>
<td></td>
</tr>
<tr>
<td>• Human intervention will remain critical for supervising teams and managing stakeholders.</td>
<td></td>
</tr>
</tbody>
</table>

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.

Emerging skills

- Process Improvement and Optimisation
- Advanced Digital Acumen
- Automation Management
- Technology Application
- Business Advisory
- Systems Thinking
- Collaboration
- Compliance Mindset Development
- Decision Making
Freight Officer

**Technology solutions impacting this job...**

<table>
<thead>
<tr>
<th>Smart Billing, Costing &amp; Reconciliation</th>
<th>Connected Trade Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimised Documentation</td>
<td></td>
</tr>
</tbody>
</table>

**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 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.

**Job tasks today**

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluate customer needs to improve freight operations processes and plans</td>
<td>M  • 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.</td>
</tr>
<tr>
<td>Recommend cargo solutions to optimise space, cost and efficiency</td>
<td>M  • 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.</td>
</tr>
<tr>
<td>Perform compliance-related administrative activities</td>
<td>M  • 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.</td>
</tr>
<tr>
<td>Manage stakeholder communications</td>
<td>M  • 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.</td>
</tr>
</tbody>
</table>

**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.

---

**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
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

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
</table>
| Plan complex freight shipments; advise customers on freight shipment alternatives | M | • 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 | • 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 | • 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 | • 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.

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

CHANGE INCREMENTALLY

Emerging skills

- 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

Enhanced data availability will augment the job holder’s ability to recommend optimal solutions and provide feedback on process improvement.
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.

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategise competitive shipping solutions for customers</td>
<td>L - 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.</td>
</tr>
<tr>
<td>Drive strategic cargo operations</td>
<td>L - 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.</td>
</tr>
<tr>
<td>Develop compliance strategies</td>
<td>L - 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.</td>
</tr>
<tr>
<td>Manage stakeholders and teams in the workplace</td>
<td>L - 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.</td>
</tr>
</tbody>
</table>

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.

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.

- 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

ORDER FULFILMENT / SALES / BD
Business Development Director / Country Route Development Director / Trade Lane Director / Freight Trade Director

Business Development Manager / Sales and Marketing / Vertical Sales Account / Key Account / Project Cargo Sales / Route Development / Trade Lane Manager

Customer Service Manager

Senior Customer Service Officer / Customer Service Specialist

Customer Service Officer / Service Quality Analyst

Order Management Executive / Quote Desk / Order Fulfilment / Inside Sales Officer

Field Sales / Key Account Executive / Sales Operations Management Specialist

ORDER FULFILMENT / SALES / BD
Order Fulfilment / Sales Operations Management / Customer Service Coordinator

Order Fulfilment Assistant / Sales Operations Management Assistant / Customer Service 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
Order Fulfilment Assistant / Sales Operations Management Assistant / Customer Service Assistant

Technology solutions impacting this job...

<table>
<thead>
<tr>
<th>Smart Lockers</th>
<th>Round-the-clock customer service via Virtual Assistants</th>
</tr>
</thead>
</table>

Impact assessment...

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

**High degree of change in tasks**

**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**

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address customer queries and issues</td>
<td>• 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.</td>
</tr>
<tr>
<td>Communicate requirements and status updates to stakeholders</td>
<td>• 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.</td>
</tr>
<tr>
<td>Perform documentation of customer orders</td>
<td>• 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.</td>
</tr>
</tbody>
</table>

**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...

<table>
<thead>
<tr>
<th>Smart Lockers</th>
<th>Round-the-clock customer service via Virtual Assistants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimised Documentation</td>
<td></td>
</tr>
</tbody>
</table>

### Impact assessment...

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

**HIGH degree of change in tasks**

*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 | H
Communicate requirements and status updates to stakeholders | H
Conduct studies to identify trends and market movements | M

### 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
## Technology solutions impacting this job...

<table>
<thead>
<tr>
<th>Solution</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Lockers</td>
<td></td>
</tr>
<tr>
<td>Optimised Documentation</td>
<td></td>
</tr>
<tr>
<td>Round-the-clock customer service via Virtual Assistants</td>
<td></td>
</tr>
</tbody>
</table>

## 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 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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
</table>
| Identify customer needs and resolve CRM conflicts | M  | - 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 | M  | - 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 | M  | - 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.

### 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
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.

**Job tasks today**

<table>
<thead>
<tr>
<th>Job task description</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinate for delivery of logistics services that meet customer needs</td>
<td>• 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.</td>
</tr>
<tr>
<td>Analyse market needs and opportunities in key accounts within assigned verticals</td>
<td>• 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.</td>
</tr>
<tr>
<td>Research potential customer information to facilitate sales</td>
<td>• 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.</td>
</tr>
</tbody>
</table>

**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.

**Technology solutions impacting this job...**

- **Smart Lockers**
- **Optimised Documentation**
- **Round-the-clock customer service via Virtual Assistants**

**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

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**

Emerging skills
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...**

**Impact assessment...**

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

**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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop co-created solutions with customers to enhance offerings and competitiveness</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Develop vertical business plans to grow the markets of vertical sectors</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Develop sales proposals; review sales performance</td>
<td>M • 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.</td>
</tr>
</tbody>
</table>

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

**CHANGE INCREMENTALLY**

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

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 sales, marketing and business strategies accordingly.
Customer Service Officer / Service Quality Analyst

Technology solutions impacting this job...

- **Smart Lockers**
- **Optimised Documentation**
- **Round-the-clock customer service via Virtual Assistants**

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.

**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.

**Job tasks today**

<table>
<thead>
<tr>
<th>Task</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand customer processes and needs</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Analyse trends, dynamics and market movements to grow businesses</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Document and understand process improvements</td>
<td>M • 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.</td>
</tr>
</tbody>
</table>

**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.

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

**REQUIRE REDESIGN**

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

Emerging skills
Technology solutions impacting this job...

- Smart Lockers
- Round-the-clock customer service via Virtual Assistants
- Optimised Documentation

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.

**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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
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</tr>
</thead>
</table>
| Identify lapses in delivery of logistics services to customers | H  | • 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 | M  | • 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 | L  | • 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. |

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.

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

**REQUIRE REDESIGN**

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

Emerging skills
Customer Service Manager

Technology solutions impacting this job...

| Smart Lockers | Round-the-clock customer service via Virtual Assistants |

Impact assessment...

| LOW degree of change in tasks |

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop intervention strategies to mitigate gaps in delivery of logistics services</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Drive customer attraction and retention strategies</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Assess effectiveness of processes improvement solutions</td>
<td>L • 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.</td>
</tr>
</tbody>
</table>

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.

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

CHANGE INCREMENTALLY

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

Emerging skills
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.

### Job tasks today

**Lead customer relationship management strategies**
- L • 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 • 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 • 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.

### Impact at task-level / Future view of job tasks

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

### 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

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

**CHANGE INCREMENTALLY**
Job Dashboards for

Logistics Solutioning and Programme Management

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
## 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.

### Today, this 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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform operational documentation for logistics services</td>
<td>• Operational documentation for logistics services will be digitalised by using optimised documentation solutions enabled by RPA, OCR, computer vision, digital data logging etc.</td>
</tr>
</tbody>
</table>
| Perform data analysis and research                   | • 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   | • 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     | • 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.

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

**REQUIRE REDESIGN**

### 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
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...

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify gaps and weaknesses in customers’ logistics operations</td>
<td>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.</td>
</tr>
<tr>
<td>Analyse implications of big data analytics on logistics solutions</td>
<td>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.</td>
</tr>
<tr>
<td>Determine customer logistics service needs</td>
<td>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.</td>
</tr>
<tr>
<td>Optimise use of allocated resources; supervise teams</td>
<td>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.</td>
</tr>
</tbody>
</table>

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.

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:

- 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
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.

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop innovative logistics solutions for customers</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Propose solutions by analysing data, research and customer needs</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Develop new businesses and relationships</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Manage department resources, risks, and teams</td>
<td>L • Predictive analytics will expedite resource management, risk assessment and mitigation planning. • However, leveraging personal relationships and influence remains critical for success in this role.</td>
</tr>
</tbody>
</table>

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.

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

CHANGE INCREMENTALLY

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
## 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...

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyse customer information and needs</td>
<td>M</td>
</tr>
</tbody>
</table>
| Analyse logistics solutions to review gaps | M | • 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 | • 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 | • 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.

### 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
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...

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

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecast customer needs to enhance solution offerings</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Lead implementation of logistics solutions for customers</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Lead vertical business tasks and vertical strategies</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Program-manage logistics solutions for customers across verticals</td>
<td>L • 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.</td>
</tr>
</tbody>
</table>

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.

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

CHANGE INCREMENTALLY

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.

- Artificial Intelligence Application
- Data Storytelling and Visualisation
- Internet of Things Application
- Threat Intelligence and Detection
- Business Advisory
- Knowledge Management
- Strategic Service Excellence
- Systems Thinking
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...

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.

**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.

#### Job tasks today

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
</table>
| Execute supply chain operations for customers        | • 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                   | • 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      | • 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| • 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.

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

**LOGISTICS SOLUTIONING AND PROGRAMME MANAGEMENT**

**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.

**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
## 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.

### Current job role

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
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</tr>
</thead>
</table>
| Coordinate logistics services’ operational schedules | M  • 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 | L  • 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 | M  • 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 | M  • 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. |

### Emerging skills

As customers implement 4.0 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

### Within 3 to 5 years...

This role will evolve to advice 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.

**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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Evaluate gaps in operations; propose solutions</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Analyse implications of data operations; highlight risks</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Forecast customer needs to enhance solution offerings</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Develop strategic project plans</td>
<td>L • 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.</td>
</tr>
</tbody>
</table>

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

**CHANGE INCREMENTALLY**

**Emerging skills**

Business acumen and human judgment remain critical for enhancing customer services. This will further be informed by customer analytics and data.

- 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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
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</table>
| Develop measures to mitigate gaps in delivery of logistics services | • 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 | • 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 | • 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. |

**Impact assessment...**

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

**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.

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

**CHANGE INCREMENTALLY**

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.

• Artificial Intelligence Application  
• Automation Management  
• Internet of Things Application  
• Threat Intelligence and Detection  
• Business Advisory  
• Knowledge Management  
• Strategic Service Excellence

**In the next 3 - 5 years...**

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.
Job Dashboards for
Logistics Process Improvement & Information Systems

**Impact assessment**  **Within 3 – 5 years**

**PROCESS IMPROVEMENT**
- Logistics Innovation & Process Improvement Manager / Customer & Logistics Systems Manager
- Business Process Excellence Engineer / Operations Specialist / Industrial Operations Engineer
- Logistics IT Executive / Digital Services Executive / Logistics System Analyst

**IT SOLUTIONS / SYSTEMS**
- IT Business Solutions Manager / Digital Services Manager
- Operations Integration Specialist / System Integration Engineer / Infrastructure Specialist
- IT Business Solutions Project Specialist / Digital Services Project Specialist

**DATA MANAGEMENT**
- Logistics Data Management Coordinator / Logistics Data Entry Coordinator
- Logistics Data Specialist / Master Data Analyst / Master Data Executive

**Legend:**
- High degree of change in tasks
- Undergo displacement
- Medium degree of change in tasks
- Require redesign
- Low degree of change in tasks
- 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.

### Job tasks today

<table>
<thead>
<tr>
<th>Job tasks today</th>
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</tr>
</thead>
</table>
| Support data entry and management; perform data analysis and research | - 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       | - 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          | - 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.

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
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.

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyse data; develop data management systems</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Review technology trends for application to logistics business</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Identify gaps and propose logistics solutions</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Facilitate team / department projects</td>
<td>M • 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.</td>
</tr>
</tbody>
</table>

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

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

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.

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify gaps and propose logistics solutions</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Analyse performance of current logistics processes</td>
<td>M • 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.</td>
</tr>
<tr>
<td>Adapt latest technology to improve operations</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Recommend allocation of resources for business activities</td>
<td>M • 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.</td>
</tr>
</tbody>
</table>

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

REQUIRE REDESIGN

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.

- 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.

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.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
</table>
| Recommend logistics solutions that address customer needs | L | • 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 | L | • 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 | L | • 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 | L | • 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. |

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

CHANGE INCREMENTALLY

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.

Emerging skills

- 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

In the next 3 – 5 years...

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.
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**

### Emerging skills

This role will continue to utilise specialist IT knowledge for development, customisation and maintenance of logistics IT solutions.

- Applications Development
- Artificial Intelligence Application
- Internet of Things Application
- User Experience Design
- Systems Thinking
- Complex Problem Solving
- Critical Thinking
- Lateral Thinking

### 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.

<table>
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<tr>
<th>Job tasks today</th>
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<tbody>
<tr>
<td>Support in data management initiatives</td>
<td>M • A combination of IoT, RPA, cloud and blockchain will automate data capture and data processing tasks.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td>Implement IT systems for logistics</td>
<td>L • Cognitive automation will expedite research on latest technology by scanning reports, news and other sources.</td>
</tr>
<tr>
<td></td>
<td>• RPA will be able to automate data gathering and research through the different management systems.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td>Provide technical support for IT troubleshooting</td>
<td>L • 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.</td>
</tr>
<tr>
<td>Coordinate with stakeholders; support risk assessment</td>
<td>L • 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.</td>
</tr>
</tbody>
</table>

### 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.

- LOW degree of change in tasks

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.

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</tr>
<tr>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td>Analyse latest technology</td>
<td>L</td>
</tr>
<tr>
<td>• AI is able to scan a wide range of sources to draw insights on the latest technology trends in the market.</td>
<td></td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td>Review customer needs to determine suitability of IT solutions</td>
<td>L</td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td>• However, human involvement remains critical for identifying IT process and system improvements and enhancing customer experience.</td>
<td></td>
</tr>
<tr>
<td>Coordinate with stakeholders; support risk assessment</td>
<td>L</td>
</tr>
<tr>
<td>• 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.</td>
<td></td>
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</table>

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

CHANGE INCREMENTALLY

Emerging skills

- Applications Development
- Artificial Intelligence Application
- Cyber Risk Management
- Internet of Things Application
- User Experience Design
- Business Advisory
- Systems Thinking
- Critical Thinking
- Lateral Thinking

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.

<table>
<thead>
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</tr>
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<tbody>
<tr>
<td>Apply latest technology to improve operations</td>
<td>L • Al 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.</td>
</tr>
<tr>
<td>Review customer needs to determine suitability of IT solutions</td>
<td>L • Al 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.</td>
</tr>
<tr>
<td>Facilitate delivery of key outcomes within IT projects</td>
<td>L • 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</td>
</tr>
</tbody>
</table>

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.

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
## 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**

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

## Today

This job role is responsible for managing business development processes and implementing logistics IT business solutions for customers, including managing post implementation optimisation.

<table>
<thead>
<tr>
<th>Job tasks today</th>
<th>Impact at task-level / Future view of job tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform technology application and Integration tasks</td>
<td>L • 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</td>
</tr>
<tr>
<td>Manage integrated IT solutions to serve complex customer needs</td>
<td>L • 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</td>
</tr>
<tr>
<td>Manage team and department activities</td>
<td>L • 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</td>
</tr>
</tbody>
</table>

**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
<table>
<thead>
<tr>
<th>Skill</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adaptability</strong></td>
<td>Ability to effectively respond to diverse situations and undertake lifelong learning to adapt to changes impacting the workplace</td>
</tr>
<tr>
<td><strong>Change Management</strong></td>
<td>Manage people, processes, tools and techniques to help company make successful transitions, resulting in adoption and realisation of changes</td>
</tr>
<tr>
<td><strong>Collaboration</strong></td>
<td>Working cooperatively with others, virtually and physical, to build consensus and to take collective action to achieve common objectives</td>
</tr>
<tr>
<td><strong>Complex Problem Solving</strong></td>
<td>Incorporate related information and past experience into the evaluation of options and development of solutions</td>
</tr>
<tr>
<td><strong>Compliance Mindset</strong></td>
<td>Design and deliver training materials on regulatory compliance topics to spread awareness and encourage adoption of a compliance mindset and behaviours</td>
</tr>
<tr>
<td><strong>Critical Thinking</strong></td>
<td>Apply reasoning to evaluate statements, separating truth from falsehoods, and assess the strengths and weakness of different options of solution, conclusion and approach</td>
</tr>
<tr>
<td><strong>Decision Making</strong></td>
<td>Assemble information to form a well-rounded understanding of complex situations</td>
</tr>
<tr>
<td><strong>Global Perspective</strong></td>
<td>Display openness to and awareness of diversity across global culture and market trends</td>
</tr>
<tr>
<td><strong>Lateral Thinking</strong></td>
<td>Identify opportunities by interpreting information and connect insights from various sources, incorporate a creative approach to develop actions</td>
</tr>
<tr>
<td><strong>Personal Influence</strong></td>
<td>Ability to leverage personal influence and charisma to convince stakeholders to take appropriate actions or to reach a mutually beneficial agreement</td>
</tr>
<tr>
<td>Skills Library</td>
<td>Business Skills</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td><strong>Business Advisory</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Business Continuity Management</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Business Development</strong></td>
<td>Identify new business opportunities to better meet the needs of existing markets and bring benefits to the company</td>
</tr>
<tr>
<td><strong>Business Negotiation</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Business Process Re-engineering</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Contract Preparation, Evaluation, Negotiation and Tendering</strong></td>
<td>Manage contract creation, evaluation, negotiation, and tendering to maximise operation and financial performance of an company</td>
</tr>
<tr>
<td><strong>Contract/Vendor Management</strong></td>
<td>Manage contract creation, execution and analysis to maximise financial and operational performance and minimise risks</td>
</tr>
<tr>
<td><strong>Corporate Governance</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Customer Behaviour Analysis</strong></td>
<td>Devise customer behaviour analysis tools and approaches and perform analysis on information pertaining to customer behaviours</td>
</tr>
<tr>
<td><strong>Customer Management</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Financial Management</strong></td>
<td>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</td>
</tr>
</tbody>
</table>

*Source: Skills Framework for Logistics*
<table>
<thead>
<tr>
<th>Skills Library</th>
<th>Business Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Innovation Management</strong></td>
<td>Manage decisions, activities and practices that transit ideas to realisation for purpose of generating business value</td>
</tr>
<tr>
<td><strong>Intellectual Property (IP) Management</strong></td>
<td>Establish company IP goals, manage and implement collation of IP materials to support IP reviews and registration processes</td>
</tr>
<tr>
<td><strong>Knowledge Management</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Market Research</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Public Relations Management</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Public-Private-Individual Partnership Collaboration</strong></td>
<td>Manage contracts between private entities and public agencies to maximise financial and operational performance and minimise risks</td>
</tr>
<tr>
<td><strong>Risk Management and Administration</strong></td>
<td>Identify, assess and prioritise risks and apply resources to mitigate risks and impact of incidents</td>
</tr>
<tr>
<td><strong>Social Media Management</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Stakeholder Management</strong></td>
<td>Monitor and maintain constructive relationships with stakeholders by influencing their expectations appropriately to help a business move toward its stated goals</td>
</tr>
<tr>
<td><strong>Strategic Human Resource Management</strong></td>
<td>Establish strategies, policies and principles aligned to business objectives and leverage on company culture to enhance integration and maximisation of employee contributions</td>
</tr>
</tbody>
</table>

1 Source: Skills Framework for Logistics
<table>
<thead>
<tr>
<th><strong>Strategic Service Excellence</strong>&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Establish strategies and operating principles to consistently meet and manage customer's expectations in order to support business requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy Implementation</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Evaluate the impact of critical business functions, conduct situational analysis and formulate, review and refine business function strategies</td>
</tr>
<tr>
<td><strong>Strategy Planning</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Develop company strategies and policies by analysing impact of internal and external influencing factors and seeking consultations from relevant stakeholders</td>
</tr>
<tr>
<td><strong>Sustainability Management</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Systems Thinking</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Workplace Safety and Health Audit System Management</strong></td>
<td>Establish the policies and work procedures to ensure organisation's compliance to audit requirements</td>
</tr>
</tbody>
</table>

<sup>1</sup> Source: Skills Framework for Logistics
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<tr>
<th>**Skills Library</th>
<th>Industry 4.0 Skills**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advanced Digital Acumen</strong></td>
<td>A sophisticated understanding of technology and software features used to analyse and manipulate data and use technology to organise and share information clearly</td>
</tr>
<tr>
<td><strong>Applications Development</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Artificial Intelligence Application</strong></td>
<td>Identify use cases for application of heuristic algorithmics and artificial intelligence in operations to enable systems or software agents to learn, improve, adapt and produce desired outcomes or tasks.</td>
</tr>
<tr>
<td><strong>Augmented Reality Application</strong></td>
<td>Facilitate the design and implementation of augmented reality applications to increase efficiency of work processes</td>
</tr>
<tr>
<td><strong>Automation Design</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Automation Management</strong></td>
<td>Oversee automation systems to ensure operation requirements are met as well as propose strategies for the automation systems performance improvement</td>
</tr>
<tr>
<td><strong>Autonomous Logistics Design and Application</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Big Data Analytics</strong></td>
<td>Analyse and validate significant volumes of data to discover and quantify patterns and trends to improve logistics operations and processes</td>
</tr>
<tr>
<td><strong>Cloud Computing Application</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Cyber Risk Management</strong></td>
<td>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</td>
</tr>
</tbody>
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</tr>
<tr>
<td><strong>Data Interpretation and Analysis</strong></td>
</tr>
<tr>
<td><strong>Data Storytelling and Visualisation</strong></td>
</tr>
<tr>
<td><strong>Data Strategy</strong></td>
</tr>
<tr>
<td><strong>e-Logistics IT Solutioning</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Engineering Installation Design</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Enterprise Database System Administration</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Information Technology and Network Security</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Integrated System Design and Application</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Internet of Things Application</strong></td>
</tr>
<tr>
<td><strong>Robotic and Automation System Maintenance</strong></td>
</tr>
</tbody>
</table>

<sup>1</sup> Source: Skills Framework for Logistics
### Technology Application
- Apply and integrate evaluated technologies into company operations or processes to achieve desired outcomes

### Technology Infrastructure Management and Integration
- 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, anomalus 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

---

*Source: Skills Framework for Logistics*
<table>
<thead>
<tr>
<th>Technical Skills^1</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Cargo Administration</td>
<td>Manage and administer transportation for unpacked commodity cargo (both liquid and dry) in large quantities</td>
</tr>
<tr>
<td>Cargo and Receipt Inspection</td>
<td>Conduct cargo operations associated with the instructions, procedures and labels relevant to the processing of the receipt and delivery of containers and cargo</td>
</tr>
<tr>
<td>Cargo Issuance and Dispatch</td>
<td>Maintain conditions and stipulated requirements for compliance before issuance and dispatch of imported cargo</td>
</tr>
<tr>
<td>Cargo Lifting</td>
<td>Conduct cargo operations associated with heavy lift freight including oversized loads</td>
</tr>
<tr>
<td>Cargo Security Control</td>
<td>Maintain security in cargo environment including legislations and regulatory requirements</td>
</tr>
<tr>
<td>Cargo Tracking System Administration</td>
<td>Perform processes in tracking of cargo movement via various forms of transport</td>
</tr>
<tr>
<td>Cold Chain Operations Administration</td>
<td>Perform processes involved in cold chain management which include packaging and material handling equipment for storage and during transportation</td>
</tr>
<tr>
<td>Container Loading and Unloading Administration</td>
<td>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</td>
</tr>
<tr>
<td>Cross Docking</td>
<td>Transfer inbound materials, goods and products from receiving docks to shipment docks for outbound deliveries</td>
</tr>
<tr>
<td>Dangerous Goods Management</td>
<td>Perform specialised services covering dangerous goods operations for regulatory compliance and customer requirements</td>
</tr>
<tr>
<td>Environmental Protection Management</td>
<td>Establish policies and procedures for sustainable environment practices covering green procurement, gas emissions, disposal methods, product quality standards and regulatory compliance</td>
</tr>
<tr>
<td>Equipment Maintenance</td>
<td>Perform equipment maintenance including preparation, preventive and breakdown maintenance</td>
</tr>
<tr>
<td>Event Logistics Administration</td>
<td>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</td>
</tr>
</tbody>
</table>

^1 Source: Skills Framework for Logistics
<table>
<thead>
<tr>
<th>Technical Skills</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freight and Cargo Claim Administration</td>
<td>Perform claim documentation and procedures including filing and monitoring of claims and claim resolution</td>
</tr>
<tr>
<td>Freight Insurance Administration</td>
<td>Perform freight insurance documentation covered for goods during shipment including cargo insurance purchased directly from shippers or third-party insurers</td>
</tr>
<tr>
<td>Hazardous Materials Identification System (HMIS) Administration</td>
<td>Establish procedures and documentation using Hazardous Materials Identification System (HMIS) for control and audit</td>
</tr>
<tr>
<td>Import and Export Documentation Administration</td>
<td>Administer shipping documents associated with the import and export of goods</td>
</tr>
<tr>
<td>International Trade Legislation Compliance</td>
<td>Identify all aspects of international trade processes and foreign and multilateral trade laws for regulatory compliance</td>
</tr>
<tr>
<td>Livestock Cargo Administration</td>
<td>Arrange transportation of livestock cargo including documentation, cargo inspection and compliance with regulatory requirements</td>
</tr>
<tr>
<td>Logistics Operations Research and Planning</td>
<td>Adopt advanced quantitative methods to analyse, design, plan and control logistics systems in order to support business requirements</td>
</tr>
<tr>
<td>Logistics Process Quality Management</td>
<td>Apply processes to align all components of business to quality requirements of the company in order to maximise quality and reduction of waste</td>
</tr>
<tr>
<td>Logistics Solution Design Thinking</td>
<td>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</td>
</tr>
<tr>
<td>Logistics Solution Product/Project Management</td>
<td>Manage activities to meet project requirements and translate to plans that deliver on time, on-budget learning and integration that companies need</td>
</tr>
<tr>
<td>Logistics Solutions Marketing</td>
<td>Plan, implement and control business activities to conduct buying and selling of product offerings or services between buyers and sellers of logistics services</td>
</tr>
<tr>
<td>Logistics Solutions Sales</td>
<td>Identify customer needs, evaluate these needs and identify probable solutions so as to sell logistics solutions and services to solve the needs of customers</td>
</tr>
<tr>
<td>Material Flow Modelling</td>
<td>Analyse the inflow and outflow of material, substance or product flows across different industrial sectors or within ecosystems to achieve optimisation</td>
</tr>
</tbody>
</table>

1 Source: Skills Framework for Logistics
<table>
<thead>
<tr>
<th>Technical Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Material Handling Equipment (MHE) Handling</strong></td>
</tr>
<tr>
<td><strong>Material Management (Planning, Sourcing, Use, Disposal)</strong></td>
</tr>
<tr>
<td><strong>Order Fulfilment Administration</strong></td>
</tr>
<tr>
<td><strong>Pricing for Cargo Services and Operations</strong></td>
</tr>
<tr>
<td><strong>Pricing for Transportation Services and Operations</strong></td>
</tr>
<tr>
<td><strong>Pricing for Warehouse Services and Operations</strong></td>
</tr>
<tr>
<td><strong>Process Improvement and Optimisation</strong></td>
</tr>
<tr>
<td><strong>Retail Logistics Administration</strong></td>
</tr>
<tr>
<td><strong>Shipment Load Planning and Palletisation/Consolidation</strong></td>
</tr>
<tr>
<td><strong>Supply Chain Solutioning/Modelling/Planning/Strategising</strong></td>
</tr>
<tr>
<td><strong>Time Sensitive Cargo Delivery Management</strong></td>
</tr>
<tr>
<td><strong>Transport Management System Administration</strong></td>
</tr>
<tr>
<td><strong>Transportation Equipment Handling</strong></td>
</tr>
</tbody>
</table>

1 Source: Skills Framework for Logistics
<table>
<thead>
<tr>
<th>Technical Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transportation Hub/Control Centre Administration</strong></td>
</tr>
<tr>
<td><strong>Transportation Route and Schedule Planning</strong></td>
</tr>
<tr>
<td><strong>Vertical Programme Management</strong></td>
</tr>
<tr>
<td><strong>Warehouse Administration</strong></td>
</tr>
<tr>
<td><strong>Warehouse Automation Application</strong></td>
</tr>
<tr>
<td><strong>Warehouse Facility Management</strong></td>
</tr>
<tr>
<td><strong>Warehouse Facility Security Control</strong></td>
</tr>
<tr>
<td><strong>Warehouse Inventory Control/Audit</strong></td>
</tr>
<tr>
<td><strong>Warehouse Layout Design</strong></td>
</tr>
<tr>
<td><strong>Warehouse Maintenance and Housekeeping</strong></td>
</tr>
<tr>
<td><strong>Warehouse Management System Administration</strong></td>
</tr>
<tr>
<td><strong>Warehouse Performance Measurement</strong></td>
</tr>
<tr>
<td><strong>Warehouse Space Utilisation</strong></td>
</tr>
<tr>
<td><strong>Warehousing / Cargo-related Occupational Health and Safety Management</strong></td>
</tr>
</tbody>
</table>

1 Source: Skills Framework for Logistics
Appendix V

GUIDELINES TO JOB REDESIGN
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

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
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

![Instruction Table]

---

**EXECUTIVE SUMMARY**

**BUSINESS DIRECTION**
- Current State
- Desired State

**GAP / CHALLENGE**
- Cost
- Execution Timeline

**JOB REDESIGN SOLUTION**

**TARGET AREAS / AUDIENCE**
- Benefits

**PROJECT TEAM**
Guide to Analysing the Business Case for Job Redesign

| Template |
|-----------------|-----------------|-----------------|-----------------|
| EXECUTIVE SUMMARY | BUSINESS DIRECTION | GAP / CHALLENGE | JOB REDESIGN SOLUTION |
| | Current State | | |
| Desired State | | | |
| | | COST | EXECUTION TIMELINE |
| | | | |
| TARGET AREAS / AUDIENCE | | | |
| | | BENEFITS | |
| PROJECT TEAM | | | |
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

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

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

COST

<table>
<thead>
<tr>
<th>Item</th>
<th>Current</th>
<th>After Job Redesign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headcount</td>
<td>30</td>
<td>15 operators</td>
</tr>
<tr>
<td>Labour hours</td>
<td>8 hrs/day/staff</td>
<td>8 hrs/day/staff</td>
</tr>
<tr>
<td>Technology implementation cost</td>
<td>Nil</td>
<td>$300,000</td>
</tr>
<tr>
<td>Training and development cost</td>
<td>$200 / staff</td>
<td>$600 / staff</td>
</tr>
</tbody>
</table>

BENEFITS

<table>
<thead>
<tr>
<th>Item</th>
<th>Current</th>
<th>After Job Redesign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time required for day-to-day warehouse operation planning</td>
<td>4 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>Manpower required to monitor</td>
<td>8 pax</td>
<td>4 pax</td>
</tr>
<tr>
<td>Quality of products</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Process improvements</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

EXECUTION TIMELINE

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kickoff and stakeholder buy-in</td>
<td></td>
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<tr>
<td>Diagnosis (Stakeholder interviews, Job Shadowing)</td>
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<tr>
<td>Diagnosis (Operational diagnostics, prioritisation and recommendation)</td>
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<tr>
<td>Design (action plan, change agenda, performance metrics)</td>
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<tr>
<td>Implementation (project roll out and change management interventions)</td>
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<tr>
<td>Post Job Redesign monitoring and iterations</td>
<td></td>
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<tr>
<td>Analysis and final report</td>
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</tr>
</tbody>
</table>
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

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.
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.

<table>
<thead>
<tr>
<th>Job Roles</th>
<th>Processes</th>
<th>New Tasks</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>Observations</td>
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<tr>
<td>Job Roles</td>
<td>Processes</td>
<td>New Tasks</td>
<td>Remarks</td>
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<tr>
<td>Job Roles</td>
<td>Processes</td>
<td>New Tasks</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Warehouse Supervisor</td>
<td>Manually records inventory count and monitor warehouse operations.</td>
<td>Actively uses RFID-logging, barcode scanning and sensor technology to record inventory count.</td>
<td>Reduction in time spent conducting manual recording. Time can be diverted to value-add tasks such as process improvement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uses advanced analytics to gain insights on warehouse processes and areas for improvement.</td>
<td>Tap on advanced analytics for more accurate reporting with less human errors to enhance overall warehouse operations efficiency.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uses conventional tools (e.g. paper and pen) to conduct warehouse quality, safety and risk assessment</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uses dashboards quality, safety and risk monitoring tool to generate investigation reports.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix V

(c) Guide to Change Management
Plan and Approach
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.

1. Why
   Define the purpose, outcomes and case for the proposed change

2. Understand needs
   Build a rich understanding of all stakeholder preferences, needs and reactions

3. Understand the change
   Develop a deep understanding of the implications of the Job Redesign or change

4. Co-create the future
   Co-design the future ways of working and experience

5. Align the company
   Design the future company and ways of working

6. Prepare the company
   Get the business ready for the change

7. Build the capability
   Training and knowledge transfer to lift capability and drive self-sufficiency

8. Execute and sustain the change
   Implement new ways of working, measure success and track benefit realisation
**Guide to Change Management Plan and Approach**

*Key Stakeholders to engage in the Change Management process*

**Who are the key stakeholders**

<table>
<thead>
<tr>
<th>Internal Stakeholders</th>
<th>External Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Management, Project Sponsors</td>
<td>Impacted Business Units / Departments</td>
</tr>
<tr>
<td>Internal HR Team</td>
<td>Customers/ Other Companies</td>
</tr>
<tr>
<td>Other Vendors</td>
<td>Rest of Company</td>
</tr>
</tbody>
</table>

**What do they need**

**Internal Stakeholders**
- How does it impact the role of the current job incumbents?
- How do we articulate the support for change?
- What training is required to support the impacted job incumbents to take on the redesigned role?
- How does the redesigned job role impact the end customers/ other stakeholders?
- How does the redesigned job impact other business units/departments?

**External Stakeholders**
- How does the redesigned job role impact the end customers/ other stakeholders?
- How does the redesigned job role impact interaction with vendors?

**How to mitigate their concerns**

**Internal Stakeholders**
- Early stakeholder engagement
- Align needs/ expectations & customise change plans
- Continued emphasis on relaying benefits of adoption

**External Stakeholders**
- Hands-on training/ self-help resources
- Real-time messaging (i.e. mixed media; social media platforms, digital banners etc.)
- Direct access to address queries (i.e. helpdesks, mailbox)
- Clear guidance on new working ways
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

- **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

- **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

- **Leaders**
  - Senior Management
  - Head of Department
  - Business Unit Managers

- **Change Champions**
  - Business Unit Managers
  - Employees

- **Impacted Employees**
  - 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.
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
- Involves 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:

- **RECRUITMENT & SELECTION**
  - Refine/develop existing job description by taking into consideration new tasks and skills.

- **LEARNING & DEVELOPMENT**
  - Identify skill gap between existing and redesigned job role and develop training roadmap to equip employees in the future job role.

- **PERFORMANCE MANAGEMENT**
  - Set or revise performance goals of employees in the new redesigned job.

- **CAREER PLANNING**
  - Identify career pathways (i.e. lateral, vertical, diagonal) for the redesigned job.

- **COMPENSATION & BENEFITS**
  - Review wages in newly redesigned job based on the breakdown of new tasks and skills required to perform the job.
Guide to Implications of Job Redesign on HR Processes
*Downstream human resource efforts impacted by job redesign initiatives (1/5)*

**RECRUITMENT AND SELECTION**

1. Understand the job description of the existing job role in the current state
   - Observe or conduct engagements with job incumbents to understand the existing job role
   - Understand the skills and responsibilities to perform job role using job description

2. Know the skills required to perform successfully in the redesigned job
   - Define the end state of how the new redesigned job will look like
   - Identify new, modified and/or eliminated tasks in the newly redesigned job
   - Develop skills required to successfully perform the tasks

3. Develop job descriptions for redesigned jobs to reflect the new tasks and responsibilities
   - Conduct discussion with HR and job incumbents to validate the observed changes in the redesigned job
   - Document the role requirements on job description for advertisement and performance appraisal purpose
Guide to Implications of Job Redesign on HR Processes

Downstream human resource efforts impacted by job redesign initiatives (2/5)

TRAINING & DEVELOPMENT

1. Identify training needs and develop training plans based on skills required
   - Understand company’s current and near future goals
   - Identify whether the current workforce has the right skills to support the business goals and process

2. Curate training programmes by developing in-house content or outsourcing to external providers
   - Identify appropriate and relevant training programmes
   - Budget for your employees to attend required training

3. Evaluate training effectiveness
   - Use training evaluation forms
   - Conduct discussions between HR and trainees’ line managers about any observed improvement
   - Calculate the Return on Investment of the training
Guide to Implications of Job Redesign on HR Processes

Downstream human resource efforts impacted by job redesign initiatives (3/5)

**PERFORMANCE MANAGEMENT**

1. **Identify and set performance goals of the redesigned job**
   - Identify both hard and soft performance goals aligned with business strategies to drive desired behaviours
   - Ensure that performance goals are reasonable and realistic

2. **Assess ongoing performance of the employees in the impacted job role**
   - Set interim performance goals for employees
   - Conduct regular check-ins, mid-year and monthly reviews with employees to provide feedback on employee’s performance
   - Document reviews in the performance appraisal form

3. **Build a career development plan to support employees**
   - Provide feedback and coaching on employee results and behaviour
   - Address employee’s performance concerns and work out an action plan to achieve desired performance
Guide to Implications of Job Redesign on HR Processes

Downstream human resource efforts impacted by job redesign initiatives (4/5)

CAREER MANAGEMENT

1. Classify jobs into job families
   - Define the job profile/job description
   - Assign jobs of similar nature which require similar knowledge and skills into the same job family

2. Develop a job levelling system applicable across job families
   - Identify jobs which requires similar level of roles and responsibilities, as well as years of experience, and link them to certain job grades across different job families

3. Define key skills required
   - Ensure the required skills and years of experience are listed for each job family

4. Create possible vertical and lateral pathways
   - Identify the possible career movements for employees across different job roles
Guide to Implications of Job Redesign on HR Processes

Downstream human resource efforts impacted by job redesign initiatives (5/5)

1. Evaluate the job role and criticality of skills
   - Determine the relative worth of a job in relation to other jobs through job evaluation on the basis of its content and the complexity

2. Benchmark similar job role to industry standards
   - Refer to industry specific wage data and procure salary survey information
   - Compare similar job roles within the same industry specific reports

3. Examine the changes in the new skills in redesigned job
   - Understand the current wage structure within the organisation
   - Examine additional skillsets and corresponding increase in responsibilities
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

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.
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.

<table>
<thead>
<tr>
<th>Job Redesign Intervention</th>
<th>IMPACT ANALYSIS</th>
<th>Adjustments required / Next Steps</th>
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<td></td>
<td>Key Performance Indicators</td>
<td>Before Job Redesign</td>
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</table>
## Post-Job Redesign Implementation Analysis

### Template

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<tr>
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<th>IMPACT ANALYSIS</th>
<th>Adjustments required / Next Steps</th>
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<td>Key Performance Indicators</td>
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### Adjustments required / Next Steps

- June 20
### Post-Job Redesign Implementation Analysis

**Template (sample)**

**Sample job role: Warehouse Officer**

<table>
<thead>
<tr>
<th>Job Redesign Intervention</th>
<th>IMPACT ANALYSIS</th>
<th>Other outcomes</th>
<th>Adjustments required / Next Steps</th>
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<tr>
<td><strong>Key Performance Indicators</strong></td>
<td><strong>Before Job Redesign</strong></td>
<td><strong>After Job Redesign</strong></td>
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<tr>
<td>Introduce RFID, Barcode, sensor technology, robotic sorting system</td>
<td>Time taken for planning and monitoring of inventory level and storage utilization</td>
<td>4 hours</td>
<td>2 hours</td>
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<tr>
<td></td>
<td>Time taken to inspect cargo handling activities</td>
<td>2 hours</td>
<td>0.5 hour</td>
</tr>
<tr>
<td></td>
<td>Number of staff required on the ground</td>
<td>8 officers</td>
<td>4 officers</td>
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<td>...</td>
<td>...</td>
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Appendix VI

ECOSYSTEM STAKEHOLDERS
Ecosystem stakeholders

**Associations, Government agencies, Employee and trade unions**

<table>
<thead>
<tr>
<th>Associations</th>
<th>Government Agencies</th>
<th>Employee and Trade Unions</th>
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</thead>
<tbody>
<tr>
<td>Container Depot Association,</td>
<td>Employment and Employability Institute,</td>
<td>Employees Union:</td>
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<td>Singapore Aircargo Associations,</td>
<td>Economic Development Board</td>
<td>• Air Transport Executive Staff Union</td>
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<td>Singapore Logistics Association,</td>
<td>Enterprise Singapore,</td>
<td>• Supply Chain Employees' Union</td>
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<td>International Federation of Freight</td>
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<td>• National Trade Union Congress</td>
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## Ecosystem stakeholders

### Educational institutions

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<td>Institute of Technical Education</td>
<td>A2V Construction Services Pte Ltd</td>
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<td>Nanyang Polytechnic</td>
<td>Aa International Consultancy Pte. Ltd.</td>
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<td>Ngee Ann Polytechnic</td>
<td>Aat Training Hub Pte. Ltd.</td>
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<tr>
<td>Temasek Polytechnic</td>
<td>Absolute Kinetics Consultancy Pte Ltd</td>
</tr>
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<td>Republic Polytechnic</td>
<td>Ace Ehs Singapore Pte. Ltd.</td>
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Appendix VII

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**Research papers and company reports**


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