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Evaluating Singapore's Logistics Market Potential:

Logistics Market Profile and Logistics Technology Landscape

WHAT'S INSIDE

- I. Singapore's Logistics Market Profile
- II. Technology-Enabled Logistics in Singapore
- III. Technology as a Tool for Supply Chain Sustainability

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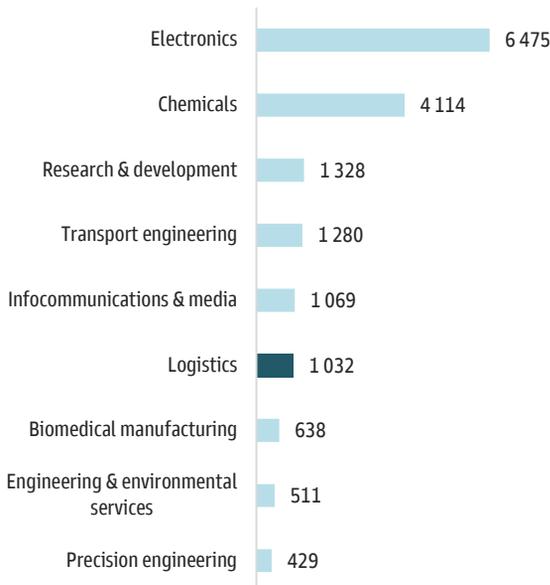
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Singapore plays a premier role in the global logistics market. As an open economy with the world's third highest rate-to-GDP ratio at 321% in 2020, trade, connectivity and infrastructure are crucial to Singapore's economy. According to World Bank, Singapore ranks as the 2nd major logistics hub in Asia and 7th worldwide. This can be attributed, in a large extent, to the active integration of technology into the supply chain process: Singapore processes 90% of permit electronic applications within 10 minutes and clears 90% of physical cargo within 8 minutes. Among the key sub-sectors of the logistics market are contract logistics, freight forwarding and land transportation.

Singapore has been successful in FTA negotiations, reaching conclusion in record time. Singapore's FTA partners include developing economies of the PRC, India, and Southeast Asia as well as rich industrialized economies of the US, European Union, and Japan. Such economic complementarity facilitates both inter-industry and intra-industry trade.

Singapore is one of the main global trading hubs due to the high quality of its port infrastructure. There are up to 200 connection vessels in Singapore at any moment and all types of ships are able to enter the port owing to deep berth areas, quay lengths, and depths of harbor. Owned by the Singapore-based and world's leading marine terminal operator PSA International, Singapore's

Figure 3: Estimated asset investment commitments in Singapore in 2020, by industry (in million Singapore dollars)



Source: Maritime and Port Authority Singapore; UNCTAD; Lloyd's List; Singapore Economic Development Board

Figure 1: Import of goods from 2011 to 2020

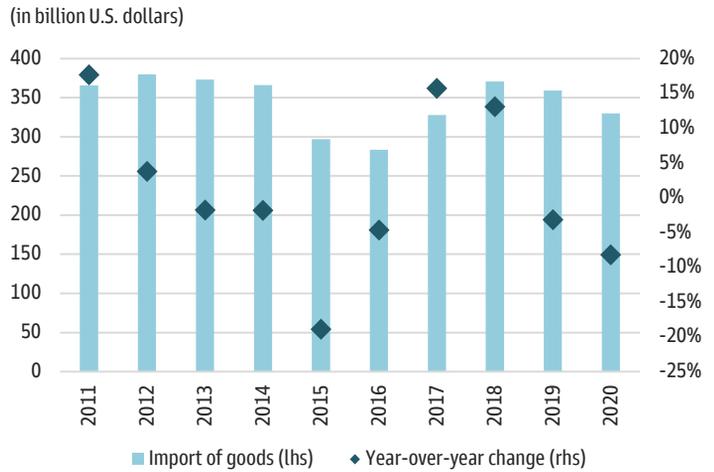


Figure 2: Export of goods from 2011 to 2020

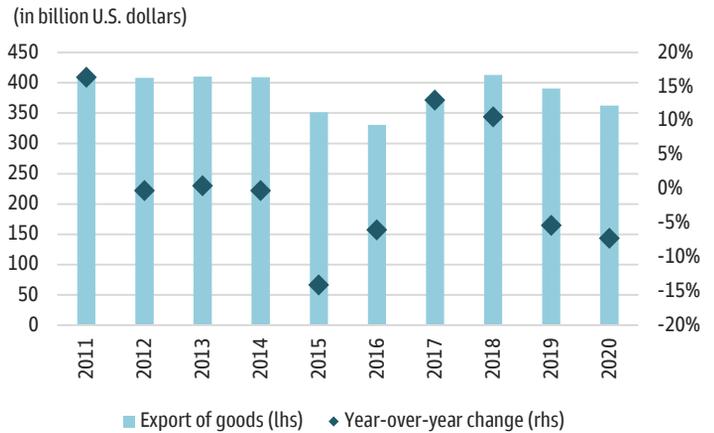


Table 1: Major manufacturing industries by output value

Manufacturing industry	2020 output value (in Singapore million dollars)	% of total manufacturing output value
Computer, Electronic & Optical Products	137,406.7	46.26%
Chemicals & Chemical Products	37,625.5	12.66%
Machinery & Equipment	27,231.5	9.16%
Refined Petroleum Products	21,580.1	7.26%
Pharmaceutical & Biological Products	16,010.3	5.39%
Other Transport Equipment	12,723.5	4.28%
Other Industries	44,441.5	14.96%

Singapore's Logistics Market Profile

four container terminals have connections to more than 600 ports in over 120 countries and are global hubs for transshipments. Notwithstanding the competition from neighboring Hong Kong and Malaysia, Singapore remains first in ASEAN for container throughput. Since 2010, Singapore's port container throughput has been constantly increasing and reached 36.87 million TEUs in 2020 vs. 28.41 million TEUs in 2010. In 2020, the Port of Singapore ranked the 2nd largest container port in the world by throughput, only after Shanghai, China (43.50 million TEUs). In addition, as of January 2020, Singapore owns the fifth biggest fleet in terms of deadweight tonnage and third biggest fleet in terms of vessels. Singapore's fleet consisted of some 4,914 ships with a total deadweight tonnage of 140 million tons in 2020.

To accommodate for increasing throughput, Singapore is building the mega-port in the western part of the city, the Tuas Terminal. The Tuas Terminal is expected to be the world's largest fully automated terminal, when it will be completed in 2040. The port will have automated yard cranes, drones, and driverless vehicles for port transport.

In the trucking segment, there were a total of 150 to 200 players in Singapore, as of 2020. 76% of trucking companies are in the small-tier segment, 14% are in the mid-tier segment, while the remaining 10% are in the large-tier segment. According to the Converging Knowledge Report, ca. 90% of mid-tier trucking companies have evolved from one-stop trucking service providers by expanding their service offerings with freight forwarding and warehousing/storage.

Figure 4: Container ship fleet size as of January 2021, by nationality of operator (in gross tonnage)

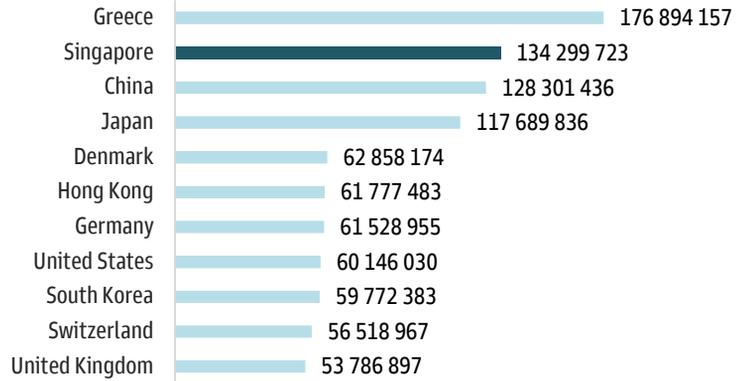


Figure 5: Number of tanker arrivals in Singapore from 2007 to 2020 (in 1,000s)

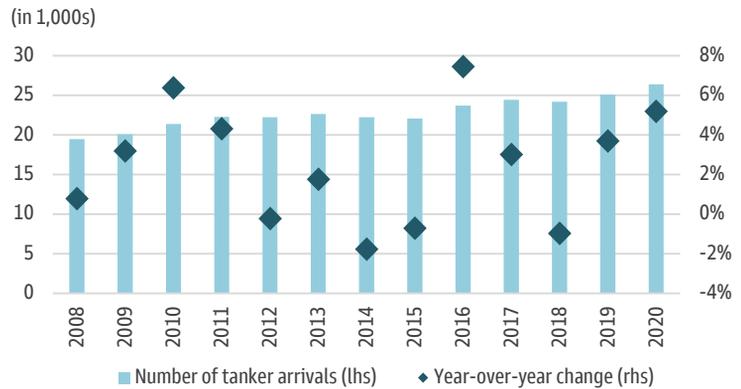


Figure 6: Median time spent by vessels in the Port of Singapore from 2018 to 2020 (in days)

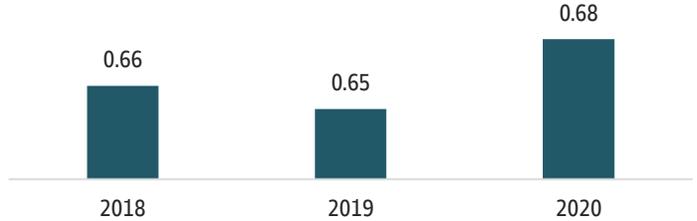
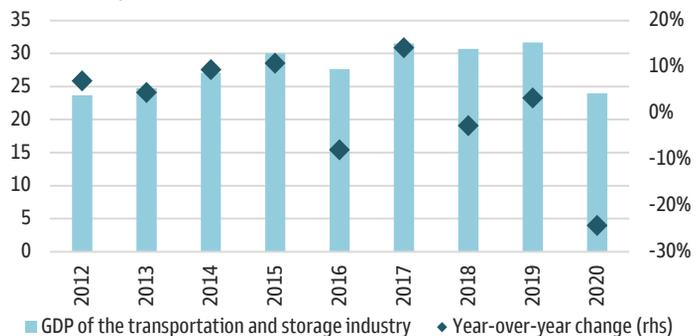


Figure 7: Major terminal operators worldwide in 2019, based on equity-adjusted throughput (in million twenty-foot equivalent units)



Figure 8: GDP of the transportation and storage industry, Singapore, 2012-2020 (in billion Singapore dollars)



Source: Maritime and Port Authority Singapore; UNCTAD; Lloyd's List; Danske Rederier

Singapore's Logistics Market Profile

Singapore's airfreight market remains the most efficient in Southeast Asia and Southwest Pacific and ranks as the highest in terms of connectivity from a frequency and capacity point of view. These factors allow logistics operators to provide competitive B2B inbound rates and B2C cross-border logistics services in Southeast Asia. At times, air freight costs in Singapore can be up to 40% to 45% cheaper compared to Malaysian Airlines via KLIA and Thai Airways via Suvarnabhumi.

Moreover, Singapore's Changi's Airport is named the best world's air cargo airport in terms of performance, value and facilities (Source: Air Cargo Excellence Report 2018). The airport has one of the widest networks in Asia with connectivity to 411 cities and 99 countries and handling capabilities of up to 325,000 tonnes of temperature-sensitive cargo annually. Operational excellence of Singapore's air cargo market attracted 24 out of 25 global largest airfreight forwarders to Singapore.

As of 2020, Singapore's logistics market was valued at US\$7.57 billion, constituted 1.94% of GDP and employed approximately 205,500 people (5% of the residential workforce). According to Mordor Intelligence, the Singapore logistic market is expected to register an annual growth rate of 5% from 2021 to 2026. Singapore established itself as a global logistics hub and will continue to leverage on its competitive advantages such as efficiency, reliability and resilience of its network.

Table 3: World's largest logistics providers with operations in Singapore

Asia	Europe	USA
APEX Logistics International	Agility	Crane Worldwide Logistics
Dimerco Express Group	Bollore Logistics	Expeditors
Hitachi Transport System	CEVA Logistics	FedEx Logistics
Kerry Logistics Network	Dachser	UPS Supply Chain Solutions
Kintetsu World Express	DB Schenker	
Nippon Express	DHL Global Forwarding	
NNR Global Logistics	DSV	
Sinotrans	Geodis	
Yusen Logistics	Hellmann Worldwide Logistics	
	Kuehne + Nagel	
	Panalpina	

Table 2: Air cargo loaded by country/region of destination, 2020

Country/region	Tonnes	% of global air cargo loaded
Hong Kong	79,790.0	11.08%
Mainland China	77,188.0	10.72%
Thailand	53,192.9	7.39%
Japan	40,968.1	5.69%
Indonesia	38,893.5	5.40%
Malaysia	23,404.9	3.25%
United Kingdom	21,878.5	3.04%
Vietnam	15,701.3	2.18%
Philippines	10,384.7	1.44%
Germany	9,544.4	1.32%

Figure 9: The largest container ports worldwide in 2020, based on throughput (in million TEUs)

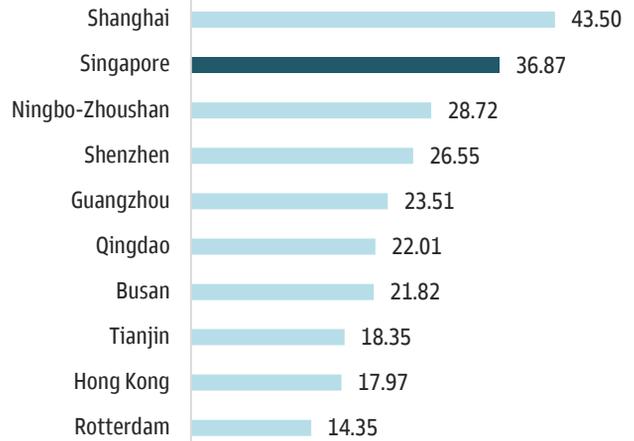
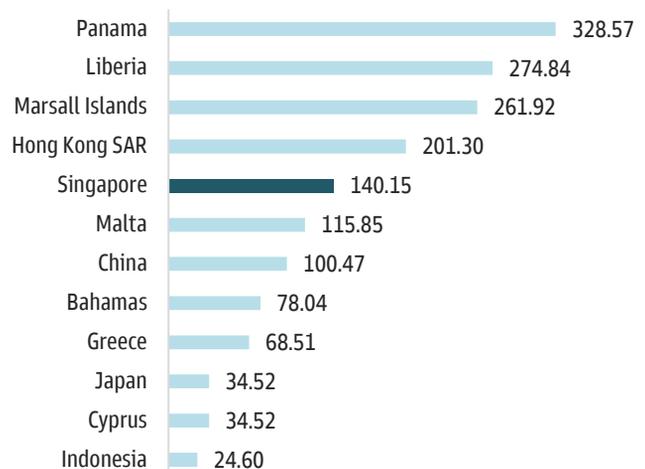


Figure 10: Deadweight tonnage of world merchant fleet by country of beneficial ownership as of January 1, 2020 (in million dwt)



Source: Marine Department (Hong Kong); UNCTAD; Lloyd's List; Changi Airport

Technology-Enabled Logistics in Singapore

Singapore's technology logistics market is represented by a wide variety of rapidly growing startups in trucking & fleet, last mile delivery, warehousing & fulfillment, OMS, TMS, WMS SaaS. With high labor costs and land constraints, Singapore's government focuses on initiatives to support analytics & optimization solutions. Singapore ranks in the top-10 smart cities worldwide in 2020, with key factors for such a ranking including technology, urban planning, mobility and transportation.

A significant number of logistics startups provide delivery services in Singapore, including Hong Kong's Lalamove (on-demand trucking marketplace for last mile delivery), Indonesia's J&T Express (on-demand trucking marketplace), Singapore's NinjaVan (last mile delivery) and Janio (trucking marketplace). It is worth to mention that Singapore-headquartered NinjaVan's valuation soared past US\$1 billion after its Series E round of US\$578 million. The company operates across Southeast Asia and expands its services beyond last-mile delivery towards helping independent online merchants source for products.

Warehousing & e-fulfillment segment is represented by local and international players in Singapore, namely, Locad (Singapore), iStore iSend (Malaysia), BEAM (Singapore), Anchanto (Singapore), J&T Express (Indonesia), iHub Smart Logistics (Singapore), Qxpress (Singapore). Notably, warehousing & e-fulfillment companies expand their logistics offerings. For example, in 2021, Singapore's cross-border

warehousing and e-fulfillment company Qxpress acquired Hong Kong-based freight forwarding and third-party logistics firm KorChina Logistics to better serve cross-border business-to-consumer as well as direct-to-consumer demand.

One of the prominent players in the data analytics & optimization space is Singapore-headquartered Quincus, which automates manual tasks and provides real-time visibility. The company's modules include admin control with customized documents sent to stakeholders, dispatch management, route optimizations, pricing, integration with external systems for improved tracking. Quincus facilitates more than 70 million shipments per month and aims to help airlines, logistics providers, ecommerce firms, freight carriers and household brands with their supply chain management. The company's geography of operations expanded outside of Singapore to Indonesia, Malaysia, Mexico, Taiwan, Vietnam, United Arab Emirates, United States, and United Kingdom. Another notable logistics optimization startup with operations in Singapore is India's Locus. Founded in 2015, Locus established its offices in United States, United Kingdom, India, Singapore, Indonesia, Vietnam, and Germany, and has gained clients in North America, Southeast Asia, Europe, and India. The company's clients are represented by e-commerce, 3PL, FMCG and retail operators. According to Locus, the startup's solutions for reverse/return logistics, dispatch planning and route optimization have saved its clients up to US\$150 million by mid-2021. With fluctuation in demand, optimization plays a key role in the logistics market.

Figure 11: Cities in motion (smart cities) index ranking worldwide in 2020

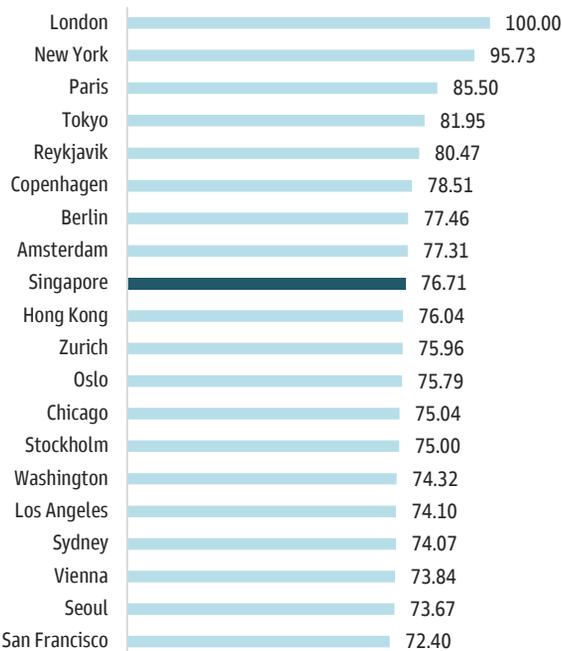
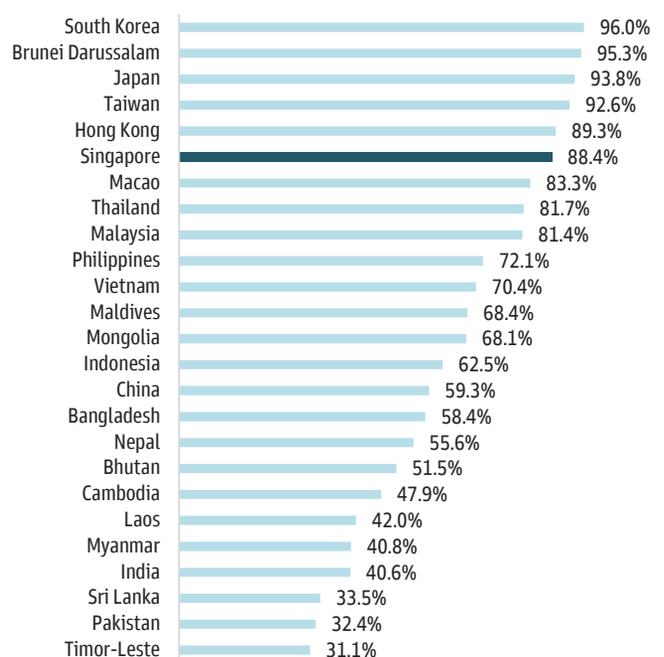


Figure 12: Internet penetration in Asia as of June 2020, by country or region



Source: IESE Cities in Motion Index 2020; Internet World Stats

Selected Players of Singapore's Logistics Technology Landscape

Trucking and Fleet



Last Mile Delivery



Warehousing & Fulfillment



OMS, TMS & WMS SaaS



Supply chain challenges continue to make headlines, and several factors are altering short- and long-term supply needs. Most frequent threats affecting global supply chains include cyber threats, distribution disturbances, government policies, demographic changes in the workforce.

While shippers and their logistics providers adjust to market demands and capacity changes, it usually takes not less than 18 to 24 months or more before the supply chain reaches balance. Supply chain shocks affect each player in the supply chain. For example, during the COVID-19 pandemic, it has been common to observe a shift from ca. 50% of the consumer dollar spent at home and ca. 50% away to the structure of ca. 80%-20%, which created shifts along the supply chain. Flexibility on labeling and packaging enabled transportation from a bulk environment to retail, international trade, or vice versa.

Disruptions such as COVID-19 also pose significant delays within supply chains. For example, in June 2021, a COVID-19 outbreak significantly decreased volume at the Yantian port in China and, in August 2021, led to the partial shutdown of the world's busiest port, the Ningbo-Zhoushan port, in China. Looking at air cargo, another COVID-19 outbreak resulted in the suspension of freight operations at Shanghai's Pudong International Airport in August 2021. According to NTT Data, 42% of the global supply chain is represented by Asia. Therefore, any disruption in this region leads to a substantial impact on the global supply chain. Prolonged anti-pandemic measures also continue to severely impact supply chains. For example, it is ten times higher to send a container from Asia to Europe in November 2021 than in April 2020.

Political and regulatory uncertainties worldwide are also impacting supply chains. Trade disputes, mainly with China, have led to disruptions in the global supply chain and shifts in manufacturing locations. For instance, Australia's recent geopolitical hostilities with China, the country's major import partner, hampered supply chains in chemicals, energy, and water treatment. Shipping costs increased by almost 300%. COVID-19 constraints in trade compounded ongoing political disputes.

According to the World Bank, the global economy is expected to stage its most robust post-recession recovery in 80 years in 2021. As a result, those within the supply chain need to develop new strategies to meet shifting

needs and increasing demand in the global supply chain.

Supply chain challenges have accelerated the adoption of technology and demonstrated the need for visibility. Companies worldwide are moving towards practices for digitalization across supply chains, which include sourcing, production process, supply chain configuration, optimization, data analytics and customer relationships, collaborative tools for communication between suppliers, distributors and customers. The key goals of technology adoption within supply chains are support of circular economy and reverse logistics. For example, implementation of robotics together with WMS & TMS can decrease unnecessary activities with low added value. Omnichannel logistics that accelerated during the pandemic should be a new standard for the logistics market with end-to-end visibility, dispatch management and route optimization.

Figure 13: Impacts of COVID-19 pandemic on Singapore's supply chain



Vanishing retail turnover

(-15 index points y-o-y to 80.5 in 2020 Singapore Retail Index)



Fluctuations in freight volumes

(Slight drop of 1% in Singapore's container throughput to 36.87 million TEUs in 2020 after all-time high of 37.2 million TEUs in 2019)



Major industries hit hard

(-3% in Singapore's manufacturing GDP to 96.33 billion Singapore dollars in 2020 from 99.36 billion Singapore dollars in 2019)



Increased demand for certain products

(As of February 2021, increased demand for certain products was the leading result of the COVID-19 pandemic, which impacted operations of ca. 38% companies within supply chains in Singapore)



Disruption of global supply chain

(As of February 2021, disruption of global supply chain due to the COVID-19 pandemic impacted operations of ca. 31% of companies within supply chains in Singapore)

Source: Maritime and Port Authority Singapore; Singapore Department of Statistics; Bastian Consulting

To achieve efficiency, logistics operators invest in expanding the breadth and depth of logistics optimization technology. The evolutionary expansion of OMS, TMS & WMS products improved the value proposition for logistics providers. While OMS, TMS & WMS products can be tailored for each particular logistics operator, most 3PL operators are mainly looking at such features as scheduling, planning, booking, order tracking, inventory management and billing. In addition, more 3PL operators are focusing on the implementation of control tower visibility (visibility, tracking & asset management) in the future.

While increasing use of OMS, TMS & WMS solutions among logistics providers have already become a widespread trend, the adoption of industry 14.0 is going to be a defining factor for the sustainability of supply chains. 14.0 technology solutions include automated storage and

retrieval systems, smart inventory counting, intelligent robotic sorting, predictive and prescriptive maintenance, predictive and prescriptive fleet management, dynamic route optimization, autonomous last mile delivery, autonomous last yard delivery, optimized documentation, smart lockers, virtual assistants, connected trade platforms, smart billing, costing & reconciliation. Assessing the state of 14.0 industry development in Singapore, logistics companies are at different stages in their digitalization journeys. The type of technology solutions used varies on strategic priorities and prospective competitive advantage.

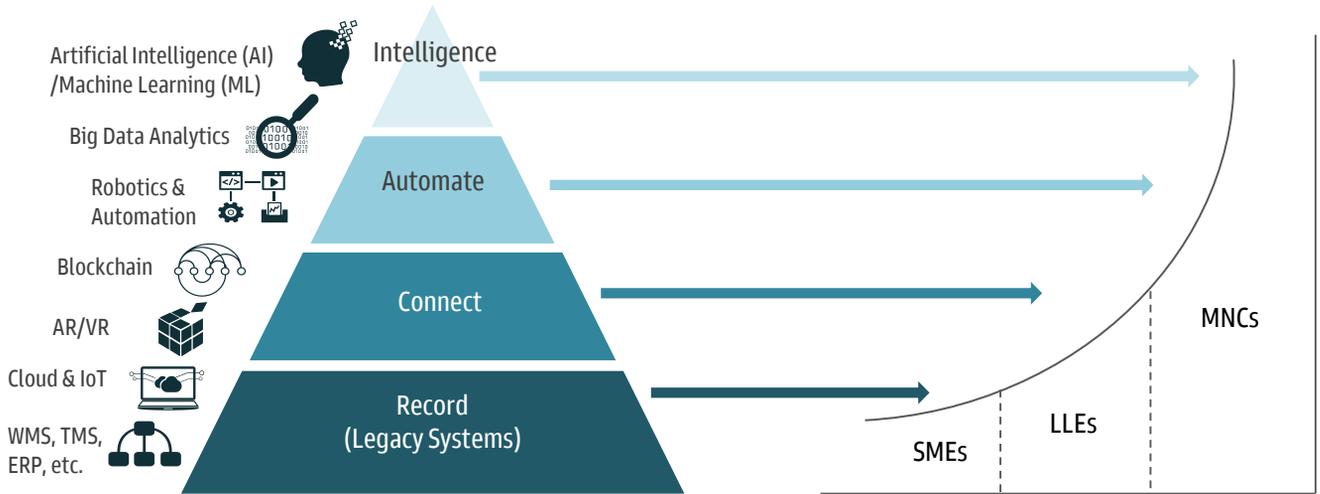
In Singapore, SMEs typically have a limited digital vision and financial resources. Therefore, Singaporean SMEs mainly use WMS, TMS and other simple optimization tools for route planning. Due to cost barriers, these solutions di-

Table 4: Key technology solutions sought after by 3PL operators in 2021 and demand forecast for 2022

Technology	2021 % reported by shippers	2022 % reported by shippers
Control tower visibility (visibility, tracking & asset management)	37%	60%
Transportation management (scheduling)	72%	51%
Transportation management (planning)	69%	51%
Cloud-based solutions	23%	49%
Transportation sourcing	51%	40%
Warehouse/distribution center management	51%	38%
Advanced analytics and data mining tools	27%	38%
Web portals for booking, order tracking, inventory management, and billing	40%	36%
Supply chain planning	35%	30%
Customer order management	29%	30%
Customer relationship management (CRM)	17%	28%
Global trade management tools (including customs processing and import/export documents management)	17%	26%
Distributed order management	29%	21%
Tard management	27%	21%
Network modeling and optimization	45%	19%
Warehouse automation	27%	17%
Radio-frequency identification (RFID)	9%	13%
Blockchain	8%	9%
Robotic process automation (RPA)	12%	9%
Wearables (biometrics, health & safety, etc.)	9%	2%

Source: Singapore Institute of International Affairs

Figure 14: 14.0 industry technology adoption curve



igitize mainly a part of work, leaving operations manual and dependent on human intervention. Logistics players with better financial capabilities, LLEs and MNCs, focus on the adoption of IoT, cloud, blockchain, AR/VR, robotics to partially automate processes and operations. Lastly, more MNCs aim to fully digitize operations to achieve centralized management of operations led by a CIO and CTO. At the last stage, MNCs are able to stay ahead of supply chain disruptions by leveraging on big data and artificial intelligence for predictive and prescriptive capabilities.

Going forward, more logistics companies in the early stages of digital adoption are going to move up the digitalization curve (Figure 14) in line with the development and entrance of new 14.0 technology enablers. In Singapore, the adoption timeline for 50% of these companies is expected to stand at 5 years (Source: Ernst & Young).

Source: Ernst & Young

Table 5: 14.0 technology solutions by logistics sector

Sector	14.0 technology solutions
Warehouse management	Smart inventory counting; picker to parts & parts to picker automated storage and retrieval systems (AS/RS); intelligent robotic sorting; predictive & prescriptive maintenance
Transportation	Predictive fleet management; dynamic route optimization; autonomous last mile delivery; autonomous last yard delivery
Freight forwarding	Smart billing; costing & reconciliation; connected trade platforms
Sales & customer service	Smart lockers; round-the-clock customer service via virtual assistance; optimized documentation

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