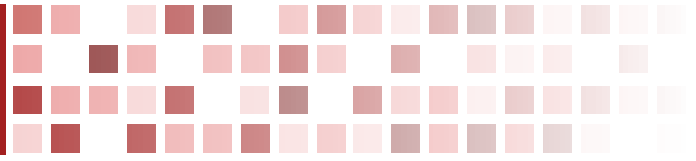# *Building connected supply chains*

Potential for digital solutions to transform supply chains in the Asia-Pacific region

pwc

Need for digital supply chains

A typical industry supply chain comprises multiple segments including sourcing, production, transport and logistics (inbound and outbound), warehousing and distribution. This report focuses on understanding the need and the way forward for digital adoption across internal company functions and external segments that impact the movement of goods – to and from the manufacturing site – and excludes the adoption of technologies impacting production operations within the manufacturing plant.

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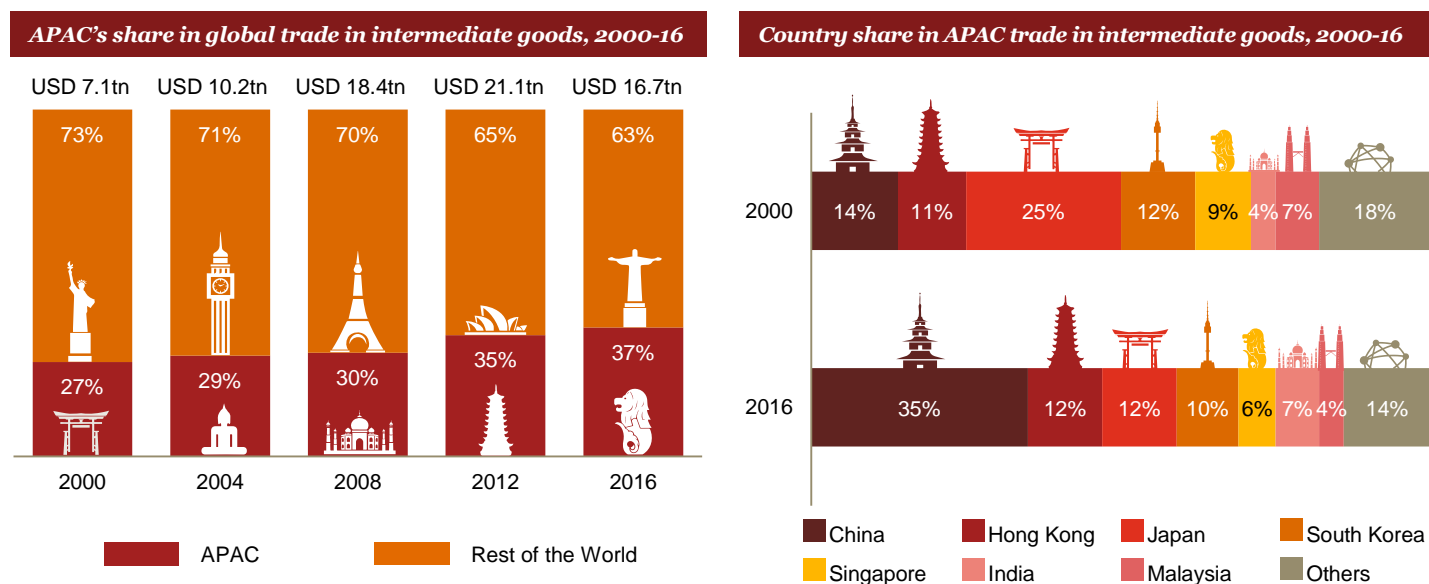# Evolving role of Asia-Pacific in Global Value Chains (GVCs)

The global production landscape has undergone significant changes over the past few decades, with companies spreading their supply chain networks across multiple locations worldwide to benefit from cheaper labour, regulatory incentives and proximity to growing consumer markets. The shift in manufacturing activity to new locations has been further driven by rising trade liberalisation and improvements in global connectivity, facilitated by multiple trade agreements and regional coalitions.[1] Together, these developments signify global sourcing at an unprecedented scale, leading to growing trade in intermediate goods coupled with the tendency to establish new production hubs. As per estimates, GVCs managed by multinational enterprises already account for almost 80% of global trade.[2]

Driven by these trends, the past few decades have also seen the Asia-Pacific (APAC) region emerge into a major production and logistics centre for global supply chains – led by Japan and South Korea's focus on product design and high-tech manufacturing, China's remarkable rise in lower-value production and assembly, and the emergence of major logistics and finance hubs in Hong Kong and Singapore. More recently, fast growing wages in China have also driven many firms, especially those in labour-intensive production, to shift base to new low cost locations in India and emerging ASEAN markets such as Vietnam, Myanmar and the Philippines.[3] As shown in figure 1.1, APAC has established a strong presence in GVCs, accounting for the largest regional share in global trade in intermediate goods in 2016. APAC trade for intermediate goods grew threefold over 2000-16, with about 85% of trade flows in 2016 being concentrated in select markets including China, Hong Kong, Japan, South Korea, Singapore, India and Malaysia.[4]

The dominance of APAC in global trade is projected to continue. As per PwC estimates, 16 of the top 20 bilateral trade routes worldwide by 2030 will include APAC markets. Overall, these leading routes will represent USD 4.7 tn in trade value by 2030, with routes involving APAC accounting for more than 80% share.[5] However, there still exist multiple challenges including infrastructure gaps, operational complexities and evolving market dynamics that need to be addressed to achieve this goal and strengthen APAC's position in global supply chains. APAC businesses are accordingly expected to push for greater digital adoption to manage these issues more effectively in the coming years.

Figure 1.1: Asia-Pacific's role in Global Value Chains

APAC's share in global trade in intermediate goods, 2000-16

Country share in APAC trade in intermediate goods, 2000-16

Source: UN Comtrade Database, International Trade Statistics, 2016
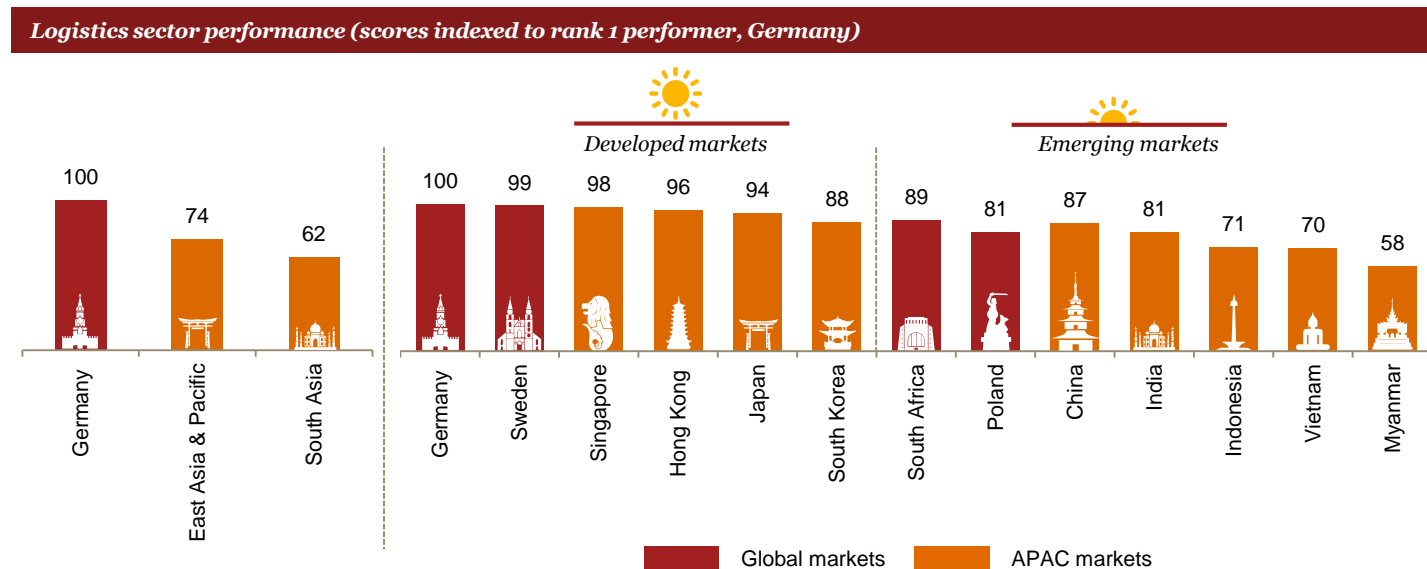
Gaps in logistics performance

Despite strong improvements in select markets over the past few years, APAC continues to lag in overall logistics performance. As shown in figure 1.2, while developed hubs such as Singapore and Hong Kong have achieved global leadership in logistics performance, emerging markets in Southeast Asia continue to fall behind their counterparts. Regional aggregates for South Asia are also significantly below the global leader, Germany. This is mainly due to factors such as unfavourable regulatory conditions, infrastructure gaps (including weak land and sea connectivity) and inefficient operational practices that lead to significantly higher logistics costs and greater supply chain vulnerabilities in emerging APAC markets. For example, while logistics costs represented 9% of GDP in Germany in 2016, they accounted for about 13% of annual GDP in India and a high 21% in Vietnam.[6]

These gaps have driven the demand for third-party logistics (3PL) services in the region, with companies, especially international players, looking at outsourcing specific logistics services to reduce inventory and fixed-logistics costs while improving supply chain reliability. Considering the poor state of logistics infrastructure and rising operational

complexities (discussed in sections that follow), demand for 3PL services has understandably grown most significantly in the Asia-Pacific region, by more than 6% annually over 2010–16 (compared to a 2.8% CAGR globally). Consequently, APAC is also the largest market for 3PL services with a 38% share of global revenues in 2016.[7]

The imperative for catch-up in logistics performance, mainly in emerging APAC markets, is expected to drive the adoption of digital solutions going forward – more so among the many 3PL players operating in the region. Limited legacy issues will act as an advantage for emerging markets, for them to adopt next-generation technologies to improve the efficiency and resilience of their supply chain networks. For example, a leading logistics services provider in APAC has introduced a new digital solution to manage shipment-related decisions in real-time. Based on predefined business rules, the solution automatically decides the best shipping options as per changing demand and supply trends to optimise supply chain performance. Other large-scale 3PL companies operating in the region are also piloting new technologies such as wearables and autonomous transportation solutions to improve operational effectiveness.[8]

Figure 1.2: Logistics gaps between APAC and global markets

Logistics sector performance (scores indexed to rank 1 performer, Germany)

Developed markets

Emerging markets

Germany	East Asia & Pacific	South Asia	Germany	Sweden	Singapore	Hong Kong	Japan	South Korea	South Africa	Poland	China	India	Indonesia	Vietnam	Myanmar
100	74	62	100	99	98	96	94	88	89	81	87	81	71	70	58

Global markets   APAC markets

Source: World Bank, Logistics Performance Index Dataset, 2016

Rising supply chain complexity

Besides acting as a supplier to global markets, APAC is also becoming a major consumer of global products. Over the years, rapid economic growth in APAC has improved purchasing power in less tapped markets, attracting global firms to cater to the region's fast growing consumer base. Intra-regional trade is especially on the rise, connecting new domestic markets with regional and global supply chain networks. As per UN estimates, intra-regional trade already accounted for a majority 56% of APAC exports and 58% of imports in 2016.[9] With this rising complexity, effectively managing the associated risks has become a growing priority for APAC firms, leading companies to look for new ways of improving their supply chain performance.

To drive this, supply chain operations are expected to evolve from a traditional linear approach to an integrated digital model, with multi-nationals looking to establish centralised, technology-driven hubs to better manage their regional networks. These central hubs will connect to different elements of the supply chain (production, warehousing, logistics etc.) through a network of track and trace technologies, and manage them in real-time through a centralised data analytics engine. Advanced logistics hubs such as Singapore and Hong Kong show a strong potential for evolving into digital nerve centres managing supply networks in APAC in the coming years. These locations have the need to manage significant volumes of trade flows, and are equipped with quality institutions, infrastructure and support services that are required to maximise the impact of a sophisticated digital supply chain model.[10]

Changing market conditions

Market dynamics in APAC are in a state of flux, with consumer needs and business conditions experiencing major shifts that are driving digitalisation. An unprecedented growth in the middle class and income levels is leading to changes in consumer preferences – marked with rising demand for product choice, improved visibility of orders and quicker order fulfilment. Consumers are also expecting higher quality and safety standards while governments are strongly pushing the sustainability and corporate accountability agenda, thus driving up compliance costs for firms.[11]

Case example:

Driven by recent food safety related incidents, new regulations have been adopted in China to tighten controls on food supply and production, and provide greater enforcement powers to local authorities. The revised laws are considered among the most stringent adopted in the country so far, and are expected to significantly raise the cost of doing business in the sector. In another market, listed companies in Singapore face growing regulatory pressures, as they would need to disclose implementation of anti-corruption policies all along their supply chain in both domestic and overseas markets, as part of mandatory reporting expected to take effect in 2018. [12]

Overall, the changing market conditions are increasing competitive pressures on companies to improve their top-line by expanding market reach and by offering more personalised products and services – while managing higher costs associated with improving customer experience, entering untapped regions and meeting stricter traceability standards. These evolving dynamics are in turn pushing the need for technology adoption by companies at the front end (through online sales channels) – supported at the back end by a digitally connected supply chain that ensures the visibility, reach and agility demanded by consumers.[13] Online sales are witnessing unprecedented growth in the APAC region, pushing with it the demand for technology-led 3PL services on the supply side. Going forward, APAC is projected to account for the largest share in retail e-commerce sales worldwide (66%) by 2021 – indicating significant scope for digital adoption to effectively manage its fast-growing order flows.[14]
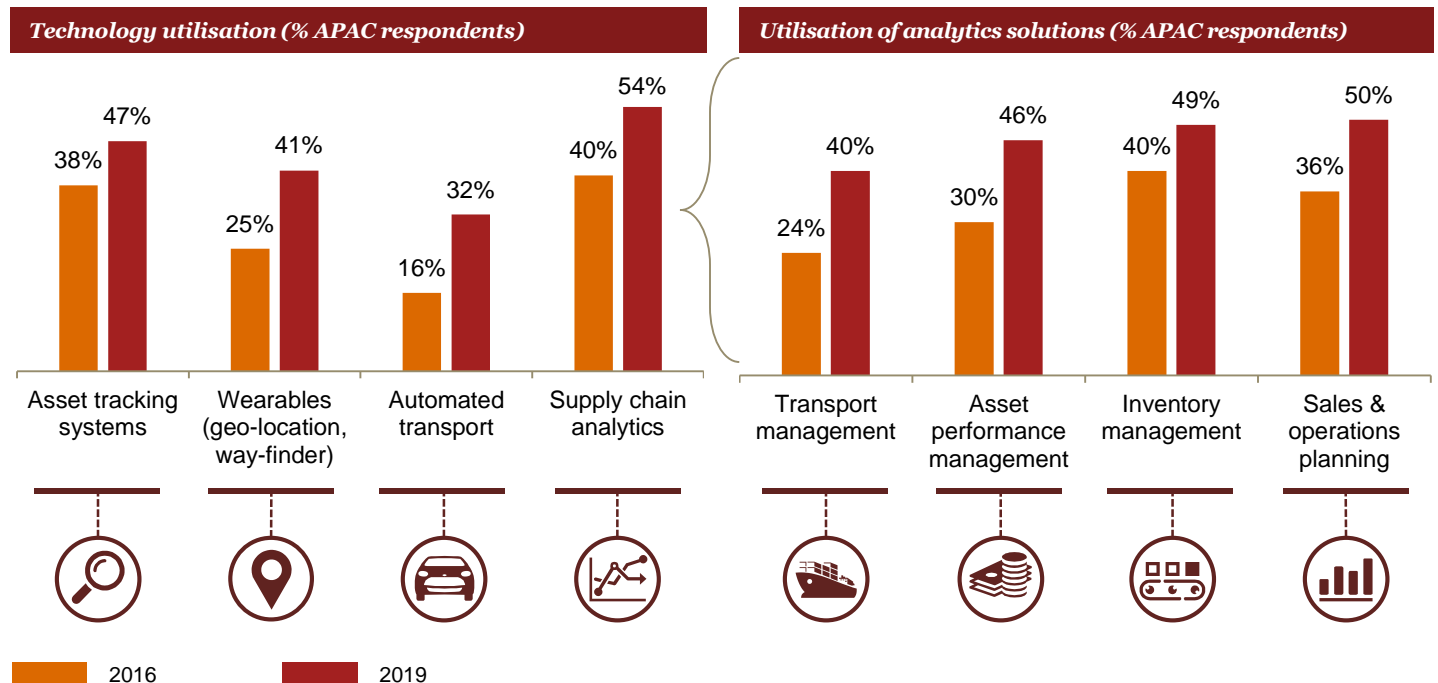
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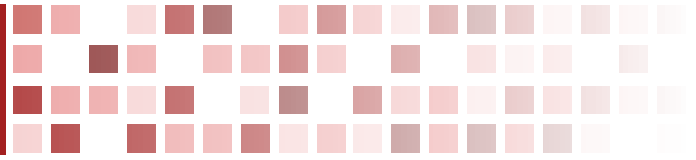
Rising supply chain digitalisation in APAC

A strong need and rising interest in supply chain digitalisation is already visible, both worldwide and in the APAC region. Globally, the push towards digital supply chains is increasing, with survey respondents who recognised the digital supply chain as 'disruptive and important' growing from 49% in 2014 to a majority 67% in 2016.[15] Another study of consumer brands further highlights the push towards supply chain technologies in APAC, driven by concerns such as the need for market expansion (57% respondents), rising industry competitiveness (54%), changing demand patterns (45%) and increasing compliance pressures (37%). As per survey results, while a notable percentage of APAC

respondents (around 40%) agreed to have already deployed technologies such as simpler collaboration applications and supply chain analytics, utilisation is expected to rise beyond 50% for these applications in the coming years. Analytics in particular is expected to gain strong traction, with a large percentage of companies planning to adopt these solutions to manage sales operations, inventories, asset performance and transportation. Though more nascent technologies such as wearables and automated vehicles have seen limited uptake (a quarter of respondents or less), a large percentage of APAC businesses expressed plans to adopt these over the next few years.[16]

Figure 2.1. Digital supply chain technology adoption in APAC

Technology utilisation (% APAC respondents)

	Asset tracking systems	Wearables (geo-location, way-finder)	Automated transport	Supply chain analytics
2016	38%	25%	16%	40%
2019	47%	41%	32%	54%

Utilisation of analytics solutions (% APAC respondents)

	Transport management	Asset performance management	Inventory management	Sales & operations planning
2016	24%	30%	40%	36%
2019	40%	46%	49%	50%

■ 2016   ■ 2019

Source: IDC, Digitisation trends in Brand-Oriented Value Chains in Asia-Pacific (excluding Japan), 2016

In terms of impact, global supply chain professionals anticipate notable improvements in profitability from digitalisation in the coming years. As per a PwC study, transportation and logistics companies worldwide expect a 3.2% reduction in annual costs combined with a 2.7% increase in annual revenues, through digital adoption over the next five years.[17] Considering the inherent need to counter its challenges around higher logistics costs and fast changing business dynamics (as discussed in section 1), the uptake of digital solutions could be expected to yield an even stronger impact among players operating in the APAC region.

Besides digital uptake by the corporate sector, improvements in supply chain performance will also depend on the state of logistics infrastructure and institutions required for efficient operation. Keeping this in mind, governments and regulators in APAC will also need to play a major role in pushing digital adoption, especially within logistics infrastructure to improve monitoring and to facilitate faster clearances.[18] Leading supply chain hubs in APAC such as Hong Kong and Singapore have accordingly launched initiatives to push technology adoption, and evolve into next-generation centres managing regional trade flows and supply networks.

Case example:

Singapore launched Project SAFER (Sense-Making Analytics for Maritime Event Recognition) in 2017, to optimise port operations by adopting predictive analytics and machine learning based solutions that improve vessel tracking, detect illegal activities and accurately predict vessel arrivals, among a range of other applications. The Maritime and Port Authority of Singapore also invited start-ups to pitch solutions based on digital technologies such as Internet of Things, Data Analytics and Artificial Intelligence, and will be extending funding support to develop chosen solutions while testing these with its industry partners. Besides these, Singapore also launched a new trade services platform (called the Global e-Trade Services or GeTS platform), connected to multiple foreign government agencies and businesses, to enable faster cross-border clearances.[19]

On the other hand, Hong Kong has set-up a logistics and supply chain R&D centre to develop solutions targeted at increasing adoption among small and medium-sized enterprises. The centre has developed low-cost tools to improve supply chain performance (such as a wearable RFID reader that costs USD 64 as compared to market options above USD 1,000), offers programs to push regular software upgrades and has piloted new training systems based on Virtual Reality and Artificial Intelligence.[20]

Emergence of new digital solutions

As discussed earlier, industry players in APAC are increasingly looking at new solutions to evolve to a connected and 'smarter' supply chain model that improves their overall operational effectiveness. A next generation of digital solutions based on technology platforms such as Analytics, Artificial Intelligence (AI), the Internet of Things (IoT) and Blockchain, are accordingly expected to gain adoption to realise this objective. As highlighted in figure 2.2, these technology solutions will impact different sets of supply chain attributes – including visibility, efficiency, resilience and reach – that will collectively enable greater supply chain effectiveness in the coming years. These key attributes are defined as:

1. Visibility: Ability to view operations across multiple supply chain segments in a timely manner
2. Efficiency: Ability to reduce order fulfilment time, though faster order processing and transport
3. Resilience: Ability to adjust for and recover from sudden fluctuations and unanticipated disruptions
4. Reach: Ability to extend the span of delivery networks to remote customer locations

However, adopting these new tools alone will not be enough to maximise the impact of digital adoption, and companies will also need to build a set of supporting capabilities – working with multiple parties involved in the supply chain including external suppliers, regulators, service providers and customers. These horizontal capability requirements (achieving ecosystem-level integration, developing a robust implementation roadmap and bridging talent and infrastructure gaps) will be key to building an optimal digital transformation strategy for the company, as detailed in section 3.

Figure 2.2. Improving supply-chain effectiveness in APAC

Technology platforms	Technology solutions	Supply chain effectiveness			
		1 Visibility	2 Efficiency	3 Resilience	4 Reach
Analytics	Next-generation analytics	✔	✔	✔	
Automation /Artificial Intelligence (AI)/Augmented Reality (AR)	Autonomous transportation		✔		✔
	Wearables	✔	✔	✔	
Internet of Things (IoT)	Asset Tracking	✔			✔
Block chain	Smart Contracts	✔	✔		
Supply-chain wide capabilities	Enabling ecosystem-wide integration				
	Developing an implementation roadmap				
	Plugging talent and infrastructure gaps				

Source: PwC analysis

The following pages detail these new digital solutions expected to gain significant traction in APAC markets:

Next-generation analytics[21]

Supply chain challenge:

- Supply chains in APAC are becoming more complex and difficult to manage, led by rising fragmentation of supply networks, growing number of SKUs to satisfy consumer demand for personalisation, and the proliferation of e-commerce and omni-channel business models.
- This growing complexity is making it difficult to understand how disparate parts of the supply chain interact, and where possible bottlenecks or areas of optimisation could be located.
- Rising competitiveness and stricter traceability regulations have increased the costs of making sub-optimal decisions, and most analytics tools adopted today are proving inadequate to manage these complexities. These tools are limited in use of data sources and are mostly 'descriptive' in scope – restricted to describing locations, sources of demand or expected schedules for delivery.

Smart solution:

- Next-generation analytics solutions are moving beyond describing only the current state and aim to optimise decision-making within the supply chain. They are more focused on analysing the 'predictive' element of supply chain performance, to better understand the future state.
- These solutions are able to detect data-based signals from the market to anticipate changes in demand patterns, and thereafter translate these variations into changes in supply chain requirements such as production capacity, storage and logistics needs.
- More sophisticated solutions are also looking to integrate vast pools of data inputs from multiple sources such as weather, traffic and social media – besides from all supply chain segments – to enhance the 'prescriptive' power of decision-making. These solutions not only provide managers with the most optimal scenario but also suggest ways to achieve it.

How it helps:

Visibility:
Provides end-to-end visibility of supply chain performance, integrating data from multiple segments and notifying managers in real-time of any changes in key operational metrics.

Efficiency:
Enables efficient planning and scheduling of operations, evaluating the impact of changing conditions to order fulfilment while also suggesting optimal ways of making improvements.

Resilience:
Allows managers to minimise bottlenecks by building 'what-if' scenarios that adjust supply chains in real-time. Also enables them to quickly and effectively respond to any sudden disruptions.
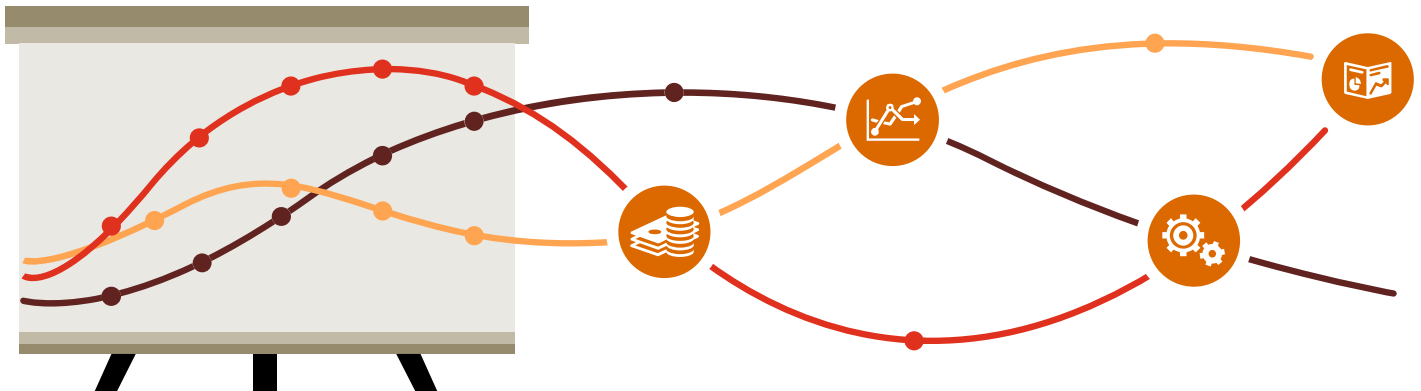
Autonomous transportation[22]

Supply chain challenge:
- Considering the inherent infrastructure gaps, regulatory barriers and procedural inefficiencies, transportation and logistics continue to represent major cost areas for companies in APAC.
- Transport, storage and handling of goods represent highly labour-intensive activities in the supply chain. Fast rising labour costs and stagnating productivity levels are increasing the pressure on company margins in the APAC region.

Smart solution:
- Advanced automation solutions such as autonomous forklifts and pallet movers are increasingly being adopted for intra-warehouse logistics, benefiting from the structured environment of the warehouse and limited regulatory interventions (as compared to adoption across public infrastructure), to help reduce labour costs while also improving productivity levels.
- For external transport, hybrid models such as truck platooning are being tested in developed parts of APAC (such as in Japan, Singapore), where a series of autonomous trucks are able to follow a lead truck piloted by a human employee with the help of mapping software and short-range radars. The model helps address safety concerns around lack of human intervention, while benefiting from greater automation.
- Autonomous drones are gaining adoption for indoor applications such as stock-taking in the warehouse, which is a highly tedious process, prone to human errors. These solutions help optimise inventory management by reducing the time taken to make inventory counts from multiple days to a few hours, while improving accuracy and reducing labour costs.
- Besides this, solutions involving drones are also being piloted for last mile operations, testing their viability for same-day delivery and delivery to remote areas. China has taken a lead in the region in terms of developing standards for beyond line-of-sight (BLOS) drone operations, while Japan plans to begin commercial flights into urban areas and remote locations by 2020.

How it helps:

Efficiency:
These vehicles can operate for longer hours, while communicating in real-time with a smart warehousing system that optimises traffic flows and operations such as docking, storage and intra-warehouse movements. This helps reduce order processing and delivery time, while minimising human error and accidents.

Reach:
Automation combined with optimal routing and fleet management enables companies to reduce labour, fuel and maintenance costs – allowing expansion to untapped regions, which were unprofitable or geographically difficult to reach through traditional means, due to limited demand or infrastructure gaps.

Wearables[23]

Supply chain challenge:

- Order picking represents a highly labour-intensive and costly activity, requiring employees to navigate through the warehouse to find products using handheld terminals or paper-based documentation. As per estimates, this time-consuming activity could represent 55%-65% of operating costs in a warehouse, and thus has a major impact on overall supply chain effectiveness.
- Rising penetration of e-commerce and proliferation of product SKUs is further increasing the pressure on warehousing operations, to expedite tasks while managing much higher order volumes.
- Lastly, much of the equipment involved across the supply chain (trucks, production machinery or forklifts) requires technical knowledge to make repairs. This could also be a cause of delays, resulting from machine downtime while waiting for experienced technicians to arrive.

Smart solution:

- Emerging wearable systems such as 'pick-by-vision' smart glasses provide an optimised picking list for workers, navigating them through optimal routes to find the right products in lesser time and with lower training requirements.
- IoT-linked wearables equipped with scanning technologies are also integrated with the warehouse management system, to keep track of stock levels in real-time.
- Smart vision combined with voice technology could be used by employees to complete minor equipment repairs without the need for on-site technical assistance. Solutions are also being tested to visually guide workers through the steps required to repair or configure machinery.

How it helps:

Visibility:
Provides greater insight into warehouse operations by providing workers with real-time updates, while enabling inventory levels and worker safety to be monitored through sensors or IoT devices.

Efficiency:
Optimised information is made available on hands-free devices, expediting key tasks and improving accuracy. Also encourages efficiency benefits from multi-tasking and more informed decision-making.

Resilience:
Remote technicians or automated inputs can assist non-technical employees to tackle minor equipment or process related issues, reducing system downtime and minimising the impact of sudden disruptions.

Asset tracking[24]

Supply chain challenge:

- As supply chains increase in complexity and regulatory standards get stricter, asset traceability has become paramount to achieving competitive advantage in the market.

- With production plants and end user markets venturing into new untapped regions, thefts in the supply chain (of goods, fuel and machinery) have also become a major risk for companies.

- In such conditions, data on how various assets (people, products and equipment) move through the supply chain has become core to improving its overall effectiveness - by helping identify and even anticipate potential bottlenecks.

Smart solution:

- Asset tracking systems based on devices utilising IoT, RFID and other technologies (Bluetooth or GPS) are being adopted to record and transmit real-time information about the location and condition of an asset. Common pallet identification standards such as the GS1 Serial Shipping Container Code (SSCC) are also being adopted to allow easier interoperability among multiple third-party service providers.

- By improving supply chain awareness, an effective asset tracking system serves as a building block of the digitally integrated supply chain, connecting each element of the network with the central hub to enable seamless capture and exchange of operational data. Tracking data serves as an essential input for advanced predictive and prescriptive analytics solutions that help supply chain managers in making more optimal decisions.

- New technologies such as blockchain are increasingly being tested to keep unalterable records of asset provenance. For example, keeping track of product origination and shipment transactions, these systems are being deployed for agriculture products in APAC to meet stricter safety standards.

- Blockchain adoption to track supply chains is expected to gain strong traction in the coming years, with almost one-third of industry players worldwide expected to adopt such solutions by 2021. This uptake will be driven by new global partnerships such as the Blockchain in Transport Alliance or BiTA, formed in 2017, to develop technology standards and educate the industry on potential applications and benefits. The alliance brings together multiple stakeholders including leading technology vendors, OEMs, suppliers, consultants, financers and logistics services providers – to facilitate blockchain adoption in the global freight industry. The alliance aims to publish its first set of standards in 2018.

How it helps:

Visibility:

Tracks and records status in real-time across stages – including sourcing (movement of raw materials, spares), warehousing (storage locations, conditions such as temperature and humidity, inventory counts), transport & logistics (asset location, performance) and the end customer (point-of-sale data).

Reach:

Lowers the risk of extending reach to new regions, both in terms of sourcing of raw materials and last-mile distribution. Asset traceability allows companies to constantly monitor quality and other operational metrics in real-time – in locations that were earlier beyond supervision and prone to misconduct.

Smart contracts[25]

Supply chain challenge:

- Supply chain transactions such as trade finance or customs clearances involve multiple parties (regulatory bodies, trading partners, banks, clearinghouses, insurance firms etc.), numerous procedures and significant paper-based documentation that is mostly completed on a manual basis – making it prone to delays (and loss of perishable shipments) and human error.
- Growing fragmentation of supply networks is further increasing the complexities of maintaining multiple ledgers for businesses, with paper-intensive processes being inefficient and less secure.
- Changes in the international trade climate (imposition of protectionist non-tariff barriers, security concerns) are also causing tighter border controls, further driving up compliance time and costs.

Smart solution:

- Smart contracts are digital contracts that automatically trigger transactions (such as the remittance of funds) when certain pre-defined conditions are met (such as ships entering a port or goods arriving at a warehouse). These conditions are monitored in real-time using asset tracking technologies such as IoT devices or RFID-based geo-fencing solutions.
- Data inputs are automatically captured and stored securely on the blockchain, which once implemented is transparent to all participants and is unalterable unless all parties are in consensus. Digital contracts are integrated with the ERP or warehouse management system to enable automated processing of transactions, such as the release of payments post a delivery confirmation.
- Similar to blockchain-based tracking solutions, adoption of smart contracts is also being pushed by new global alliances, especially between industry-specific organisations. For example, the Blockchain in Transport Alliance (focusing on freight) has collaborated with the Wall Street Blockchain Alliance (focusing on financial services) to work jointly on facilitating the adoption of smart contracts in the supply chain finance and transport functions.

How it helps:

Visibility:
Improves awareness and accuracy of transactions by maintaining a single record among participants in real-time. A permission-based system that grants selective access, equipped with an unalterable program code (contains terms for contract execution) enables greater transparency with trust.

Efficiency:
Shared digital ledgers enable easier multi-party verification, which helps expedite and optimise processes. Digital contracts significantly reduce the extent of manual involvement and eliminate intermediaries, while also making it easier and faster to fix accountabilities and take corrective action.
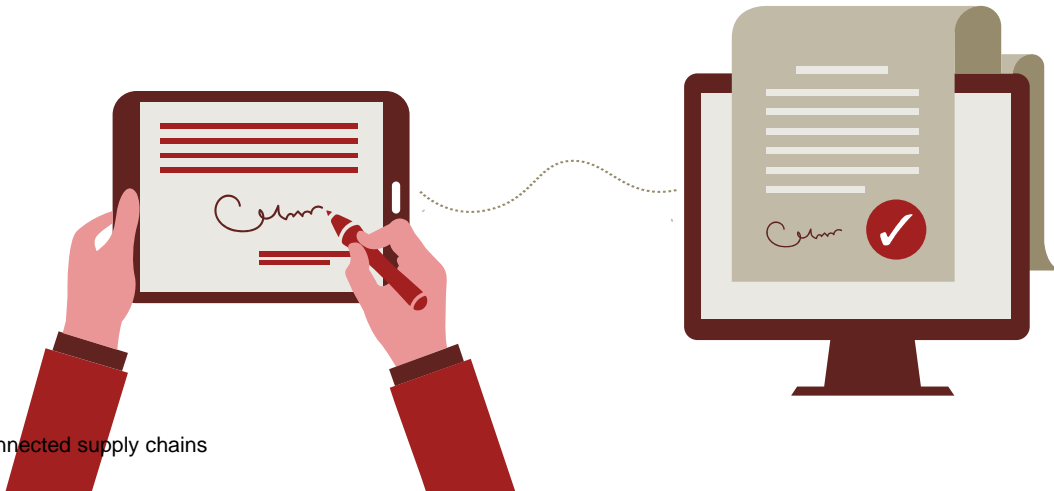
Capabilities for success
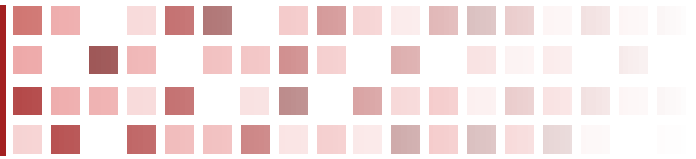
Going forward, the effectiveness of supply chain networks will be a key contributor to global competitiveness, driving both governments and private sector firms towards digital adoption. As per a recent PwC study covering over 2,000 company executives, 33% of leading companies worldwide have started investing in digital supply chain deployments while 72% plan to achieve high levels of digitalisation over the next five years. Many of these firms are also anticipating a significant first-mover advantage by building digital supply chains across their focus markets – consolidating their market position by expanding reach, influencing technical standards and establishing stronger customer relationships.[26]

As a major participant in global production and trade networks, these trends will also influence the competitiveness of the APAC region. Companies in APAC will accordingly need to develop new capabilities and address organisational challenges to benefit from the emerging digital supply chain. As digital technologies become more imperative for success, leaders in the region will need to focus on building more effectively integrated networks as well as bridge talent and infrastructure gaps, while being governed by an overall change roadmap to optimise the pace and scale of digital adoption.

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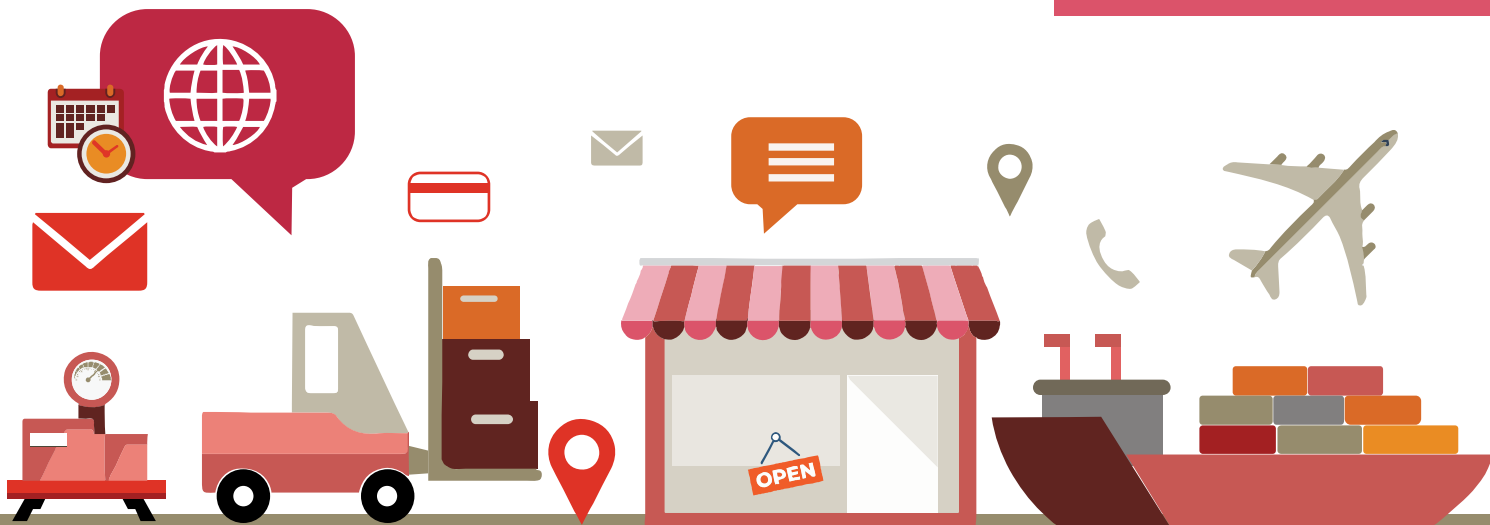
Enabling ecosystem-wide integration

As supply chains become geographically more diverse and complex, factors such as the ability to collate large volumes of data, extract valuable insights and suggest an optimal response in real-time to the right stakeholders, will become key competitive differentiators. To achieve this, the supply chain needs to be fully integrated, including connections with multiple third-party participants. Such an integrated model will ensure high level of awareness and collaboration along the supply chain – seamlessly exchanging information on operational conditions such as demand, inventories, capacity limitations or extensions in delivery time. It will allow decision-makers to evaluate changes against a set of criteria (e.g. financial metrics or the impact on other orders) and identify an optimal solution, to be communicated in real-time along the network.[27]

New structural models are emerging to help maximise the impact of digital integration. Going forward, supply chains will need to evolve from operating in linear silos, to an integrated model managed by centralised hubs – acting as 'single sources of truth' – responsible for multiple aspects, including collating and analysing information (from tracking devices, social listening, traffic feeds etc.), making optimal choices, alerting stakeholders of potential disruptions and informing them of remedial actions.[28] Besides these structural changes, building a fully-integrated supply chain will also require new data processes to be established for effective information sharing. To make this shift, companies would need to improve data governance standards by establishing codified practices around data ownership (who is internally responsible for the data), data sharing (when to share data, when to withhold) and dispute resolution (data-related issues with partners). Utilising cloud-based collaborative platforms, companies will need to work with their external partners to co-develop and adopt more sophisticated processes for information-exchange, ones that create the incentives for data sharing while addressing concerns over data transparency and confidentiality.[29]

Developing an implementation roadmap

To put strategies into action, companies must develop a detailed roadmap to navigate through the adoption of new technologies, processes and skills required by this new data-driven and customer-centric environment. Lack of a comprehensive adoption roadmap remains a major area of concern for the industry, with the largest set (45%) of global supply chain executives listing this as their primary barrier to digitalisation, far outweighing commercial concerns such as 'lack of a clear use case' (10%) or a 'lack of budget' (10%). Multiple aspects highlighted below will be key to developing such a transformation plan.[30]

Assess maturity, assign accountabilities

- Identify areas where inefficiencies exist and where technology adoption could be most impactful.
- Clearly define the standards for technology deployment to be taken forward (e.g. deployment should result in at least x% increase in revenues and y% drop in costs within year n of adoption).
- Adopt a new set of output and process-related metrics to monitor and drive digital transformation.
- Assign these metrics to specific individuals to be held accountable for progress.
- Revise HR strategies to incentivise staff to achieve these desired metrics.[31]

Deploy pilots, co-develop processes

- Deploy pilots to understand capability gaps and to showcase benefits of adoption to key stakeholders.
- These projects should test the technologies on a specific supply chain segment, and focus on developing an agile working approach with customers, supply chain partners and technology vendors.
- Internal experts and external partners must be invited to suggest improvements, incorporating their feedback into an iterative adoption process.
- By involving all stakeholders, a sense of co-creation can be fostered, ensuring they realise the benefits of technology adoption rather than consider it as an interruption to established work flows.[32]

Prioritise roll-outs, collaborate

- Based on results of the pilot exercises, clearly define the roll-out plan including the types of technologies to implement, the processes for data management and the role of key stakeholders.
- Prioritise roll-out across specific supply chains. These priority areas could include major customers, key revenue streams or leading regions – where the benefits of adoption are expected to be the highest, keeping in mind the ease of implementation (change management, investments required).
- Consider collaborations with digital leaders outside the organisation (start-ups, academics or industry organisations) to cover major capability gaps and to accelerate the pace of digital adoption.[33]

Plugging talent and infrastructure gaps

To make the transition to the new digital landscape, organisations must also focus on building integration-ready infrastructure. Advanced analytics and associated technology infrastructure (such as IoT, unified communication platforms etc.) must be adopted to generate meaningful insight from the huge volumes of data produced from integration. Leading organisations are also increasingly moving to cloud-based solutions, especially in functions involving interactions with multiple third-parties (such as transport management). To manage legacy issues, implementation plans must establish clear schedules for decommissioning or 'sun-setting' of old systems. By establishing these, a modular approach to digitalisation can be taken that involves the adoption of intermediary solutions (such as hybrid cloud, Integrated Platform as a Service or iPaaS), as legacy systems are taken offline and new technology is added. Adopting a step-wise approach also ensures stronger oversight, reducing data security risks for the firm.[34]

Detailed skill development plans, outlining hiring and training requirements, will also need to be incorporated as part of the implementation strategy. Skills in sales and data analytics will be important to understand the impact of key influencers (such as pricing, user experience) on customer demand – supply chain experts will be required to anticipate the operational impact of changes in demand or any external disturbances – and technology leaders will be needed to deploy emerging technologies such as IoT, blockchain or artificial intelligence. In addition to new skills, there will be a need to adopt new ways of working within the organisation, promoting agility and breaking down silos to enhance alignment and collaboration across a multi-skilled, cross-functional team. To drive this, the role of a Chief Supply Chain Officer is increasingly becoming important, with the widened scale and scope of digitally integrated supply chains making a leadership-level position at the helm of execution a necessity. The role will need to be granted adequate authority to make key decisions and investments, reporting directly to the senior leadership or the company board.[35]
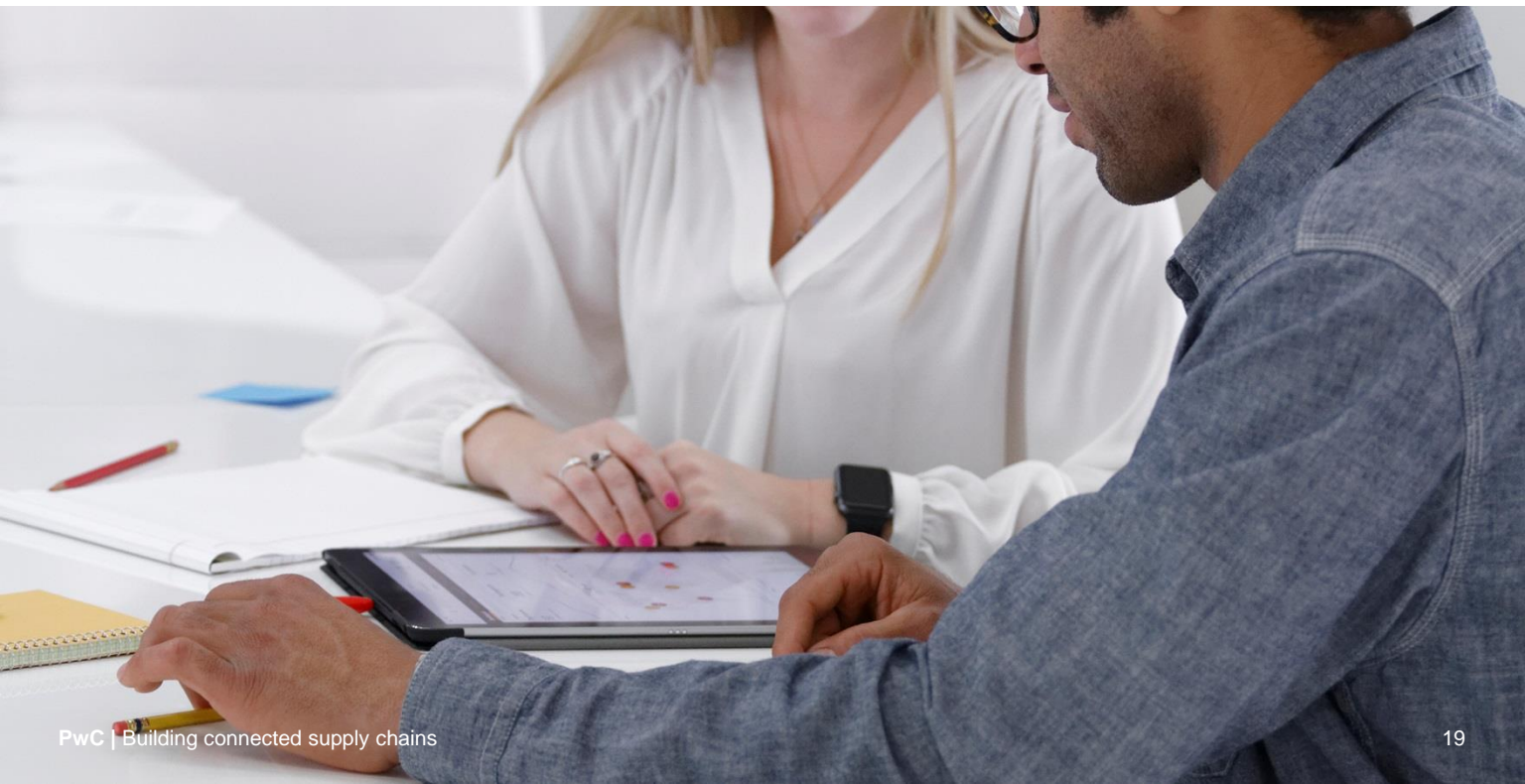
Conclusion

Marked by rising presence in global value chains, the APAC region has evolved into a major production and trading centre over the past few decades. However, challenges such as infrastructure gaps, rising fragmentation of supply networks, stringent regulatory conditions and growing consumer demand for choice, a seamless experience and faster service, have increased competitive pressures on companies. Consequently, the adoption of digital supply chain solutions is on an upward trajectory in APAC, with companies focusing on improving the effectiveness of their supply chains in order to attain a robust competitive advantage in such a dynamic business environment.

New technology solutions are expected to gain momentum, aiming at performance improvement along four attributes: visibility, efficiency, resilience and reach. These solutions will improve supply chain awareness by accurately tracking assets in real-time, while enhancing decision-making by shifting analytical expertise from a descriptive to a prescriptive approach. Other solutions will introduce the benefits of intelligent automation across functions to improve productivity levels while lowering labour and inventory costs. Besides, companies are also piloting next-generation solutions such as smart-vision wearables, autonomous transport systems and blockchain to attain a strong first-mover advantage through digitalisation in the coming years. However, effective implementation of these solutions will require focus on a few other critical aspects. New data governance practices will need to be established, adopting a structure that incentivises information sharing among partners. Finally, a detailed transformation roadmap will need to be developed to put strategy into execution, while addressing skill development and infrastructure gaps for effective implementation.

Traditional model vs. the digitalised supply chain
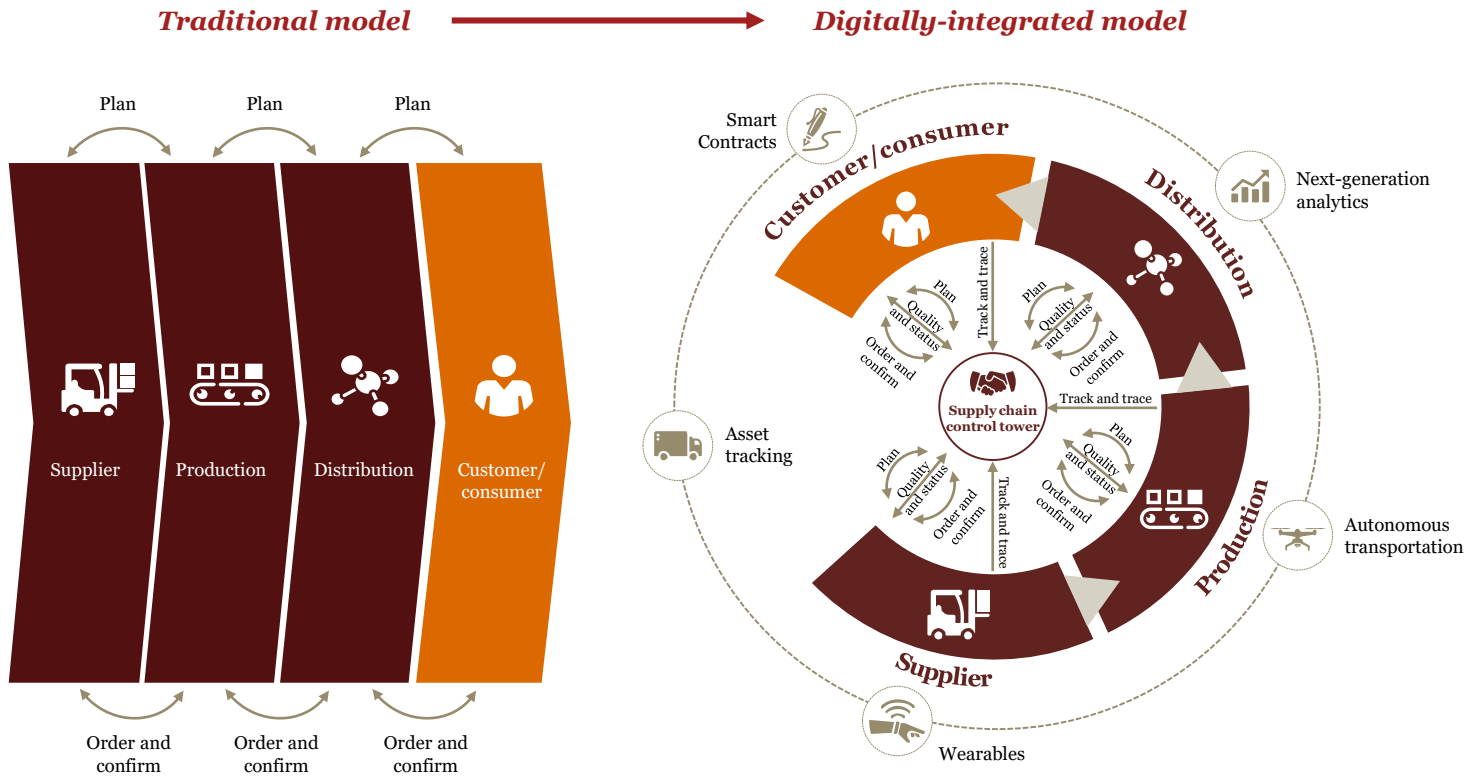
References
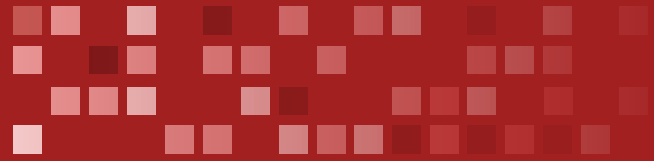
1. United Nations Economic and Social Commission for Asia and the Pacific, Global Value Chains and Interconnectedness of Asia-Pacific Economies, 2015

2. OECD, Making Global Value Chains (GVCs) Accessible to All, May 2014

3. PwC Growth Markets Centre, Winning in Maturing Markets, January 2017; IMF, Reaping the Benefits from Global Value Chains, September 2015

4. UN Comtrade Database, International Trade Statistics, 2016

5. PwC, Global Economy Watch, October 2014; DHL, Demystifying Asia Pacific Trade Trends, May 2016

6. World Bank, Connecting to Compete - The Logistics Performance Index and Its Indicators, 2016; IMAP India, Logistics India Report, 2017; Biinform, Vietnam Logistics Market Report, January 2017

7. Center for Supply Chain Research - Penn State University, 22nd Annual Third-Party Logistics (3PL) Study, October 2017; PwC Growth Markets Centre, Winning in Maturing Markets, January 2017

8. Singapore Economic Development Board, 'Managing complexity in Asian Supply Chains', June 2015; Logistics Insight Asia, 'DHL supply Chain improves safety for warehouse employees', June 2017; Singapore Economic Development Board, 'Katoen Natie to pioneer autonomous driving trucks on Jurong Island', September 2017

9. United Nations Economic and Social Commission for Asia and the Pacific, Asia-Pacific Trade and Investment Report, 2017

10. Singapore Economic Development Board, 'Managing complexity in Asian Supply Chains', June 2015; PwC's Strategy&, How Digitization Makes the Supply Chain More Efficient, Agile, and Customer-Focused, September 2016; The Economist, 'Hong Kong: Leading the way to higher-value logistics', January 2017

11. PwC Growth Markets Centre, Winning in Maturing Markets, January 2017

12. Brookings Institution, 'What China's new food safety law might mean for consumers and businesses', May 2016; Food Safety Magazine, 'China: An Overview of the New Food Safety Law', April 2016; Supply Chain Asia, 'Driving a Sustainable Supply Chain', August 2016

13. IDC, Business Strategy: Digitisation trends in Brand-Oriented Value Chains in Asia-Pacific, 2016

14. eMarketer, 'Asia-Pacific Retail and Ecommerce Sales', August 2017; Supply Chain Asia, 'The Role of Logistics Providers Amidst Asia Pacific's e-Commerce Boom', May 2016

15. Forbes, 'Digitization In Supply Chain: Five Key Trends', November 2016

16. IDC, Business Strategy: Digitisation trends in Brand-Oriented Value Chains in Asia-Pacific, 2016

17. PwC, Industry 4.0: Building the Digital Enterprise Transportation and Logistics Key Findings, April 2016

18. World Bank, Connecting to Compete - Trade Logistics in the Global Economy, 2016

19. OpenGov Asia, 'MPA Singapore completes pilot trial on New Cognitive-Based System to Improve Maritime and Port Operations', August 2017; OpenGov Asia, 'Start-ups pitch digital solutions for the Maritime and Port Authority of Singapore's Smart Port Challenge 2017', September 2017

20. The Economist, 'Hong Kong: Leading the way to higher-value logistics', January 2017; Official website, Hong Kong R&D Centre for Logistics and Supply Chain Management Enabling Technologies

21. PwC's Strategy&, HBR Webinar - Digital & Connected Supply Chain, October 2017; IBM, 'The new era of supply chain begins now', 2017; The Logistics Academy, 'How Big Data And Analytics Are Transforming Supply Chain Management', October 2016

22. Business Insider, 'Amazon looks to further logistics automation', April 2017; Automotive Logistics, 'How autonomous vehicles will impact on the supply chain', November 2017; PwC's Strategy&, How Digitization Makes the Supply Chain More Efficient, Agile and Customer-Focused, September 2016; CNBC, 'Flying warehouse drones are in the works by Singapore's Infinium Robotics', February 2017; Nikkei Asian Review, 'Japan to open its skies to commercial drones', March 2018

23. Inbound Logistics, 'The Who, What, When, and Why of Warehouse Wearables', January 2017; The Logistics Business, 'Order Picking: How efficient is your system', 2017; Supply Chain 247, 'Wearable Technology in the Warehouse', February 2016

24. Forbes, 'How IoT Will Impact The Supply Chain', January 2018; IBM, 'Truck-tracking solution protects cargo with IoT and blockchain', June 2017; Coin telegraph, 'How Walmart, Wells Fargo and Other Multi Billion Dollar Giants Use Blockchain to Check, Keep and Ship Products', December 2016; IDC FutureScape, Worldwide Supply Chain 2018 Predictions, December 2017; Official Website, Blockchain in Transport Alliance

25. IBM, 'Blockchain: four use cases transforming business', May 2017; Wall Street Journal, 'Blockchain and IoT: New Ways to Fight Supply Chain Risks', December 2017; Chamber of Digital Commerce, Smart Contracts: 12 Use Cases for Business & Beyond, December 2016; Freight Waves, 'Wall Street Blockchain Alliance and BiTA announce partnership', February 2018

26. SCM World Leaders Forum, 2017; PwC, Industry 4.0: Building the Digital Enterprise, April 2016

27. PwC's Strategy&, How Digitization Makes the Supply Chain More Efficient, Agile, and Customer-Focused, September 2016

28. Ibid

29. Gartner, The Gartner Supply Chain - Top 25, 2016

30. Forbes, 'Roadmap to Digital Supply Chain', July 2017; SCM World Leaders Forum, 2017

31. PwC's Strategy&, How Digitization Makes the Supply Chain More Efficient, Agile, and Customer-Focused, September 2016; Digital Supply Chain Institute, Digital Supply Chain Transformation Guide, October 2017

32. PwC, Industry 4.0: Building the Digital Enterprise, April 2016

33. PwC's Strategy&, How Digitization Makes the Supply Chain More Efficient, Agile, and Customer-Focused, September 2016; PwC, Change management and communications website, 2017

34. CeMAT Insider, 'Is hybrid cloud right for your supply chain?', April 2017; IT World, 'How integration supports the supply chain evolution', October 2017; Logistics Management, 'The Evolution of the Digital Supply Chain', May 2017

35. Digital Supply Chain Institute, Digital Supply Chain Transformation Guide, October 2017; Digitalist, 'How To Win With The Right People In Your Digital Supply Chain', March 2017; Wall Street Journal, Companies See 'Massive Shift' in Search for Supply Chain Talent, 2015

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