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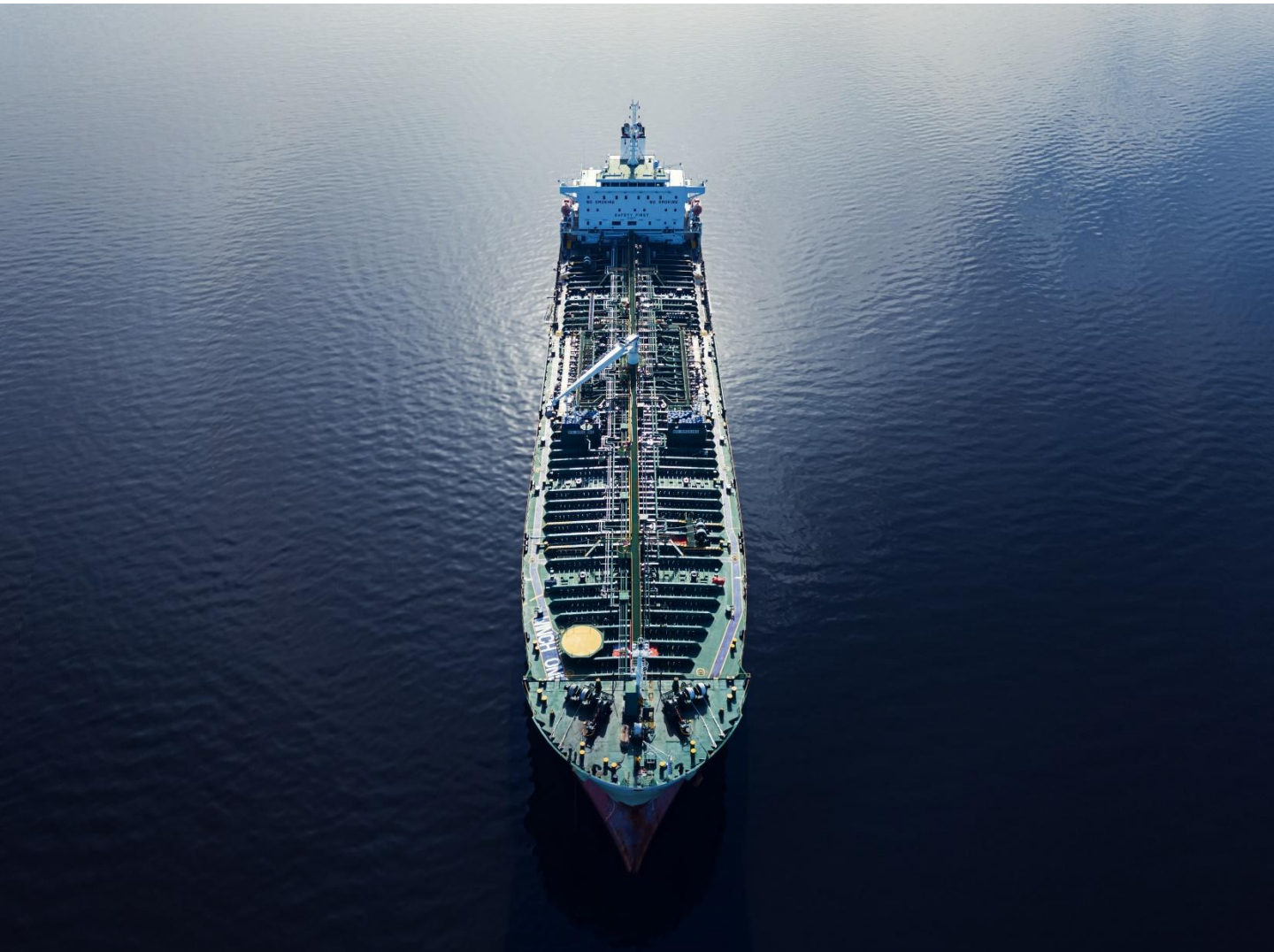

Optimization of Cross-border Commerce with Technology in Southeast Asia

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Cross-border E-commerce in Southeast Asia

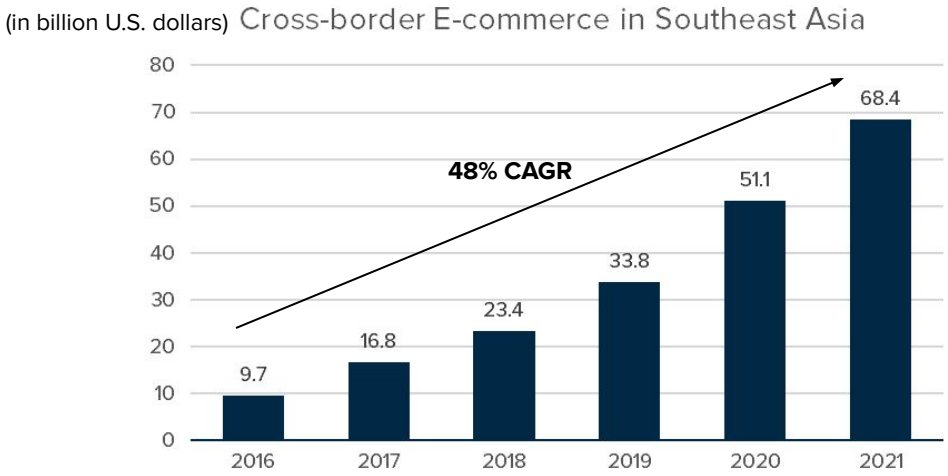
As with globalization and advances in technology, foreign trade has developed rapidly. According to UNCTAD, the global export value of trade in goods throughout the world amounted to approximately US$17.5 trillion in 2020. In comparison, this figure stood at around US$15.3 trillion in 2010 and US$6.45 trillion in 2000. However, the value of exports have been relatively flat and fluctuating in recent years (Table 1) mainly due to the disruption of supply chains, as a result of COVID-19. We expect export trade to continue to correlate to the development of supply chain infrastructure in the post-pandemic environment, and become more regionalized. In 2020, Asia Pacific accounted for 41% of global export trade, which can be attributed to ASEAN economies with competitive manufacturing costs, attracting offshoring of production, enabling cross-border trade of cheaper goods. This is evident by the rise of cross-border e-commerce activity in Southeast Asia (Figure 1).

In traditional international trade, large businesses mainly account for the flow of commodities, technologies, funds and other elements. However, the development of digital technologies have led to a steady reduction of global trade barriers resulting in more direct participation by small and medium-sized enterprises (SMEs) and individual consumers.

Table 1: Trends in global trade value of exported goods throughout the world from 2000 to 2020 (in billions, U.S. dollars)

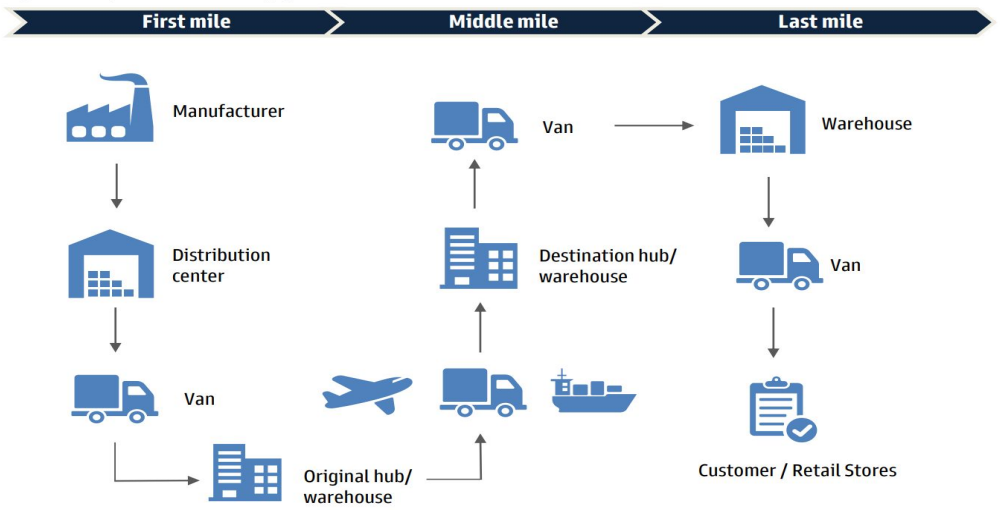
Year	Global Export Value (in billion U.S. dollars)	Year-on-year change (%)
2020	17,583	-8%
2019	19,015	-2%
2018	19,468	10%
2017	17,738	11%
2016	16,043	-3%
2015	16,556	-13%
2014	19,007	0%
2013	18,951	2%
2012	18,513	1%
2011	18,340	20%
2010	15,303	22%
2009	12,556	-22%
2008	16,149	15%
2007	14,021	16%
2006	12,128	15%
2005	10,503	-
2000	17,583	-

Figure 1: Value of the cross-border e-commerce market in Malaysia, Singapore, Indonesia, Thailand, the Philippines, and Vietnam from 2016 to 2021 (Source: Euromonitor)



Source: UNESCAP; Accenture; Alibaba; Euromonitor

Diagram 1: Cross-border e-commerce footprint



A typical cross border e-commerce supply chain can be divided into three layers. First mile, middle mile and last mile. Generally, first, middle and last miles can be described as:

First mile: Transfer of goods from the manufacturer, to a distribution center, where goods are stored for a short period of time and involved in value-added services such as order fulfillment and packaging.
Middle mile: Transfer of goods from a distribution center to a warehouse or a destination hub, which act as a storage facility for goods.
Last mile: Transfer of goods from a warehouse to the end consumer

Country	Domestic delivery time (days)
Singapore	1.2 - 1.5
Indonesia	1.6 - 2.2
Thailand	1.6 - 2.3
Malaysia	2.3 - 2.8

Table 2: Domestic delivery time in days

In a 2021 study conducted by ParcelMonitor - consisting of four ASEAN economies, Singapore had the shortest delivery time, followed by Indonesia, Thailand and Malaysia (see Table 2). Delivery times are expected to improve, driven by increased investment in the region and improving supply chain technology.

eMarketer argues that e-commerce penetration rate (defined as retail e-commerce sales as a % of total retail sales) is set to rise to 9.9% in 2025, to US$128.4 billion in Southeast Asia, representing a compound annual growth rate (CAGR) of 16.8% from 2020.

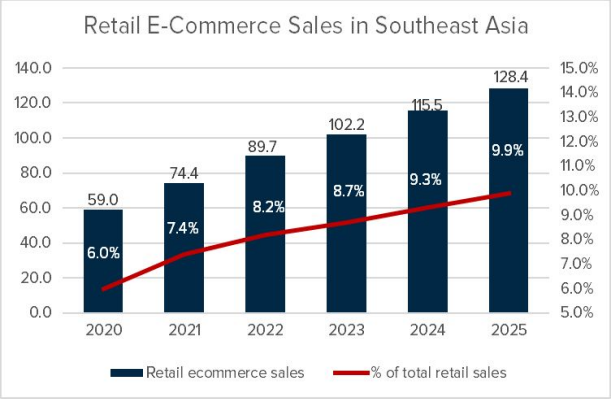


Figure 2: Projected retail e-commerce sales in Southeast Asia, in billions of U.S. dollars

Bain & Company anticipates 50 million new consumers will join the middle class in Southeast Asia, contributing to the region's US$300 billion in disposable income. The increase in disposable income will become a significant growth driver for cross-border e-commerce demand.

Source: ParcelMonitor, eMarketer, Bain & Company

Due to cross-border e-commerce platforms, SMEs are able to provide diversified consignments for global buyers. As a result, they possess greater flexibility in capacity and transformation of product lines in comparison to larger players and can perform complicated orders. SMEs quickly shift business directions and are able to facilitate complex products along with short-term changes in demand for goods.

In addition, in view of market positioning, SMEs tend to offer products in vertical markets. These factors position SMEs as important players in global trade and indicate a positive momentum for digital global trade with their participation.

The boom in participation of SMEs in digital trade has also been accelerated by the rise of online shopping in the recent years. Moreover, Southeast Asia's online shopping has undergone a stepwise increase in value. According to the "e-Conomy SEA 2021" prepared report by Google, Temasek and Bain & Company, Indonesia's retail e-commerce market generated US$53 billion in 2021 (vs. US$35 billion in 2020), while the figure stood at

Figure 2: Active e-commerce penetration in the Asia Pacific region as of January 2021, by country of region

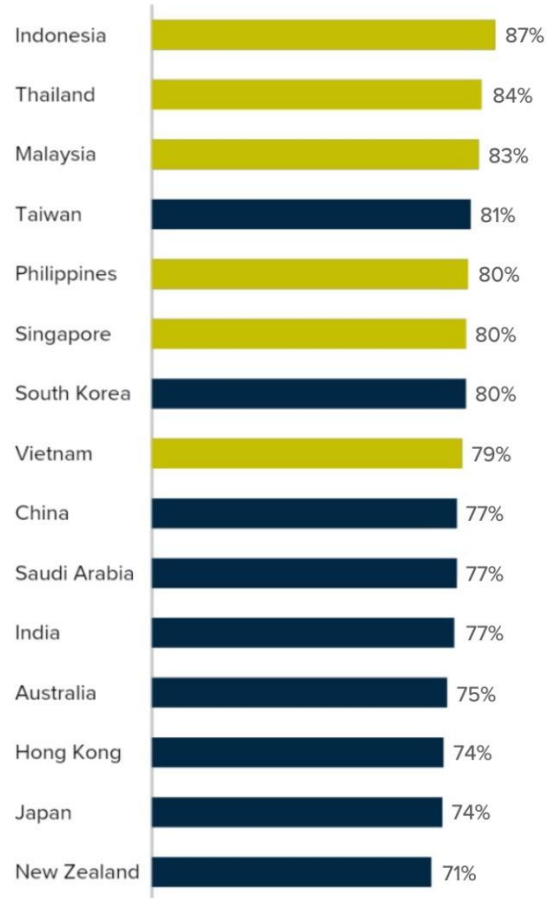
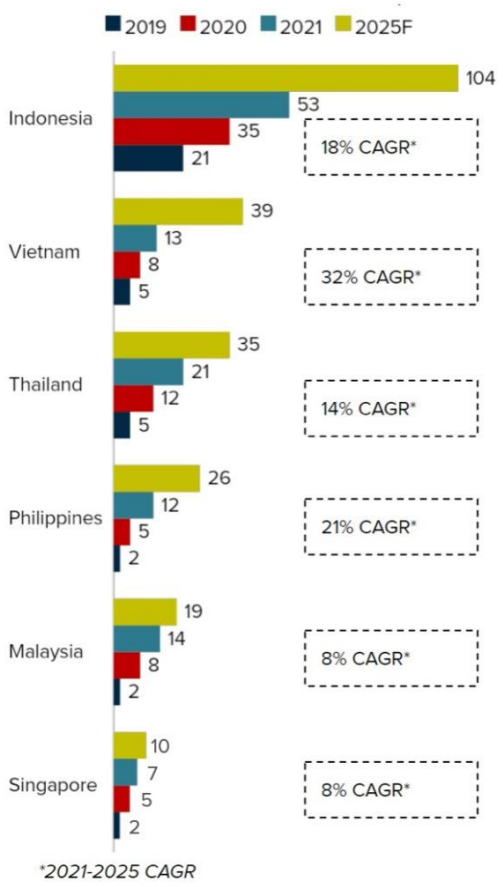


Figure 3: Retail e-commerce market volume in Southeast Asia from 2019 to 2021 including 2025 forecast, by country (in billion U.S. dollars)



Source: We Are Social; GlobalIndex; Hootsuite; Google; Bain & Company; Temasek Holdings

US$21 billion in Thailand (US$12 billion in 2020), US$14 billion in Malaysia (US$8 billion in 2020), US$13 billion in Vietnam (vs. US$8 billion in 2020), US$12 billion in Philippines (US$5 billion in 2020), and US$7 billion in Singapore (vs. US$5 billion in 2020). In 2025, Indonesia's retail e-commerce is anticipated to reach US$104 billion. Notably, Indonesia is expected to account for over 50% of the Southeast Asia e-commerce market owing to a growing middle class and increasing access to the internet. Meanwhile, Vietnam is expected to generate US$39 billion in e-commerce volume, Thailand – US$35 billion, Philippines – 26 billion, Malaysia – US$19 billion, and Singapore – US$9.8 billion.

Looking at the e-commerce user penetration in Southeast Asia, internet users in Indonesia purchased the most items online, with 87% of active users shopping online. This was the highest e-commerce user penetration rate throughout the Southeast Asia region, followed by Thailand (83.6%), Malaysia (82.9%), Philippines (80.2%), Singapore (79.7%), and Vietnam (78.7%) (Source: We Are Social; GlobalWebIndex; Hootsuite).

Depending on the country, from 30% to 73% online shoppers shopped cross-border in Southeast Asia. In 2020, the share of cross border e-commerce for goods and travel stood at 59% (US$3.8 billion) for Malaysia, 44% (US$2.4 billion) for Singapore, 38% (US$4.6 billion) for Vietnam, 23% (US$4.8 billion) for Indonesia, 21% (US$1 billion) for Philippines, 13% (US$8.1 billion) for Thailand.

Notably, in 2020, China held the largest market share in cross-border e-commerce in Malaysia (63% of the cross-border e-commerce market), Thailand (52%), Singapore (43%), Indonesia (41%), Philippines (39%) and the second largest in Vietnam (25%) (see Figure 4). Meanwhile, the United States accounted for the largest share in cross-border e-commerce in Vietnam (26%) and the second largest share in cross-border e-commerce in Philippines (23%), Singapore (20%), Indonesia (10%), Malaysia (7%), and the third largest share in Thailand (7%). South Korea accounted for the third largest share in cross-border e-commerce market in Singapore (8%), Philippines (10%), and Malaysia (4%).

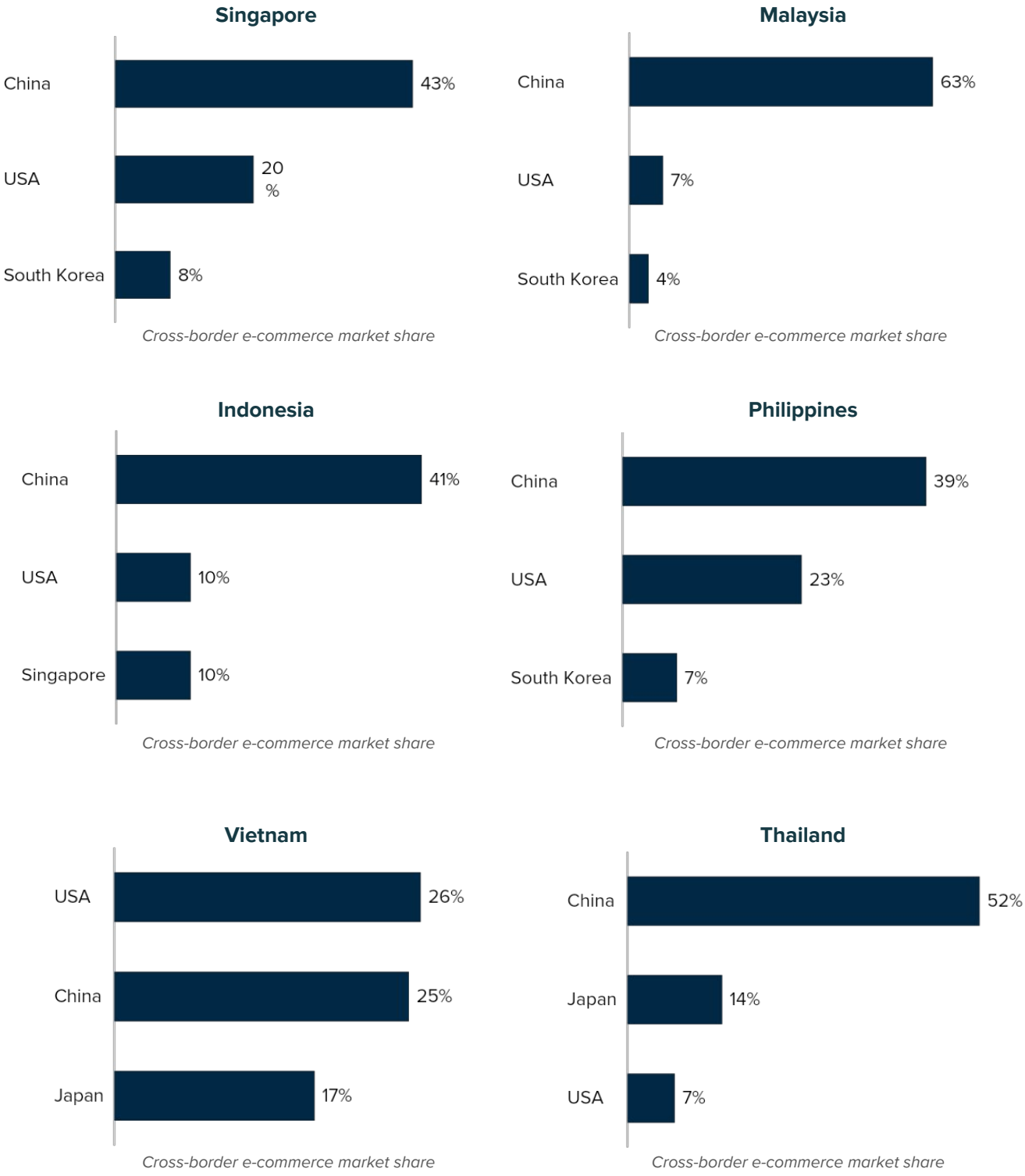
Table 2: Cross-border proportion of total e-commerce, value of cross-border e-commerce, and share of online shoppers who have shopped cross-border in selected countries in Southeast Asia, 2020

	Cross-border proportion of total e-commerce	Value of cross-border e-commerce	Online shoppers who have shopped cross-border
Malaysia	59%	US$3.8B	52%
Singapore	44%	US$2.4B	73%
Vietnam	38%	US$4.6B	40%
Indonesia	23%	US$4.8B	7%
Philippines	21%	US$1.0B	46%
Thailand	13%	US$8.1B	30%

Source: PPRO

Cross-border E-commerce in Southeast Asia

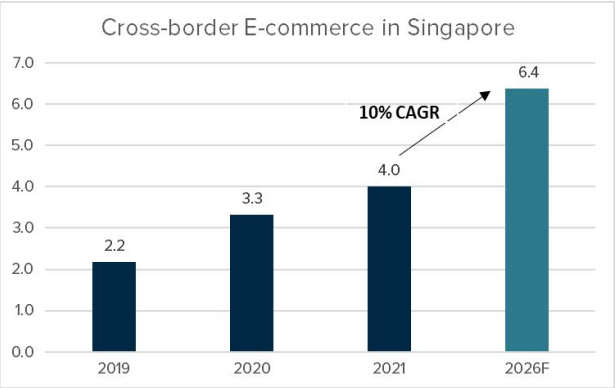
Figure 4: Market share of cross-border e-commerce in selected Southeast Asia's countries in 2020, by country



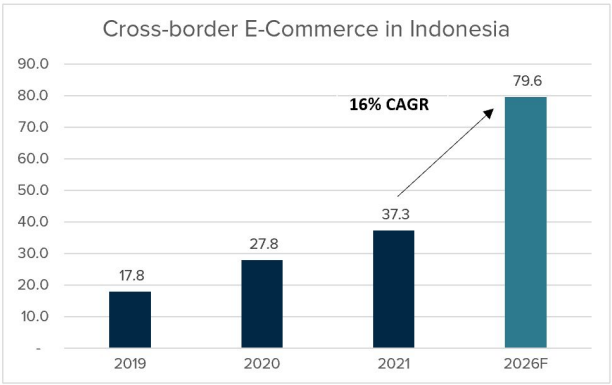
Source: PPRO

Figure 5: Projected cross-border e-commerce market size, in billions, U.S. dollars

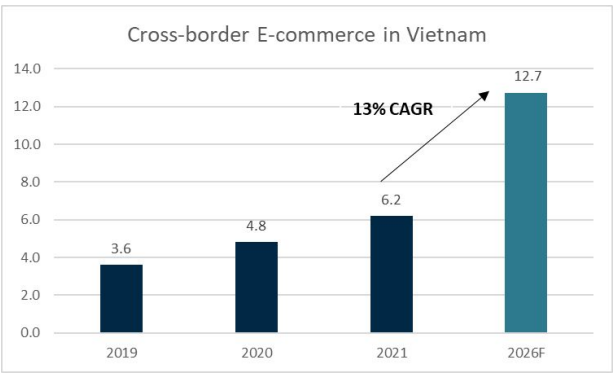
Singapore



Indonesia



Vietnam



Source: Euromonitor

Singapore

The competitive landscape of e-commerce in Singapore is highly competitive, with third party merchants holding the highest combined market share. Multiple aggressive brand acquisitions combined with tens of millions in funding, mean that these e-commerce aggregators have the potential to obtain a sizeable share over the forecast period. Increasingly, cross-border e-commerce retailers are partnering with BNPL providers. Cross-border e-commerce players could also seek to capitalise on the spending power of the more mature demographic as a growing number of older consumers have embraced technology.

Indonesia

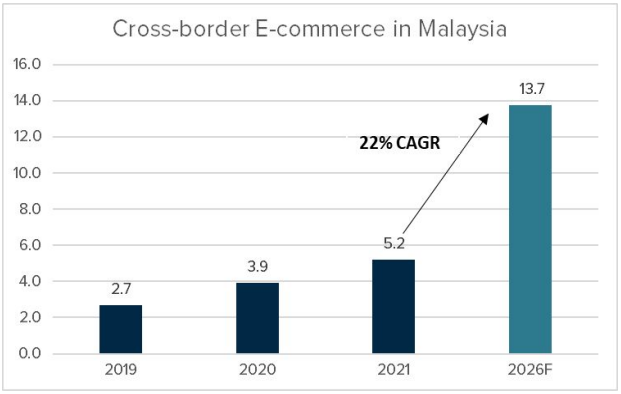
In Indonesia, there were three major factors driving the cross-border e-commerce surge: the growing middle class population, high internet and mobile penetration rates, and the fast growth of fintech and alternative financing options. Social media sales via platforms such as WhatsApp, Instagram and Facebook boomed during the pandemic as consumers have appreciated the convenience of these channels. The ease of payment (via convenience stores, or even cash on delivery) makes purchasing easy for low income people. E-commerce will continue to rise strongly due to its early stage of development and untapped large millennial population.

Vietnam

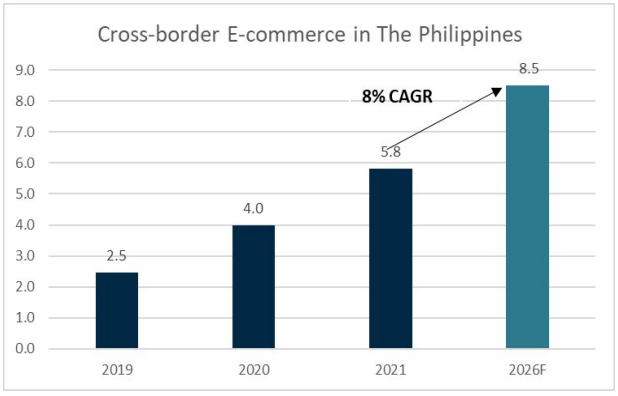
In 2021, cross-border sales rose by nearly a third in the channel, boosted by the convenience factor as well as lower viral transmission risk compared with shopping in a physical store. While growth in Vietnamese cross-border e-commerce is likely to be lower relative to prior periods, growth will likely be resilient due to support by government policy. In May 2020, the government approved a master plan for national e-commerce development through to 2025. It expects that 55% of the population will participate in online shopping by 2025.

Figure 6: Projected cross-border e-commerce market size, in billions, U.S. dollars

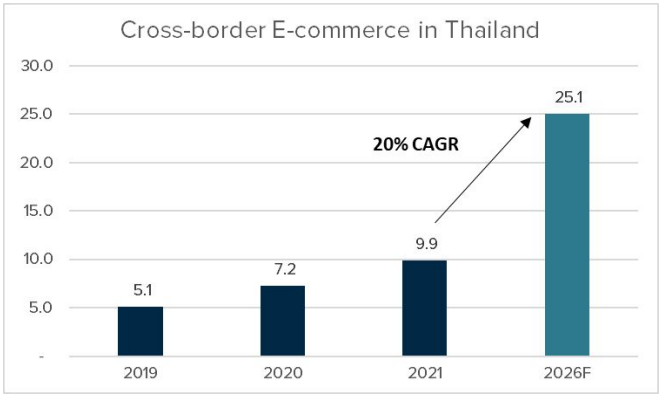
Malaysia



Philippines



Thailand



Source: Euromonitor

Malaysia

While cross-border e-commerce was already growing very robustly prior to the onset of the COVID-19 pandemic, sales growth has increased substantially in actual terms since. Growth rates are slowing only slightly in 2021 despite the much higher base. The main reason for the huge consumer interest in e-commerce is likely due to the impact of the social distancing regulations that were imposed. Growth is expected to rationalize as it is likely that consumers will want to shop offline but we expect cross-border e-commerce to continue growing due to further enhancement in supply chains.

Philippines

The Philippines is still lagging behind in terms of its e-commerce expansion. E-commerce continues to face problems in terms of infrastructure, logistics and technology that still require further improvement in the country before a larger share can be gained. Cross-border e-commerce growth is expected to grow at a normalised rate due to several factors including strong monitoring activities by the Bureau of Internal Revenue (BIR) in tax compliance – impacting e-commerce from reaching its maximum potential and strong tradition in the country of using shopping as a family leisure activity.

Thailand

During 2020, the lockdown period encouraged consumers to purchase online across almost all product sectors. The competitive pricing and opportunities for price comparison offered by cross-border e-commerce were also important factors in the channel's growing popularity, due to measures introduced to limit the spread of COVID-19 having serious economic consequences, including job losses and salary cuts, which made local consumers more price conscious. Growth is expected to stay resilient, with many consumers in Thailand becoming used to the convenience of 24/7 ordering and home delivery of e-commerce, as well as the competitive prices.

Investment Volume into Retail E-commerce in Southeast Asia

Total recorded venture capital investment volume into Southeast Asia retail e-commerce increased by 1.6 times from ca. US$1.0 billion in 2020 to US$2.8billion in 2021. The 2021 figure was attributed to a 454% year-over-year increase in investment volume into automotive retail platforms, a 327% year-over-year increase into healthcare retail platforms, a 225% year-over-year increase into FMCG retail platforms, and a 199% year-over-year increase into multi-segment e-commerce platforms. However, electronics, clothing and homeware retail platforms recorded investment volume declining by 93%, 63%, and 2% year-over-year, respectively.

In 2021, Indonesia accounted for ca. 36% of venture capital investment volume into retail e-commerce, followed by Singapore (ca. 32%), Malaysia (ca. 16%), Vietnam (ca. 12%), Thailand (ca. 2%), and Philippines (ca. 1%). Meanwhile, in 2020, Singapore represented ca. 43% of the figure, followed by Indonesia (ca. 31%), Vietnam (ca. 16%), Malaysia (ca. 6%), Thailand (ca. 4%), and Philippines (ca. 1%).

Figure 7: Venture capital investment volume into retail e-commerce in Southeast Asia, 2020 and 2021 (in billions)*

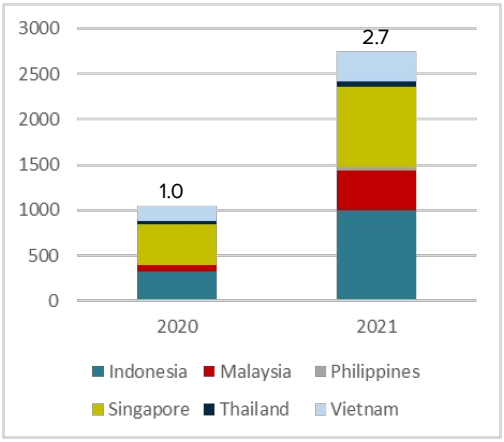
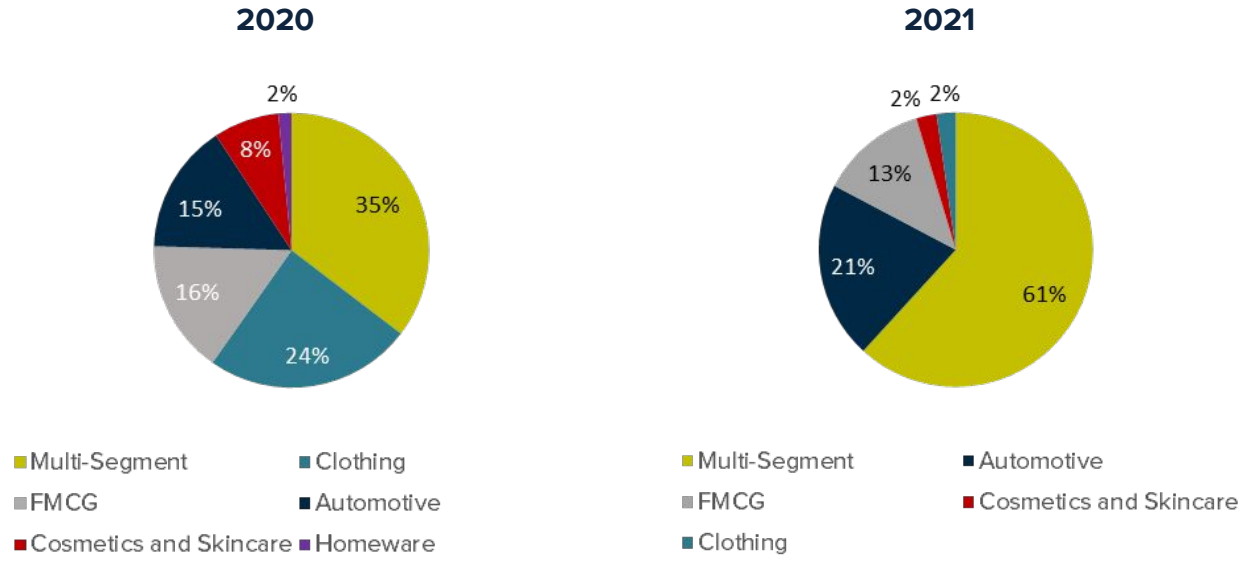


Table 3: Early stage investment volume into retail e-commerce in Southeast Asia (Source: Vynn Capital Research)

	# of early stage deals/ # of all deals	% of total investment volume
2020	38/60	14%
2021	47/82	13%

Figure 8: Distribution of venture capital investment volume into retail e-commerce in Southeast Asia by segment, 2020 and 2021



*Venture capital investment volume includes investments with disclosed funding and does not include investments with undisclosed funding.

61% of 2021 venture capital investment volume into Southeast Asia's retail e-commerce was attributed to multi-segment platforms. Tiki, Vietnam's Amazon, accounted for 25% of the segment's investment volume or US$278 million with its series E round, while Indonesia's B2B e-commerce platform Bukalapak represented 21% of the segment's investment volume after raising its pre-IPO round of US$234 million.

The second largest share (21%) of 2021 investment volume into retail e-commerce was represented by automotive e-commerce platforms. Singapore's used-car marketplace Carro accounted for 52% of the segment volume. The company closed a series C round at US$360 million and a series D round at US$100 million. Meanwhile, Malaysia's used-car marketplace Carsome represented 19% of the segment investment volume. Carsome raised US$170 million for its series D+ round, and subsequently raised another US$290 million in 2022 (*but was not included as a valid datapoint for the remainder of this report and our 2021 Supply Chain and Mobility Investment Snapshot, as both covers data for the year of 2021*).

The remaining shares of investment volume into Southeast Asia's retail e-commerce were distributed between FMCG (13%), cosmetics and skincare (2%), and clothing (2%) platforms.

With more SMEs launching or intending to launch independent e-commerce websites, website building solutions have become well sought after. Notably, Indonesia-based e-commerce enabler SIRCLO offers website building solutions for SMEs, which make setting up an e-commerce website as easy as setting up a blog. The company also provides end-to-end fulfillment solutions. In 2021, SIRCLO raised US$81 million as a part of series B and C rounds. Other prominent website buildings startups which received funding in 2021 included Indonesia's Desty (US$8 million for a pre-series A round in 2021), Philippines' Etaily (US$5.9 million for a seed round and Prosperna (US$1 million for a seed round).

With increasing cross-border solutions, more e-commerce enablers for cross-border operations emerge, apart from established e-commerce platforms such as Lazada, Shopee, JD ID, etc. Vietnam's startup TradingFoe aims to help importers and exporters in Southeast Asia and Nordic countries to find the right trading partners, while also helping companies to gain access to financing and insurance. TradingFoe received US$150 thousand as a part of its seed round in 2020. Another prominent player in cross-border trade is Philippines-based startup 1Export that provides a platform for micro, small, and medium-sized enterprises in the Philippines. 1Export helps MSMEs to export their products to other countries by connecting businesses with distributors worldwide and aiding them with country requirements such as labeling and documentation. 1Export secured seed funding of US$800 thousand in 2021.

With increasing participation of MSMEs in cross-border trade, we anticipate growth in funding for startups that solve key issues to MSMEs, such as customs clearance, branding and sales facilitation. In addition, value added services, such as insurance, assistance with documentation and customs clearance, and financing will be key factors of demand for B2B and B2C e-commerce platforms.

Table 4: Percentage of total investment volume, by country in Southeast Asia (Source: Vynn Capital Research)

Country	% of total investment volume (2021)	% of total investment volume (2020)
Indonesia	36%	31%
Singapore	32%	43%
Malaysia	16%	6%
Vietnam	12%	16%
Thailand	2%	4%
The Philippines	1%	1%

Existing Cross-Border E-commerce Logistics Solutions

Cross-border e-commerce is facilitated through logistics, which covers collection of goods from sellers, domestic transportation and warehousing, transportation to the country of destination, customs clearance at the country of departure and destination, transportation and warehousing at the country of destination. There are three main export logistics solutions for cross-border e-commerce:

National Standard and Express Post

National standard and express post service is represented by the national postal operator and the operator of universal postal services in the country. While standard post provides such benefits as full coverage of the postal network and low price, its disadvantages usually include slower speed, high packet loss rate, and lack of tracking options. Due to the lack of technological transformation and increasing demands for faster deliveries, many shippers are looking for alternative options. For example, in Malaysia, in 2020, about 36 million registered international postal items were issued and received by the Pos Malaysia Bhd vs. 73 million registered international postal items received in 2015 (Source: Statista).

International Express Courier

International express courier service is represented by large international companies with developed networks that operate overnight transport to facilitate delivery within 1-2 business days. Some of the companies that represent this logistics mode in Southeast Asia include JD Express, DHL, Fedex, and UPS. The benefits of international post include wide delivery coverage, parcel insurance and end-to-end tracking available. However, international express is a more expensive option than the national standard and express post, and more frequently additional costs may be incurred for end customer to clear parcels at customs with international express couriers.

Fulfillment Operator

The fulfillment service includes organization of transportation and warehousing process by a specialized operator on behalf of a seller. Fulfillment operator receives goods from suppliers that were ordered by online shoppers from online sellers. On behalf of online sellers, fulfillment operators pack goods for export, prepare and attach the needed documentation, and facilitate the delivery of goods to the online shopper via the network of partners. With the help of fulfillment operators, sellers can focus on sales and marketing, and fully outsource logistics to the external fulfillment operator. The benefits of fulfillment service operators include fast delivery of 1-2 business days, end-to-end tracking, and no additional costs for end customer to clear parcel at customs. However, the speed of delivery depends on the local transportation partner.

Table 5: Cross-border e-commerce logistics solutions, benefits and challenges

	Benefits	Challenges
National Standard and Express Post	Lower cost than courier, wide delivery coverage, parcel insurance	Longer delivery times (air – 10+ business days, sea – 30+ business days, lack of tracking
International Express Courier	Fast delivery (1-2 business days), wide delivery coverage, end-to-end tracking	More expensive than national standard & express post, additional costs may be incurred for end customer to clear parcel at customs
Fulfillment Operator	Outsourcing of packaging and documentation preparation, fast delivery (1-2 business days, end-to-end tracking)	Requires reliable local fulfillment partner

Bottlenecks in Cross-border Trade Faced by SMEs in Southeast Asia

While cross-border e-commerce provides growth opportunities for SMEs, digital trade presents some challenges for SMEs. Although fulfillment operators and international express couriers with well-established logistics networks can help with the cross-border logistics process, the solutions remain labour intensive and represent high costs for SMEs. According to Deloitte's survey of Southeast Asia's SMEs that participate in cross-border trade, the major challenge is high logistics cost that is not sustainable for cross-border e-commerce operations. The second major challenge to Southeast Asia's SMEs that participate in cross-border e-commerce is difficulty in clearance inspection.

In most countries in Southeast Asia, custom clearance is complex and lack transparency. In addition, issues also arise with the aftersales in e-commerce due to the complications with the customer's right to return goods. Returned goods have to undergo tedious customs administration, incur additional duties and customs in the customer's and seller's country. According to the International Trade Center, about 10% of cross-border e-commerce transactions involve returns, cancellations, and refund requests. Moreover, in the majority of cases, the seller is responsible for costs incurred with returns of goods.

Figure 9: Which factors most inhibit SMEs from cross-border trade?

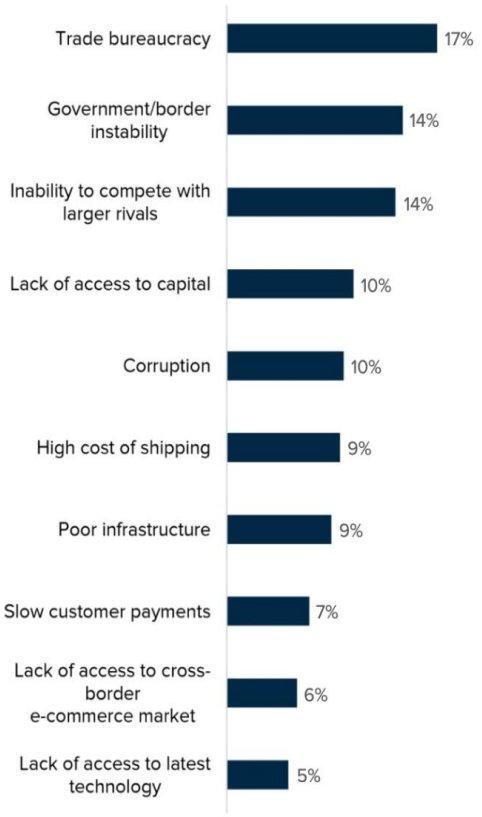


Table 6: Breakdown of challenges to the cross-border e-commerce by selected SEA countries, 2021

Cross-border e-commerce challenges	Singapore	Indonesia	Malaysia	Philippines	Thailand	Vietnam
High logistics costs	74.1%	63.2%	77.8%	78.9%	65%	44.1%
Difficulty in customs clearance inspection	37%	57.9%	58.6%	36.8%	40%	61.8%
Low awareness of brands	37%	21.1%	33.3%	31.6%	35%	47.1%
High platform expenses	37%	21.1%	42.4%	21.2%	25%	32.4%
Difficulty in marketing	25.9%	26.3%	29.3%	10.5%	30%	44.1%

Source: Deloitte; Agility; Transport Intelligence

Among Asia Pacific SMEs that conduct cross-border e-commerce transactions, payment digitalization, sales digitalization and procurement penetration rates were 55%, 53% and 42% respectively (Source: Deloitte).

Procurement & Sales

For cross-border trade, SMEs mainly use third-party platforms. B2B2C and B2C e-commerce leaders, namely, Lazada and Shopee, that facilitate participation of SMEs in cross-border digital trade, expanded and established themselves in the markets of Southeast Asian countries. By monthly visits, Tokopedia was the most popular international B2B2C and B2C e-commerce website in Indonesia (ca. 157 million web visits a month), and Shopee was the most popular e-commerce website in the Philippines (ca. 78 million visits a month), Vietnam (ca. 89 million visits a month), Thailand (ca. 61 million visits a month), Singapore (ca. 16 million visits a month) and Malaysia (ca. 56 million visits a month). (Source: iPrice Group; SimilarWeb).

B2B2C e-commerce platforms also strive to optimize customs clearance process. For example, in 2021, Lazada obtained a merit certificate from the World Customs Organization (WCO). Lazada was recognized by the Directorate General of Customs and Excise, Ministry of Finance of the Republic of Indonesia, as the first e-commerce platform in Indonesia to use the "Delivery Duty Paid" scheme for customs clearance. Through the scheme, the company is able to complete the customs clearance process for imported e-commerce shipments in an hour on average.

Many enterprises strive to establish different channels for cross-border e-commerce. In the Asia Pacific region, 70% of SMEs plan to establish independent websites for cross-border e-commerce.

In comparison to third-party logistics platforms, independent websites allow SMEs to be more flexible with operations and provide better precision. Depending on the country, 26%-41% of enterprises have already established independent websites for cross-border e-commerce. 41% of Vietnam's SMEs engaged in cross-border trade established independent websites, while the number stands at 37% in Indonesia, 36% in Philippines, 35% in Thailand, 26% in Malaysia and Singapore each. 42% of enterprises in Indonesia who haven't set up the independent website have intentions to set it up in the near future, followed by 41% in Malaysia, 37% in Singapore, 32% in Vietnam and Philippines each, and 30% in Thailand (Source: Deloitte).

Figure 10: SME independent website survey

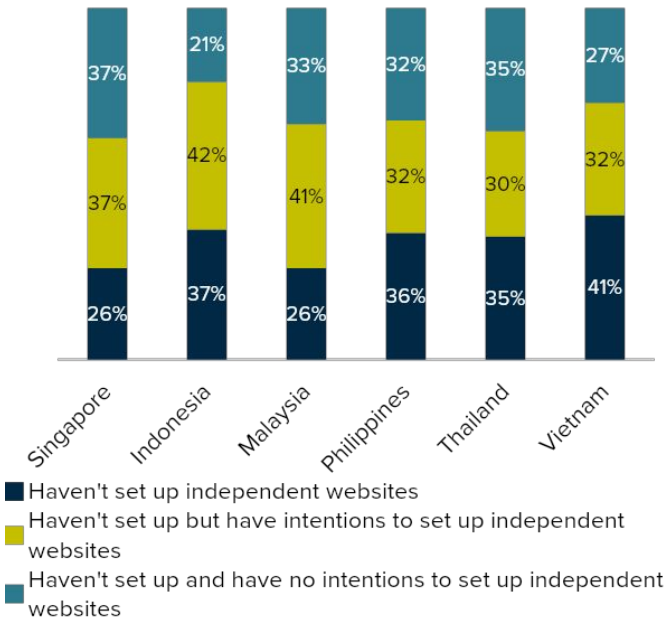
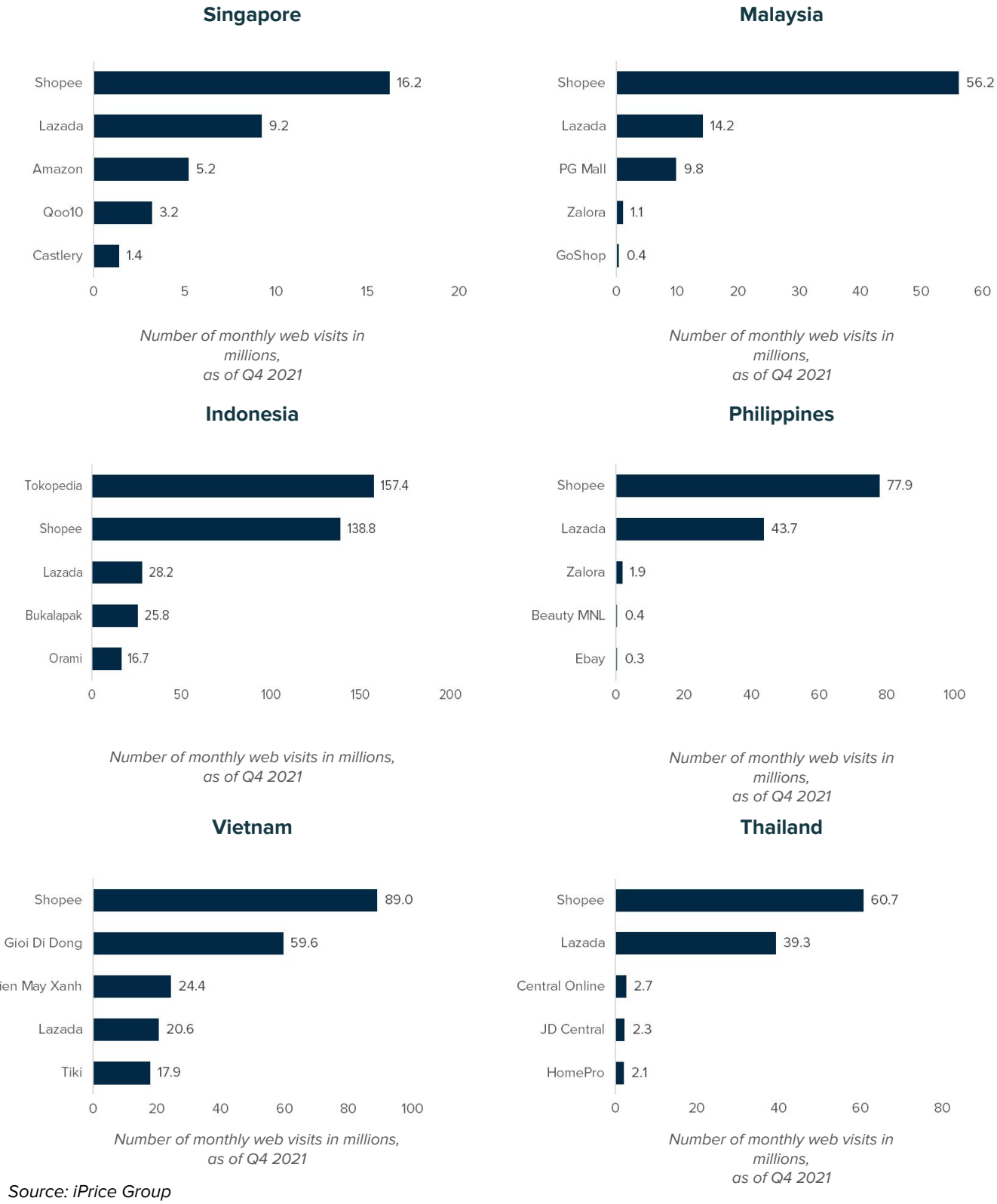


Figure 11: Degree of digitalization across links of cross-border e-commerce

Source: Deloitte

Figure 12: Most popular international B2B2C and B2C e-commerce sites in selected Southeast Asia's countries as of Q4 2021, by monthly web visits (in millions)



Source: iPrice Group

Table 7: Development stages of cross-border payments

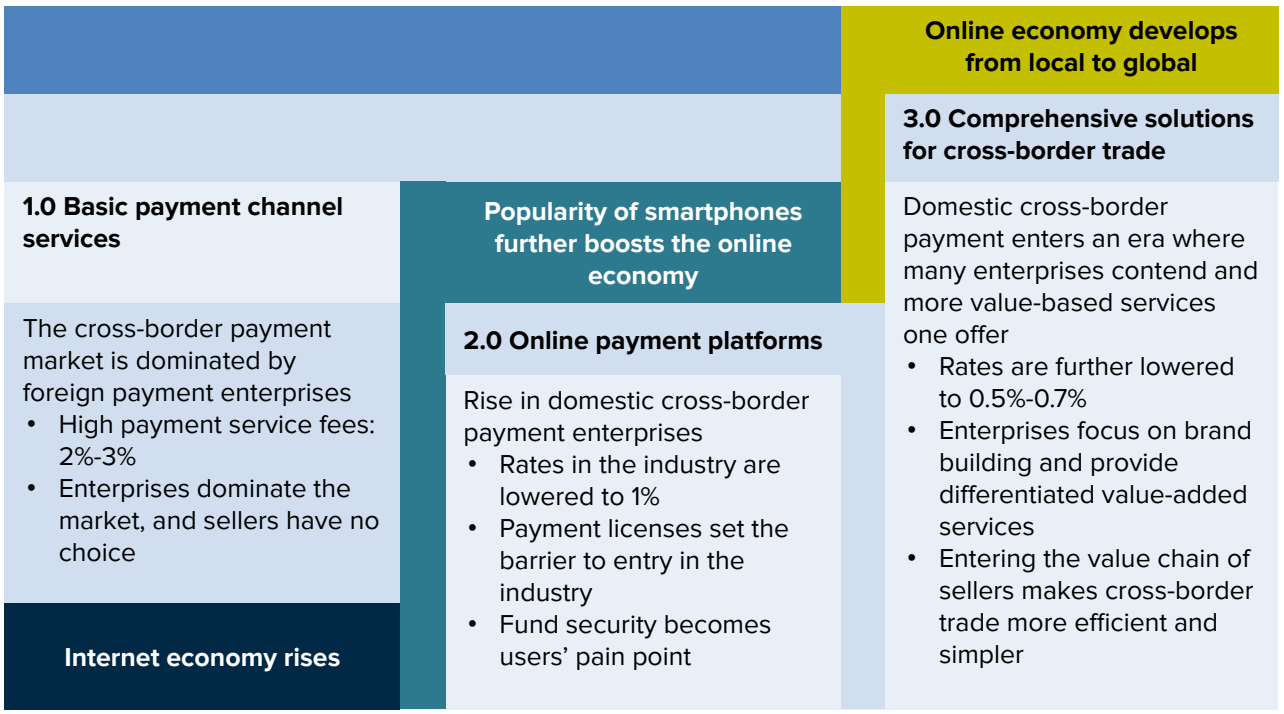
Stage 1.0	This stage is mainly dominated by foreign cross-border payment enterprises, which charge high payment service fees and the absence of other cross-border trade.
Stage 2.0	With the rise of domestic cross-border payment enterprises, transaction rates are gradually lowered, and the establishment of payment licenses gradually sets industry standards.
Stage 3.0	Domestic cross-border payments enter an era when many enterprises contend. The major means of competition no longer lies in the transaction rate, which is replaced by differentiated value-added services and one-stop solutions for cross-border trade. The businesses that can really enhance industry efficiency and better meet the integrated demand of cross-border sellers can seize the initiative in future competition.

Payments

The evolution of payment processing – from the development of basic payment services, to providing comprehensive solutions and value-added services has been an important contributing factor to the growing trend of cross-border transactions. As displayed in Figure 13, this has resulted in cost savings for sellers, lowering payment processing fees – from 2%-3% to 0.5%-0.7%.

The payment processing system of traditional banks, SWIFT, limits multi-party credit due to the international standards. As the system is based on centralized architecture and agency infrastructure, such problems such as long duration of payment transfer, high commission, multiple intermediaries increase control risks. In comparison to the SWIFT system, Blockchain-based cross-border payments offer strong advantages, including cost reduction, authenticity of transactions, real-time transaction information, security, verifiable data

Figure 13: Development course of cross-border payment platforms



Source: Deloitte

records, rich data sources, and close links with finance (Table 8). Due to the strong advantages of blockchain-based cross-border payments, the number of B2B cross-border transactions finalized on blockchain worldwide is expected to increase exponentially over the next years. According to Juniper Research, by 2025, the number of B2B cross-border transactions on blockchain will reach 745 million vs. 122 million in 2020. It is worth noting that in 2020 the Asia Pacific region accounted for 45.8 million blockchain-based B2B cross-border transactions, or 37% of global blockchain-based B2B cross-border transactions, and is forecasted to represent ca. 745 blockchain-based B2B cross-border transactions, or 42% of global blockchain-based B2B cross-border transactions, in 2025.

Figure 14: B2B cross-border transactions on blockchain in various regions worldwide in 2020 with forecasts from 2021 to 2025 (in millions)

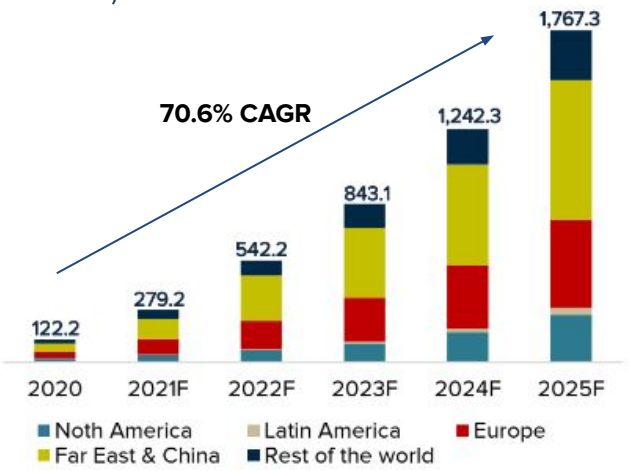


Table 8: How blockchain-based cross-border payments solve the problems of traditional payment methods?

Cost reduction	Cross-border payments incur high cost. Banks often need to turn to intermediary banks to realize indirect payments. The integrated blockchain removes the need for intermediaries, which dramatically lowers the cost of initiating cross-border transactions. Blockchain can help businesses reduce transaction costs by 40-80%, compared to a reduction of about 8% by traditional cross-border payments.
Authenticity of transactions	The underlying distributed ledger technology and hash pointer technology of blockchain grant the data stored in the blockchain immutability and traceability. The whole transactions process is subject to the blockchain, delivering more authentic orders and more reliable transactions.
Real-time transaction information	It has been proven that transactions can be completed within two to five working days if cross-border payments are made through a third party. There may be significant time differences between two currencies. Capable of realizing second-level transaction speed, the blockchain technology has reduced the confirmation period to 6-141 minutes up to now.
Security	Cross-border transactions via blockchain technology are protected by cryptography. Network participants have their own private key assigned to the event, which serves as the digital signature. The signature will be invalid if the record is changed. As blockchain has no single point of failure, it cannot be altered in a single computer.
Rich data sources	Metadata are transmitted from end to end, and pre-transaction information exchange is authorized in advance.
Irreversibility	Each transaction has verifiable records.
Close links with finance	Inclusion of the banks and other financial institutions into the ecology of blockchain enables banking institutions to conduct validation with transparent and traceable data in the blockchain. Such practices strengthen control over cross-border trade risks, and meets the bank's requirements around risk control. At the same time, banks can also eliminate the phenomenon of "multiple sums of financing for one transaction" through financing data sharing, thereby meeting the huge demand of SMEs for cross-border trade financing.

Source: Deloitte, Juniper Research

Table 9: Benefits of Digitizing Freight Forwarding (Source: Gartner)

Process	Data	Service
End to end shipment visibility	Transparent and exchangeable data, from shipper to carriers	Lower transaction costs, which results in lower cost to deliver
Cashless and digital transactions	Data-driven analysis and performance reporting	Access to multiple services, prices, lead times and carriers

Software:

1) Digital freight solutions

Digital freight shipping uses digital tools to coordinate complexities required to move freight across a diverse network of logistics asset owners. It aims to improve user experience for brands moving freight, by structuring all data in supply chain, reinforcing automation and information - with the aim of providing visibility and control over supply chain. Some of the benefits of adopting digital freight solutions, according to Gartner are listed in Table 9 above.

According to Allied Market Research, digital freight forwarding market was valued at approximately US$2.9 billion in 2020 and is projected to reach US$22.9 billion in 2030, representing a CAGR of 23%. This growth is attributed to factors such as the growth of cross-border e-commerce sales and rise in free trade agreements. North America held the largest share of the digital freight forwarding market, due to the U.S. having a major influence in international trade. However, Asia Pacific is forecasted to grow the fastest rate, due to the increasing number of manufacturing bases and special economic zones.

Due to the rise in cross-border sales, importance in reducing lead times to consumers and increasingly complex supply chains, the use of digital freight solutions are critical for businesses to improve supply chain visibility, reduce costs and improve lead times.

2) Sensors and asset tagging

Asset tagging is the process of affixing tags or labels to identify each product and track data from real-time location to maintenance history. The tags can be assigned to both fixed and moveable assets that are spread across multiple locations and warehouses. This enables businesses to achieve a holistic view of their owned assets.

Asset tagging opens up a wide range of data tracking possibilities, particularly when used alongside a computerised system such as asset tracking software. Global market share of asset tagging systems are expected to grow to US$36.3 billion by 2025, growing at a CAGR of 15% - according to research conducted by Mind Commerce.

Tracking enables businesses to ensure good practices, such as theft prevention, inventory control and real-time tracking. Businesses can save time and resources in locating equipment, and reduce costs associated with replacing lost or stolen equipment. These benefits are only possible when using tagging technology solutions.

Some popular tools include:

a) RFID tags
b) GPS trackers
c) NFC tags
d) Barcodes
e) QR codes

Source: Allied Market Research, Gartner, Mind Commerce

3) Inventory management

Inventory management software manages businesses' physical inventory by providing real-time insight into the amount of each product they have on hand and available. Inventory management software is used to manage purchasing and vendor evaluation to demand prediction and order optimization.

Inventory management software market is expected to grow at a CAGR of 6.12%, from 2021 to 2028 - to US$3.8 billion. This growth can be largely attributed to growing e-commerce demand, increasing demand for RFID technology and the need to mitigate supply chain inefficiencies – especially after experiencing COVID-19 related supply issues.

Inventory management tools solve a major problem within businesses, which is inventory inefficiency. Inaccurate inventory records create a higher lead time, resulting in a slower response to demand and to market changes. Adoption helps companies cut expenses by minimizing the amount of unnecessary parts and products in storage. Adopting inventory management tools can yield cost savings, and avoid customer disapprovals.

Industries affected by supply chain disruption

Commodities Semiconductor Electronics Automotive parts

Supply chain and mobility technologies

The supply chain and mobility sector is characterized by technological solutions that impact the entire mobility and supply chain industries – ranging from software solutions to engineering initiatives. Many supply chain leaders consider supply chain technology a source of competitive advantage – with emphasis on adopting technologies that improve human decision making and managing assets, according to Gartner.

Source: McKinsey, IDG

Mobility requirements were ranked third after risk management and artificial intelligence among the technologies businesses said they need to weather unplanned supply chain disruptions, according to a 2020 IDG survey. Lockdowns, shelter-in-place orders and travel restrictions were disrupting activity in every part of the economy, while demand in some categories skyrocketed. Companies who adapted to new ways of working and ramped their digital and risk-management initiatives provided a lasting competitive advantage.

McKinsey study has shown that the success of an organization's planning was strongly linked to its use of modern digital tools, especially in advanced analytics. Successful companies were 2.5 times more likely to report they had preexisting advanced analytics capabilities relative to organizations that reported problems. More than 50 percent of respondents in every industry say they have implemented additional analytics in 2021, relative to prior years, and the planned digitalization efforts are most likely to focus on visibility, as organizations strive for a better picture of their supply chain's real time performance. The benefits of supply chain tools, are now being recognized across industries, especially in industries where adoption is low.

As discussed in Table 10, supply chain technologies such as digital freight, sensors and asset tagging, and inventory management software are often mission-critical for companies, and is linked to success in an organization's execution efforts and provide a high return on investment, when utilised properly. Table 10 summarizes the key benefits of mobility technology adoption, as well as the startups that are currently operating in the space.

dropee

Malaysian-based startup **Dropee** – a Vynn Capital portfolio company, offers a SaaS solution for brands and wholesalers to automate procurement, and provide a complete digital overview of the entire supply chain, including supply-chain analytics, and demand forecasting through *Dropee Direct*.

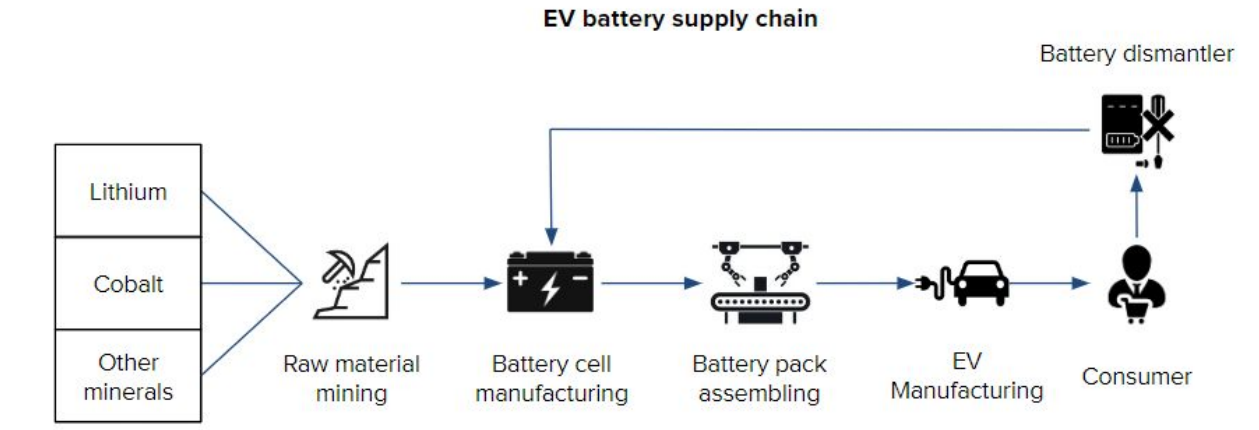
Table 10: Summary of software and digital supply-chain tools

Software	Description	Market size	Benefits	Startups
Digital freight	Digital freight shipping uses digital tools to coordinate complexities required to move freight across a diverse network of logistics asset owners.	US$2.9 billion in 2020 and is projected to reach US$22.9 billion in 2030, representing a CAGR of 23%.	End to end visibility, transparency and ease of exchange, data capture for analysis	flexport. forto sennder
Asset tagging	Asset tagging is the process of affixing tags or labels to identify each product and track data from real-time location to maintenance history.	Global market share of asset tagging systems are expected to grow to US$36.3 billion by 2025, growing at a CAGR of 15%	Tracking enables businesses to ensure good practices, such as theft prevention, inventory control and real-time tracking	Omni-ID SCANDIT ALIEN
Inventory management	Inventory management software manages businesses' physical inventory by providing real-time insight into the amount of each product they have on hand and available.	Inventory management software market is expected to grow at a CAGR of 6.12%, from 2021 to 2028 - to US$3.8 billion.	Solves inventory inefficiencies, which directly contributes to lowering cost of production, and improving lead times	tradegecko ecomdash optoro

Source: Allied Market Research, Gartner, Mind Commerce, Data Bridge

Case study: Auto industry supply chains

Diagram 2: Electric vehicle (EV) battery supply chain



Auto industry supply chain issues

According to a survey that covered six industries, the auto sector was disrupted the most by supply chain disruptions during COVID-19. Economist Intelligence Unit surveyed 175 supply chain managers – with more than 70% based in Asia. 52% of auto sector respondents highlighted that disruptions were "very significant", representing the highest proportion across the industries surveyed. The spread of more various covid variants resulted in the closure of major Asian manufacturing hubs such as China and Vietnam. Additionally, the shortage of semiconductors, also caused carmakers to reduce production. This shortage can be blamed by the surge in demand of consumer electronics such as laptops – as many people worked from home.

Supply chain technology in the auto industry and the rise of Electric Vehicles (EVs)

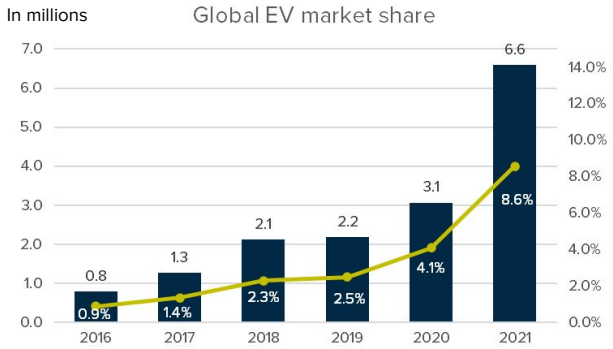


Figure 14: Global EV market share, in million registrations (Source: IEA)

The imminent rise in EVs pose risks for internal combustion engine (ICE) auto companies. According to IEA, EV adoption has been steadily rising, from only 0.8 million cars registered in 2016 to 6.6 million registered, representing 8.6% of total new car registrations worldwide (Figure 14). This represents a CAGR of 53%. Makers of ICE parts face risk of massive disruption due to generous government incentives to consumers and EV makers, which is accelerating this trend. EY-Parthenon expects that around 25% of the ICE vehicle supply chain does not carry over to EV. Hence, ICE auto companies must adapt to the changes in consumer preferences to remain competitive.

In general, EV production requires fewer components relative to ICE vehicles. ICE supply chains are generally fragmented, with more than 20,000 parts. However, the technical complexities of the modern EV require more components such as semiconductors and sensors. Additionally, raw materials in EV batteries are also difficult to source, due to high demand and logistics footprint. Diagram 2 highlights the EV battery supply chain. The supply chain for EV battery manufacturing mainly consists of four segments, namely mining for raw materials, manufacturing of battery cells, assembling battery packs and EV manufacturing. Lithium-ion batteries, which are used extensively in electric vehicles due to their higher energy density – are typically made up

Table 11: Top lithium, cobalt and nickel producing countries in 2021, by tonnes (Source: Statista)

Mineral	Country
Lithium	1. Australia: 55,000 tonnes 2. Chile: 26,000 tonnes 3. China: 14,000 tonnes
Cobalt	1. Democratic Republic of Congo: 120,000 tonnes 2. Russia: 8,500 tonnes 3. Australia: 5,100 tonnes
Nickel	1. Indonesia: 1,000,000 tonnes 2. Philippines: 370,000 tonnes 3. Russia: 250,000 tonnes

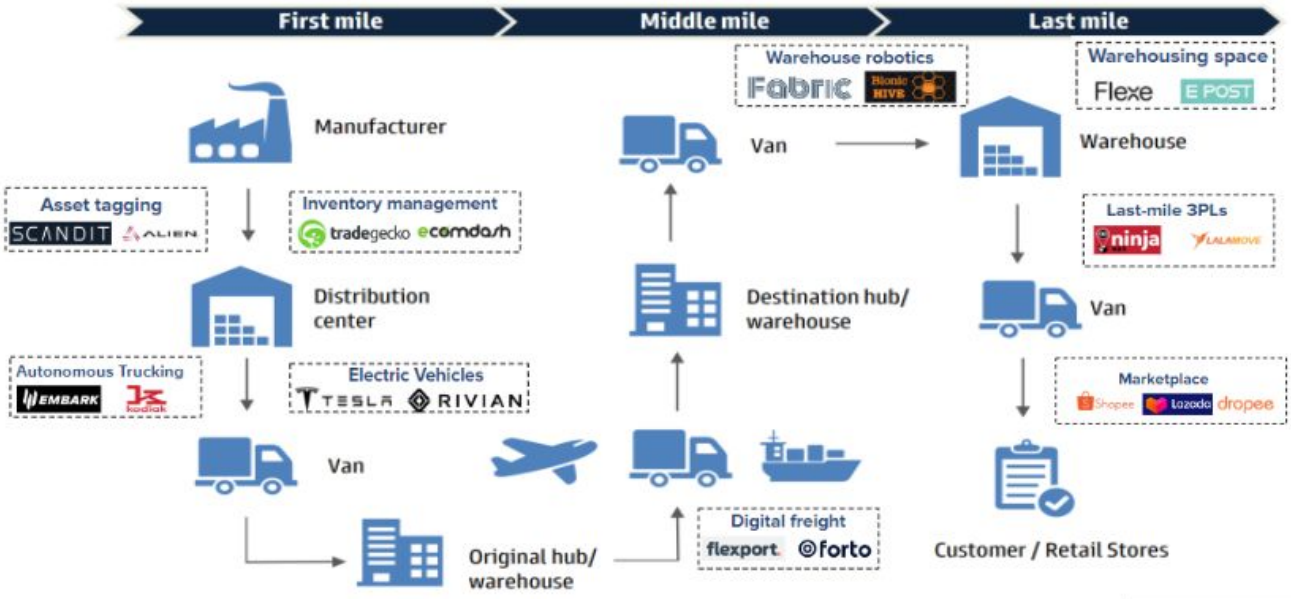
of several minerals, mainly lithium, cobalt and nickel. These minerals are generally sourced from different regions. Table 11 displays the top producing countries of lithium, cobalt and nickel.

After they are mined, raw materials are generally sent to Asia, namely China to be processed and manufactured into battery cells. EV supply chains are still overloaded, due to the large logistics footprint. For instance, despite producing nearly a quarter of all EVs, Europe only accounts for a small portion of the supply chain, at 20%. The large footprint of moving key minerals from origin points to the country of destination presents challenges such as supply chain visibility and disruptions. Lithium-ion batteries have strict transportation requirements as they are classified as a class 9 substance, due to their sensitivity to temperature, humidity and collision. Hence, the conditions of the batteries must be monitored to ensure optimal performance and useful lives. Once EV batteries approach the end of its useful life, consumers will have to recycle and/or dispose them. Although lithium-ion recycling is still in its infancy, it remains a critical factor to ensure a healthy supply chain for EVs and circularity of batteries. To ensure optimal handling, temperature and humidity must be monitored throughout the supply chain.

To mitigate supply chain visibility risks, it is crucial for auto businesses to leverage platforms that integrate systems hence promoting information sharing, collaborative decision making and real-time inventory management. Automakers are able to achieve this by adopting technologies such as Warehouse Management Systems (WMS) and Enterprise Resource Planning (ERPs), as well as supply chain visibility tools such as asset tagging. Integration of these systems ensures the timely and visible information to stakeholders, meeting KPI benchmarks and route efficiencies of the auto parts. For instance, implementing an asset tracking system would generate positive ROI in less than 12 months, and reduce inaccuracies of 10%-15% down to 0.5%, according to IT Business Edge. Implementing this system could also help in transporting EV batteries, as some solutions are built with temperature and humidity sensors, which allows real-time health monitoring of the lithium-ion batteries.

Advanced analytics help companies evaluate complex datasets and bottlenecks, to ensure effective data-driven decision making. Predictive analytics are imperative in boosting efficiency with intelligent forecasting, inventory management and dynamic pricing of parts. Intelligent tools provide dynamic routing capabilities to ensure optimised fleet utilisation, to prevent disruptions in operations. For instance, Ford teamed up with supply chain planning software company Kinaxis – to establish a rapid response supply chain system to manage global network effectively while keeping inventory levels low. The software company enables customers to forecast demand and evaluate impact of changes to key supply sources and alternatives to meet disruptions. The end result is better use of production resources, and fewer last-minute workarounds.

Diagram 3: Supply chain and logistics tech map (Source: CBInsights)



Cross-border e-commerce is a US$68 billion market opportunity in Southeast Asia and is expected to grow at a CAGR of 16.4 percent from 2021 to 2026, reaching US$146 billion (source: Euromonitor). This growth is expected to stay resilient, due to improving technological and logistical infrastructure encouraging seamless transaction processes, enhanced product localisation, and attractive prices for international consumers. The improving e-commerce infrastructure can be attributed to the increasing investment volume into cross-border e-commerce enablers in Southeast Asia. Demand for faster and more cost-effective methods of shipments, combined with less-developed cross-border logistics infrastructure in the region, relative to developed economies – attract greater investment volume from venture capital firms (as illustrated in figure 7), as well as greater technology adoption into the supply chain.

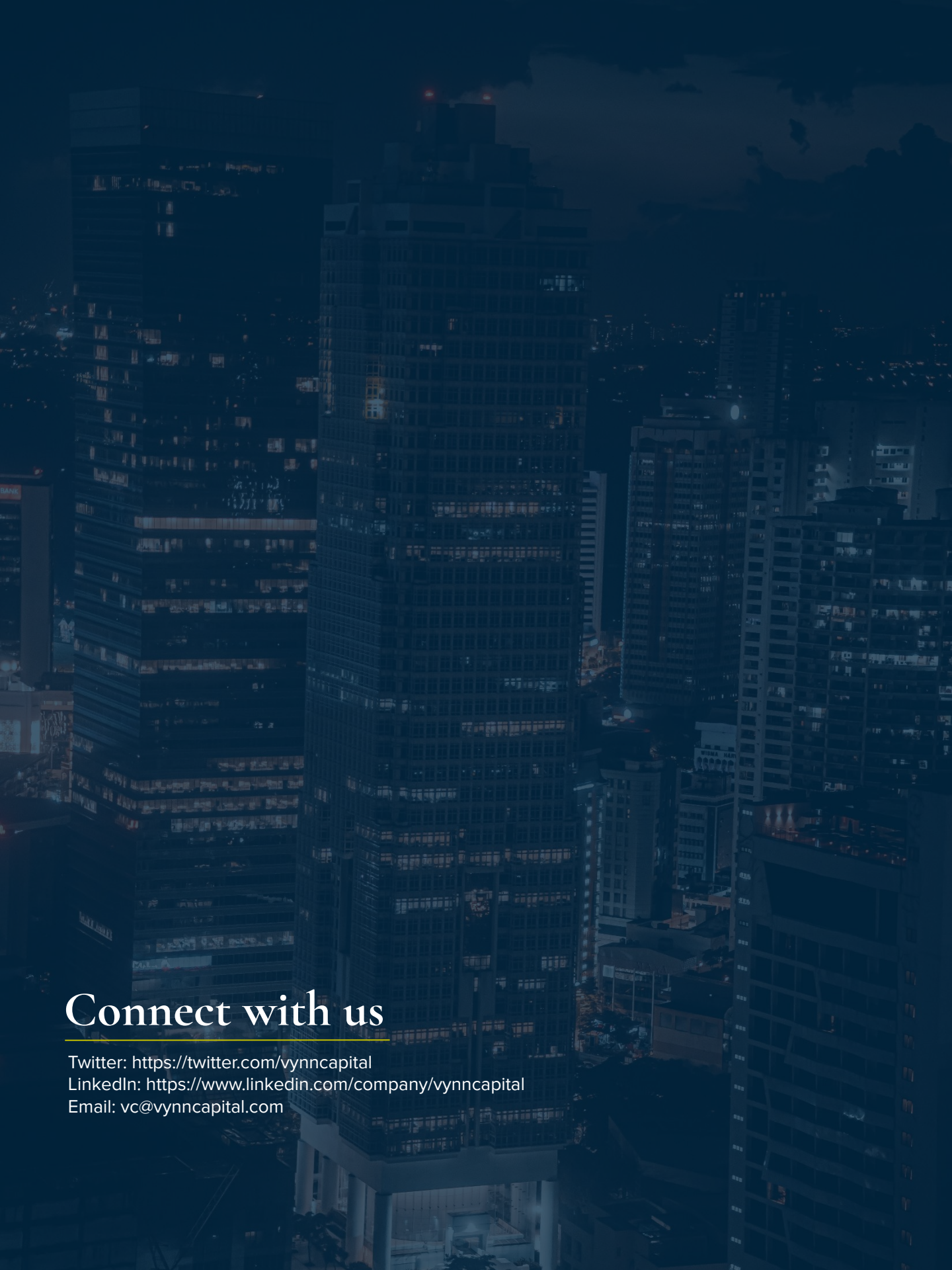
As displayed on Diagram 3, the explosive growth in supply chain efficiency tools are a product of demanding customers and cross-border bottlenecks. These products tend to have high revenue growth (due to the large total addressable market), high revenue retention rates, due to the value-added services and deep integration with core activities of their customers. However, existing logistical solutions in cross-border e-commerce are still not sustainable – the bottlenecks, which include high logistics cost and difficulty in custom clearance inspections present ample opportunities for startups to introduce effective products to the market.

Due to the facts stated in this report, Vynn Capital anticipates several key trends to play out in the supply chain and mobility space.

(i) Greater data sharing and integration due to digital adoption and automation across the supply chain. The adoption of Internet of Things (IoTs), and supply chain analytics will generate vast amounts of data, which will be shared horizontally and vertically to generate higher quality data-driven insights.

(ii) Autonomous EVs, trucking and "innovative" ways of delivering goods will also be favoured as technology becomes more efficient and productivity is prioritized, as cross-border e-commerce activity increases.

(iii) Larger enterprises to participate in the innovation cycle of mobility and supply chains, through internally developed technologies, collaborations and investments in startups over the short to medium term, allowing expansion to adjacent industries e.g. financing and insurance.



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