

EQUINIX AND KAPRONASIA
**BUILDING A CUSTOMER-CENTRIC
DIGITAL BANK IN SINGAPORE:
IT TAKES AN ECOSYSTEM**

Contents

Defining a value proposition 2

Digital banking in Singapore amid COVID-19 4

**The digital banking opportunity:
retail and corporate** 5

Key success factors for digital banks 7

1. Digital agility to support a better
customer experience. 7

2. Favorable cost structure. 8

3. Optimizing security. 8

**Conclusion:
The ecosystem opportunity** 10

Singapore will become one of the focal points of Asia’s digital banking evolution when the city-state awards digital banking licenses later this year. As a key fintech hub in Southeast Asia, Singapore is a natural starting point for digital banks in the region and was an early adopter of digital financial technology, which laid the groundwork for a dynamic fintech startup scene.

**The dawn of digital banking
in the Lion City**

No digital bank, in the purest sense of the term, currently exists in Singapore. While there are many fintechs, most provide only digital financial services that do not require a banking license: digital wallet services, cross-border payments and various virtual-asset-focused services. A digital bank (also known as a “neobank” or “virtual bank”) differs in that it is licensed to both accept customer deposits and issue loans, whether to retail customers, corporate customers or both. Singapore’s financial regulator, the Monetary Authority of Singapore (MAS) plans to release five digital bank licenses in total and will announce the successful licensees in the second half of 2020. The licensed digital banks will likely then launch in mid-2021.

While many less-developed Southeast Asian economies are leveraging digital banks to focus on financial inclusion, the role of digital banks in Singapore will be slightly different and focused on driving innovation. Bringing together traditional financial services firms, fintechs, other tech companies and even telecoms firms, digital banks could act as a catalyst for financial innovation in Singapore and help the city-state maintain its competitive advantage as a regional fintech hub.

The MAS has shown little interest in digital banks completely “disrupting” the Singapore financial services sector. While such an approach may work in Europe, where loss-making neobanks like Revolut and N26 are aggressively competing for market share with established players, it does not mesh with Singapore’s prescriptive digital banking ethos. The MAS has set strict, relatively high capital requirements for digital banks to control systemic financial risk. Risk tolerance is

higher in Europe, where regulators are willing to grant banking licenses to neobanks that are losing tens of millions or even hundreds of millions of dollars a year. Singapore would likely not authorize such a firm to take customer deposits or provide loans to customers. In comparison with Europe, digital banking in Singapore will be evolutionary, not revolutionary.

“MAS will carefully evaluate the sustainability of applicants’ business models. They must not engage in value-destructive competition to gain market share. MAS will monitor market dynamics and, where necessary, impose additional supervisory requirements or restrictions to deter such behavior. The aim here is to avoid unsustainable banking practices, and to preserve a level playing field among banks,” said MAS in a statement.¹

Defining a value proposition

At the same time, demand exists in Singapore for a seamless digital banking experience, especially among younger people who spend a lot of time on connected devices. Unencumbered by incumbents’ clunky legacy IT systems, digital banks could potentially capture a large share of this business. These virtual banks offer customers something traditional banks cannot: banking built for the digital age, from deposits and loans to asset management and insurance, all available 24/7 thanks to a high degree of automation. Digital banks typically use data analytics and artificial intelligence to provide an enhanced customer experience, whether that means better tailoring products, evaluating a potential borrower’s creditworthiness or flagging suspicious transactions.

Indeed, rather than focusing on channels and products, digital banks will likely instead pursue a customer-centric approach. Take the availability of essential banking services as an example. Incumbents in Singapore typically close before 6 p.m., when most people in Singapore are still at work. Given a choice, most people would rather not have to visit their bank in their free time. In contrast, digital banks, by nature, never shut

down, just as Amazon or eBay never close. Digital banks thus offer some of the same advantages to consumers compared to physical branches as e-commerce platforms do vis à vis brick-and-mortar stores.

Another key difference between digital banks and incumbents is the former’s emphasis on building strategic partnerships. Traditional banks have historically offered their services in a siloed manner. If customers find that certain services they need are unavailable at their bank, they must open an account with a different bank that does offer those services.

In contrast to that approach, digital banks are capitalizing on the opportunities provided by the rise of Banking as a Service (BaaS) to build ecosystems of strategic partners, with each member of the network providing complementary digital services. BaaS appeals to both neobanks and fintechs not engaged in actual “banking,” as defined by deposit taking or lending, because it allows all participants in the ecosystem to efficiently reach their target market. In the United States, the digital banks Chime, Simple and MoneyLion operate in an ecosystem of BaaS partners, as does neobank unicorn N26 in Germany.

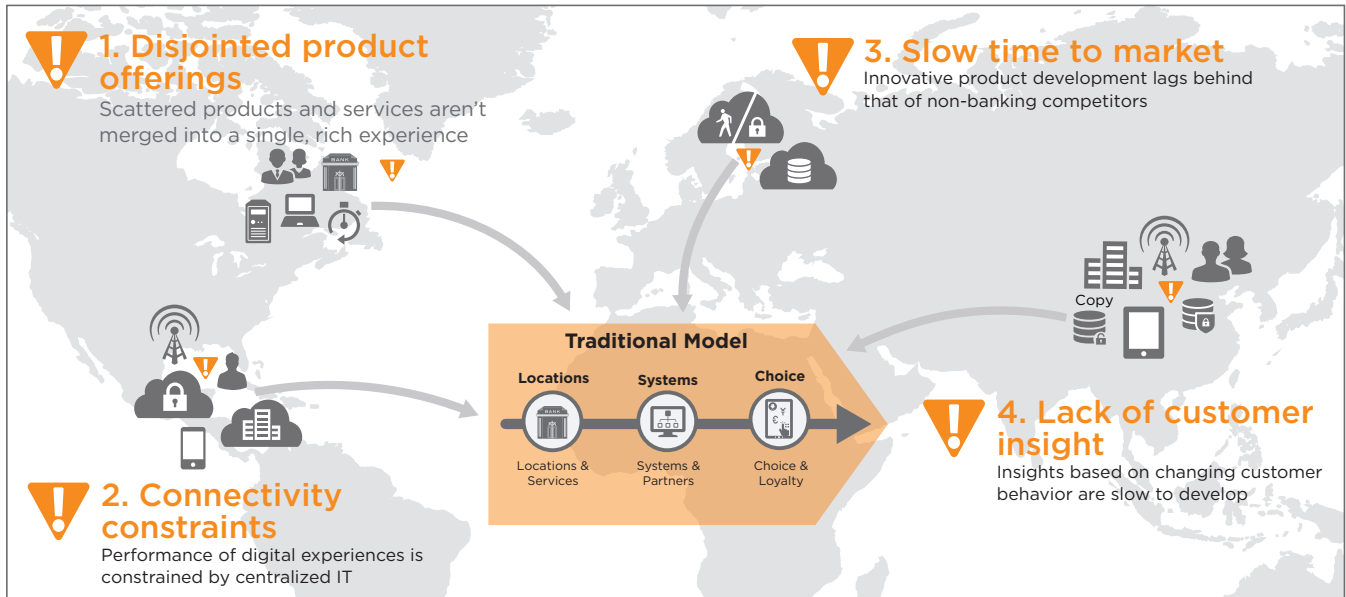
“Importantly, BaaS players can form the connective tissue between finance and the digital economy. For example, companies like Solarisbank (Germany), Green Dot (U.S.), Fidor (Germany) and Cross River (U.S.) seamlessly integrate payments, credit and insurance products into e-commerce,” note analysts from independent think tank group CGAP.²

Within these emerging ecosystems, digital banks ideally are based or colocated in the same data centers as their ecosystem partners. By doing so, digital banks can benefit from enhanced interconnectivity, while surmounting the security challenges and slow transmission speeds that come with traversing the internet. Ultimately, this helps create a better customer experience, offering the customer a more secure, efficient and higher value service. The ability to leverage BaaS and build a strong, secure ecosystem of partners will be integral to the success of Singapore’s digital banks.

¹ Monetary Authority of Singapore, “Reply to Parliamentary Question on terms of operations for virtual banks,” July 2019. <https://www.mas.gov.sg/news/parliamentary-replies/2019/reply-to-parliamentary-question-on-terms-of-operations-for-virtual-banks>.

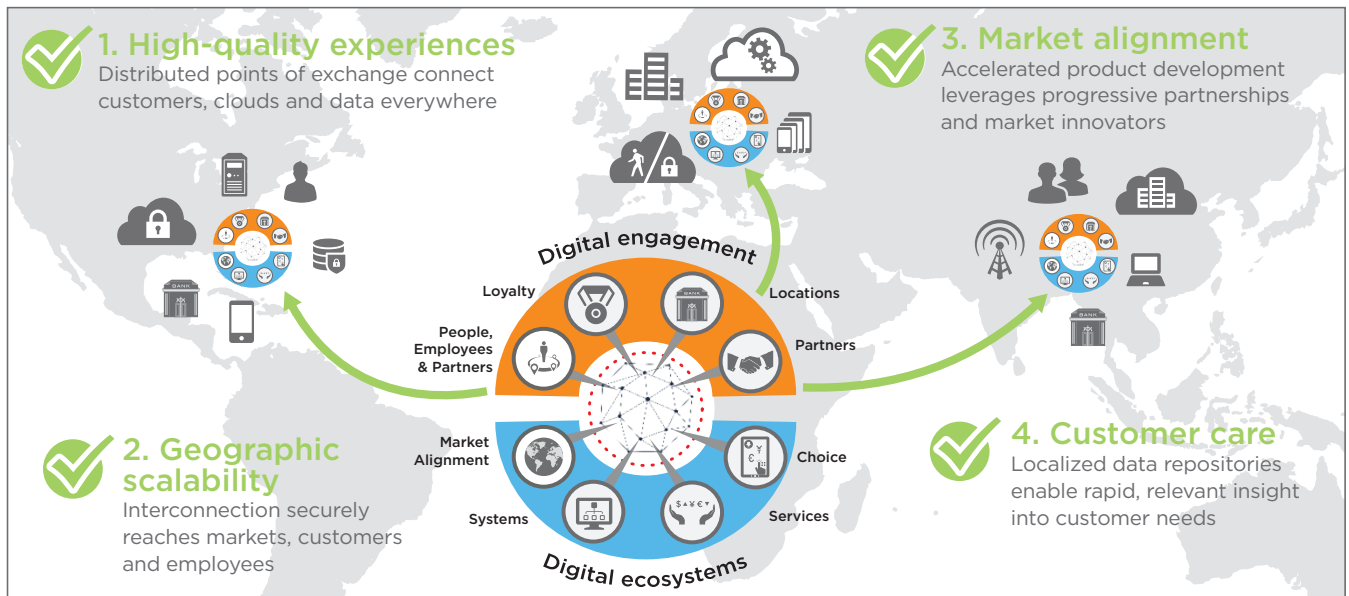
² Peter Zetterli and Ivo Jenik, “Digital Banking for the Poor,” The Finanser, July 14, 2020. <https://thefinanser.com/2020/07/digital-banking-for-the-poor.html>.

Current-State Constraints



Retail banks can't deliver solutions to meet changing customer and market needs fast enough.

Future-State Capabilities



A dynamic IT infrastructure provides high-quality experiences and quickly delivers targeting value to customers.

Digital banking in Singapore amid COVID-19

In June 2019, the Monetary Authority of Singapore (MAS) announced it would issue five digital bank licenses. Two of these will be digital full bank (DFB) licenses, and the other three will be digital wholesale bank (DWB) licenses. The DFB license allows the holder to serve both retail and corporate customers, specifically small- and medium-sized enterprises (SMEs). The licensee must be a Singaporean company based in Singapore and hold a controlling stake in the digital bank. In contrast, the holder of a DWB can only serve SMEs and other non-retail customers. Either a Singaporean or foreign company can hold a controlling stake in a DWB.

Competition for Singapore's digital bank licenses is intense. There are 21 applicants for just five licenses (seven for the DFB license and 14 for the DWB license). Applicants include several tech heavyweights, such as China's Ant Group (formally Ant Financial), the Singaporean ride-hailing service giant Grab, the Singapore- and U.S.-based gaming hardware firm Razer, and the U.S.-listed internet company Sea, owner of Singapore's e-commerce platform Shopee. SingTel, the Singaporean telecoms giant, is applying for a DFB license together with Grab.

The MAS originally intended to announce the winners of the licenses in June 2020, but decided to delay its decision until year-end given the impact of the COVID-19 pandemic on life in Singapore. However, the regulator did say in June that 14 of the 21 applicants had advanced to the next stage of assessment. Reportedly, the short-listed applicants include Grab/Singtel, Razer, Sea and MatchMove.³ The selected digital banks are likely to launch in mid-2021.

The COVID-19 pandemic has created both opportunities and bottlenecks for digital banks. On the one hand, cashless payments have risen out of necessity, particularly with more transactions moving online

because of lockdown measures and increased concern about infection via human contact. This trend augurs well for banks with a purely digital value proposition.

However, for now it is the incumbents who can take advantage of this opportunity, as digital banks have yet to go live in Singapore. Cashless transactions at Singapore's top lender DBS doubled in the first quarter of 2020 compared to the same period a year earlier. In contrast, cash withdrawals and deposits fell by a record 11% year-on-year in Q1 2020. United Overseas Bank, the second-largest Singaporean lender, reported surging growth in the use of its cards for online grocery shopping (44%), food orders (36%) and e-commerce transactions (41%).⁴

During the pandemic, Singapore's migrant workers, who number roughly 1.4 million, have begun rapidly shifting their banking online out of necessity. From April 7 to June 1—Singapore's "circuit breaker" period meant to hinder the disease's spread—the workers were confined to their dormitories. To ensure the workers received their pay during this measure, the Ministry of Manpower required all employers with workers residing in dormitories to pay salaries electronically, whether through General Interbank Recurring Order (GIRO) or direct bank transfer.⁵

During April, 41,000 migrant workers opened an account with the Post Office Savings Bank (POSB), a consumer bank affiliated with DBS that allows account holders to perform basic banking transactions by SMS and charges no remittance fees. Typically, POSB signs up just 11,000 to 13,000 migrant workers a month.⁶

It is unlikely that Singaporeans will revert to higher cash use as the pandemic recedes. That is not to say that cash will disappear from Singapore anytime soon—such predictions are hyperbolic—but that banking will increasingly digitize in line with other aspects of people's daily lives.

3 Anshuman Daga, Aradhana Aravindan, "Grab-Singtel, Sea among 14 shortlisted for Singapore digital bank licences" – sources, Reuters, <https://www.reuters.com/article/singapore-banks/singapore-shortlists-14-applicants-for-digital-bank-licences-idINKBN23POB9>.

4 Lester Wong, "Cashless transactions spike as Covid-19 forces public to adapt," The Straits Times, April 16, 2020. <https://www.straitstimes.com/tech/cashless-transactions-spike-as-covid-19-forces-public-to-adapt>.

5 Singapore Ministry of Manpower, "Advisory on salary payment to foreign workers residing in dormitories," April 11, 2020. <https://www.mom.gov.sg/covid-19/advisory-on-salary-payment-to-foreign-workers>.

6 Singapore Business Review, "POSB opens 41,000 accounts for migrant workers," May 14, 2020. <https://sbr.com.sg/financial-services/news/posb-opens-41000-accounts-migrant-workers>.

The digital banking opportunity: retail and corporate



The demand for digital banking in Singapore is strong enough that, by one estimate, roughly 20% of the population—about 980,000 people—already have an account with a neobank. Assumedly, these are neobanks located outside of the city-state since the MAS has not yet issued any digital bank licenses. Unsurprisingly, young people aged 18 to 24 are the most enthusiastic about digital banks, with 25% having an online-only account. If the current pace of adoption continues, up to one-third of Singaporeans would have a neobank account by 2025.⁷

By other estimates, the demand for digital banking in Singapore could be even more robust. Visa's most recent survey of consumer payment attitudes in Singapore, conducted in October 2019, found that 65% of Singaporeans would consider opening an account with a neobank. Another 63% of respondents said they were willing to bank with new startups, while 20% said that they would gladly shift all their banking from an incumbent to a digital bank.

"When the region shifts to a millennial, digital-led demographic, more consumers will expect digital-first experiences and want their banking and payments to match the speed and convenience of their user journeys," said Kunal Chatterjee, Visa Country Manager for Singapore and Brunei, in a press release.⁸

Singapore's high foreign exchange fees may be one reason why a significant portion of the population has a foreign neobank account. Digital banks and other fintechs involved in money transfers typically charge much lower fees than incumbents, and occasionally, nothing at all. Research by money transfer services firm TransferWise has found that Singapore spends S\$2.8 billion in foreign exchange fees annually, with each household spending roughly S\$2,000.

"A major reason Singapore pays S\$2.8 billion in fees a year is that 71% of those fees—or S\$2 billion—is hidden in the exchange rate mark-up," says TransferWise co-founder and chief executive officer Kristo Käärmann.⁹

Firms like TransferWise have become so successful that many neobanks are using them for cross-border payments rather than doing it themselves. TransferWise has about US\$2.5 billion in customer deposits, eight million customers and does US\$5 billion in monthly cross-border transactions. TransferWise recently inked a deal with the Zurich-based digital bank Neon and its open banking partner Hypothekbank Lenzburg that will allow Neon's clients to send money directly through TransferWise's platform to more than 40 countries in 20 currencies. Integrations such as these typically rely on APIs and are a good example of where an ecosystem approach can make sense.

For its part, TransferWise is keen to continue expanding partnerships through an ecosystem approach but has not expressed any interest in becoming a digital bank itself. "The only thing that the banking license in Europe lets banks do is lend out the deposits that customers give them, and that's not what our customers are asking for," Käärmann told Tech Crunch. TransferWise has not applied for a digital bank license in Singapore either, but is active in the city-state's payments market.

⁷ Richard Laycock, "Digital banking adoption in Singapore," Finder.com, April 27, 2020. <https://www.finder.com/sg/digital-banking-statistics>.

⁸ Visa, "Two in Three Singaporeans Interested in Using Neobanks: Visa Study", <https://www.visa.com.sg/about-visa/newsroom/press-releases/two-in-three-singaporeans-interested-in-using-neobanks-visa-study.html>.

⁹ Kristo Käärmann, "Why Singapore spends more on foreign exchange fees than tuition," The Business Times, March 24, 2020. <https://www.businesstimes.com.sg/opinion/why-singapore-spends-more-on-foreign-exchange-fees-than-tuition>.

Some analysts are adamant that Singapore needs digital banks to boost financial inclusion. This argument is somewhat contentious, given that almost all Singaporeans over the age of 25 have a bank account. Allianz Global Wealth estimates the ratio at 98%, behind only Israel and Japan.¹⁰

The idea that Singapore has a significant underbanked population gained traction following the publication of a report in October 2019 by Bain & Company, Google and Temasek Holdings. That report found that 38% of Singaporeans are underbanked, implying they do not have access to all the essential financial services they need, such as credit cards, insurance and long-term savings products. Interestingly, the report found similar underbanked rates in two middle-income countries, Thailand (40%) and Malaysia (45%), both of which have much lower per-capita GDP levels than Singapore.¹¹

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The Bain, Google and Temasek report may have concluded that Singapore has a relatively significant underbanked population because it surveyed people 18 and older. However, many young adults in Singapore live with their parents and are not financially independent.

SMEs are another key market segment for digital banks. While firms tend to hail Singapore's pro-business ethos, it is an expensive place to operate, and many SMEs face funding difficulties. The Singapore Business Federation (SBF), which represents about 27,000 companies, estimates that about 44% of the city-state's SMEs have internal fiscal problems, with about half citing cash flow, liquidity and credit risk as primary concerns. Two in five respondents to SBF's most recent National Business Survey—conducted prior to the COVID-19 pandemic—said they faced a credit crunch. The problem was most severe for the retail, hospitality and construction sectors.¹²

Amid the COVID-19 pandemic, the financial pressure on all those industries is at an unprecedented high. In April, the first "circuit breaker" month, Singapore's retail sales fell nearly 41%, the highest on record. Food and beverage sales plunged 53% as restaurants were only permitted to offer take-out service.¹³

There are several digital ecosystems that SMEs use that may be of interest to Singapore's neobanks. One active in the city-state is New Zealand-based Xero, whose cloud-based network includes incumbent banks like HSBC and OCBC as well as TransferWise. Xero's ecosystem connects more than 500 app partners to one million subscribers and 100,000 business advisors, and its apps are designed to support the many tasks involved in running a business. When Xero is connected with one of these tools, data can flow in real time between two systems, accelerating the completion of administrative tasks.¹⁴

Singapore's digital banks will launch at a time of intensified competition and more significant opportunity. The shift to online banking will continue gathering momentum even as the pandemic recedes. Traditional banks will seek to enhance their digital offerings to capture as large a share of this business as possible.

¹⁰ Singapore Business Review, "Chart of the Day: 98% of Singaporeans have a bank account," October 5, 2018. <https://sbr.com.sg/financial-services/news/chart-day-98-singaporeans-have-bank-account>.

¹¹ Bain & Company, Google and Temasek, "Fulfilling its promise: The future of Southeast Asia's digital financial services," October 30, 2019.

¹² Singapore Business Federation, "SBF welcomes expansion of digital banking sector to support financing needs of SMEs," January 5, 2020. <https://www.sbf.org.sg/sbf-welcomes-expansion-of-digital-banking-sector-to-support-financing-needs-of-smes>.

¹³ Department of Statistics Singapore, "Monthly Retail Sales and Food and Beverage Services Indices," Apr 2020. <https://www.singstat.gov.sg/-/media/files/news/mrsapr2020.pdf>.

¹⁴ Xero, "How our ecosystem drives small business success," 2017. <https://www.xero.com/blog/2017/03/how-ecosystem-drive-success>.

Key success factors for digital banks

- 1 Digital agility to support a better customer experience
- 2 Favorable cost structure
- 3 Optimizing security

1. Digital agility to support a better customer experience

Compared to incumbents, digital banks have several critical competitive advantages. One of the most important is digital agility. Traditional banks often struggle to square the circle by building state-of-the-art digital infrastructure on top of legacy IT systems dating back to the pre-internet era. The engineers who built the legacy IT systems did not design them to be integrated with internet-based banking systems. Unsurprisingly, bank customers often give lukewarm reviews to the online and mobile banking interfaces their banks offer.

Digital agility in theory promises a better user experience for the typical neobank customer compared to what they are used to at a traditional bank. Convenience is a significant advantage for digital banks as they, much like e-commerce platforms, never shut down. With a digital bank, it is often possible to bank wherever, whenever, and opening an account is typically fast and painless. At German neobank N26, Europe's second most valuable fintech after the U.K.'s Revolut, opening an account can be done in minutes;¹⁵ at Revolut, it reportedly takes as little as 60 seconds.¹⁶

Revolut also allows customers to create multiple wallets in the more than 29 currencies it supports and pay in the local currency when overseas. Revolut account holders can exchange dollars, euros, pounds or yen at the interbank exchange rate, significantly reducing foreign exchange fees.

At the same time, launching new financial products and services can be significantly streamlined when the technology infrastructure is similarly agile. Developing, testing and launching a new product into production is much easier in a scalable and stable cloud environment.

Being based in an ecosystem can further enhance neobanks' digital agility by allowing them to select best-of-breed solutions and integrate them quickly. For instance, if a neobank is using TransferWise for cross-border payments and wants to switch to Nium, it can make the change easily if its technology architecture is agile.

Digital agility also allows virtual banks to better tailor their services for customers. Chinese fintech giant Ant Group, which has applied for a digital wholesale banking license in Singapore, is a case in point. Ant Group has built a formidable self-contained digital banking ecosystem for the mainland China market. The best-known components of this ecosystem are the digital wallet Alipay, the digital bank MYbank, and the digital money-market fund Yu'e Bao.

Ant's Sesame Credit, an opt-in feature of the Alipay wallet, digs into Alibaba's treasure trove of user data—drawn from their purchases on its massive e-commerce marketplaces and various transactions with the e-wallet, among others—and creates a "Sesame" score. While Ant does not currently use the Sesame rating to evaluate a customer's eligibility for a loan, it has other applications.

For instance, users with a sufficiently high Sesame Credit score may be able to rent a home in China without putting down a deposit. Additionally, in November 2018, Canada began accepting Sesame Credit-generated reports, available to users with a score of 750 or higher, as proof of financial standing from Chinese applying for visitor visas. Previously, Canada only accepted bank statements to prove financial standing.¹⁷

Ant Group's competitor WeChat Pay (owned by Chinese internet giant Tencent) has an impressive digital financial ecosystem of its own, based within the super-app WeChat. In June 2020, WeChat launched its own credit-scoring system. This score is generated from a user's payment behavior and credit history on the platform. In addition to crunching numbers from WeChat Pay transactions, the credit-scoring system analyzes user data from online bank WeBank. A higher WeChat Pay score (measured on a scale of 350-850) entitles a user to more of the 1038 credit-related services. Several ride-hailing and hotel service platforms will also be integrated with the credit-rating system.¹⁸

¹⁵ N26, Opening a bank account, <https://n26.com/en-eu/bank-account>.

¹⁶ Nick Bogaert, "How Revolut delivers a great customer experience," Board of Innovation, <https://www.boardofinnovation.com/blog/how-revolut-delivers-a-great-customer-experience>.

¹⁷ He Wei, "Zhima Credit makes visa applications easier," China Daily, <https://www.chinadaily.com.cn/a/201811/27/WS55bfc7b8da310eff30328b256.html>.

¹⁸ Tony Xu, "WeChat rolls out credit-scoring system," pandaily, <https://pandaily.com/wechat-rolls-out-credit-scoring-system>.

2. Favorable cost structure

Digital banks have another key advantage over incumbents: their cost structure is typically much smaller. Without the extensive retail branch network of traditional banks, digital banks have much lower operating costs. Most importantly, their primary fixed costs are lower as they do not have to pay monthly rent for physical branches. In turn, they can charge customers lower fees and theoretically (depending, of course, on many factors) still have a sustainable business model.

Digital banks benefit from basing their IT systems in the cloud. Some build their own cloud-based infrastructure, while others shop around for the best provider for their needs and buy that platform. By architecting their systems to operate in a hybrid multicloud colocation facility, digital banks significantly reduce their fixed costs. They only need to pay a fixed fee to their Infrastructure as a Service (IaaS) and Software as a Service (SaaS) providers, lowering legacy technology concerns and system maintenance fees. At the same time, funding is freed up for more productive endeavors, such as developing innovative products and services for customers.

With their light footprint, digital banks can enter a new market using the same hybrid multicloud blueprint with a global colocation provider much easier than a traditional bank. Once they have received the requisite licenses, they need only set up a physical office for staff members—customer acquisition can occur entirely in the digital realm. Digital banks thus have an inherent potential to scale rapidly. As they continue to grow and expand their offerings, there will be more reliance on cloud providers that provide niche services and development environments to maintain their advantage.

Brazil's Nubank offers an excellent example of this capability. Nubank is currently the world's largest independent digital bank with 25 million customers. Nubank's growth has been exponential since 2019, as it grew from 15 million customers in October 2019 to 25 million in June 2020.¹⁹ To be sure, Nubank benefits from the large population of its home market (almost 210 million) and deep-pocketed investors. However, it

could not have easily grown so quickly by relying on a traditional branch network, as costs would have likely been prohibitive.

3. Optimizing security

Virtual banks' reliance on digital technology is, in some respects, a double-edged sword, making them agile but also highly vulnerable to cyberattacks. Payments and banking rely heavily on a combination of internet and traditional network carriers, yet both routes are increasingly running into difficulties in a cloud-enabled world. The internet lacks an SLA, may not have good QoS and its attack surface is vast.

A prominent area of concern is attack vectors that threaten mobile networks. Digital banks need to pay especially close attention to these types of cyberattacks because cybercriminals who target mobile devices usually do so with apps. This was the case in 79% of attacks on mobile networks in 2019, according to a recent study by Pradeo Labs. The same survey found that 10% of 50,000 Android devices analyzed hosted zero-day (unknown) malware, and 3,890 devices were infected with known malware. Network attacks have risen 4% in the past year, the study said.²⁰

Cisco estimates that from 2018-19, there was a 776% annual growth in large-scale cyberattacks of 100 gigabytes per second (Gbps) and 400 Gbps. For reference, an attack of 6 Gbps is often enough to take down a website. Cisco forecasts Distributed Denial of Service (DDoS) attacks to double from 7.9 million in 2018 to 15.4 million by 2023.²¹

Corero estimates that these DDoS attacks can cost firms up to US\$50,000 per attack, taking into consideration lost revenue and other factors. 69% of respondents to a 2018 survey said that their organization experiences 20 to 50 DDoS attacks a month.²²

The worst damage wrought by cyberattacks is not necessarily the easiest to quantify, such as potential loss of intellectual property as well as reputational damage—losing customer trust and confidence is perhaps the biggest risk of all. Major data breaches

¹⁹ Oliver Smith, "Brazil's Nubank reaches 25m customers across Latin America," AltFi, June 2, 2020. https://www.altfi.com/article/6655_brazils-nubank-reaches-25m-customers-across-latin-america.

²⁰ DARKReading, "Apps Remain Favorite Mobile Attack Vector," February 13, 2020. <https://www.darkreading.com/mobile/apps-remain-favorite-mobile-attack-vector/d/d-id/1337043>.

²¹ Cisco Annual Internet Report (2018-2023) White Paper, March 9, 2020. <https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.html>.

²² Andrew Lloyd, "DDoS Attacks Can Cost Organizations \$50,000 Per Attack," Corero, <https://www.corero.com/blog/ddos-attacks-can-cost-organizations-50000-per-attack>.

can shake the confidence of customers in the ability of organizations to protect their personal information.

During the pandemic, online scams have risen sharply in Singapore. Scammers employing bogus loan schemes defrauded victims out of S\$41.3 million from January to March, up roughly 28% over the same period a year earlier, according to Singapore police.²³

Given the risk of network attacks on the public internet, some financial services providers are transitioning to interconnected cloud solutions that use private peering. Being able to connect to multiple providers from a single course, such as a data center, offers a higher level of security than banks can achieve on the public internet.

At the same time, generic Hardware Security Modules (HSM) provide secure key management to protect data in public, private, hybrid or multicloud environments, simplifying provisioning and control of encryption keys. In addition to generic HSMs, any bank or payment company issuing or acquiring card-based transactions will also need a payment HSM. Both generic and payment HSMs are relatively expensive pieces of hardware, especially as an up-front cost when launching a new business without any revenue. Therefore, HSM as a Service inside of colocation facilities for both generic and payment HSM is emerging as a strategic way to shift the CAPEX to OPEX. This enables a service-based approach to key management, supporting use cases such as point-of-sale point-to-point encryption, signature and verification of digital wallets, and many others.

Some digital banks are using artificial intelligence to make their ecosystems more secure and to fight fraud, such as U.K.-based neobank Revolut, Europe's most valuable fintech startup. Revolut currently offers its multicurrency wallet and remittance service in Singapore. However, in November 2019, it dropped out of the city-state's digital banking race, citing high capital requirements.²⁴

Revolut has developed a machine learning-powered fraud-prevention system it calls Sherlock. Completely autonomous, Sherlock monitors all Revolut users' transactions continuously. When Sherlock detects a suspicious transaction, it pulls up user and merchant profiles from Couchbase, an open-source cloud database service, then blocks the purchase and freezes the user's Revolut card. Sherlock then sends a push notification to the user, who confirms whether the transaction is fraudulent or not. If the operation is legitimate, Sherlock unfreezes the card, and the person can complete the transaction. If it is fraudulent, the AI system immediately terminates the card. The user then orders a replacement.²⁵

According to Revolut and Couchbase, Sherlock's anti-fraud capabilities save more than US\$3 million per year in customer money. Just 1 cent out of every US\$100 is lost due to fraud, which compares favorably to the industry average of 7-8 cents. In recognition of Sherlock's efficacy, the FStech Awards recognized Revolut and Couchbase with the Anti-fraud Solution of the Year in April 2020.²⁶

Being able to connect to multiple providers from a single course, such as a data center, offers a higher level of security than banks can achieve on the public internet.

As transactions continue to move online in Singapore, so will related security challenges. As they go live, the Lion City's digital banks will need to ensure they are well prepared to tackle this problem, as doing so will be integral to building and maintaining customer trust.

²³ Cara Wong, "Scam victims lost \$41.3 million in Q1; e-commerce and loan scams among most common," The Straits Times, May 4, 2020. <https://www.straitstimes.com/singapore/courts-crime/scam-victims-lost-413-million-in-first-quarter-of-2020-e-commerce-and-loan>.

²⁴ Natalie Choy, "Revolut drops out of Singapore digibank race over high capital requirement," The Business Times, November 13, 2019. <https://www.businesstimes.com.sg/banking-finance/sff-x-switch-2019/revolut-drops-out-of-singapore-digibank-race-over-high-capital>.

²⁵ Mark Jones, "How Revolut's Sherlock AI saves its customers from fraud," T_HQ, November 21, 2019. <https://techhq.com/2019/11/how-revoluts-sherlock-ai-saves-its-customers-from-fraud>

²⁶ Perry Krug, "Couchbase and Revolut Win FS Tech Awards' Anti-fraud Solution of the Year Accolade," The Couchbase Blog, April 7, 2020. <https://blog.couchbase.com/couchbase-and-revolut-win-fs-tech-awards-anti-fraud-solution-of-the-year-accolade>.

Conclusion: The ecosystem opportunity

Singapore's banking sector will continue its steady digital transition even if the COVID-19 pandemic is brought under control faster than expected. It is important to see the pandemic not as the key enabler of financial digitization, but merely a catalyst for a trend that was already taking shape as digital banks further refine their customer-centric business model, placing the bank within a comprehensive network ecosystem of partners. This ecosystem can facilitate a better customer experience by allowing customers to access a wider array of services that are more personalized than those found at traditional banks. Technologies like big data analytics and artificial intelligence enable digital banks to serve customers in a more targeted manner, whether building credit profiles, developing specific products for them, or enhancing account security.

Rising interconnectivity will accelerate the rise of digital banking ecosystems. In its 2019 Global Interconnection Index (GXI) market study, Equinix predicts that global interconnection bandwidth will rise at a 51% compound annual growth rate (CAGR) through 2025. The growth rate in Asia-Pacific is predicted to be even faster than the global average at 56%.

Driving this surge in data traffic will be enterprise customers. By connecting to more cloud platforms and business ecosystems, enterprise customers can more effectively store, move and analyze their large troves of data. "At the core of this trend is interconnection, which ties the web together," said Rich Miller, founder of the news site Data Center Knowledge, in a recent commentary.²⁷

That is indeed a quick rate, and the forecast was made before the COVID-19 pandemic, which has accelerated the transition to online services. In its 2019 GXI report, Equinix found that Singapore's banking and insurance sector ranked first in the Asia-Pacific region for interconnection deployment in 2019. Banking and insurance are at the forefront of what can be thought as "a perfect digital storm," in which fintech, cybersecurity, data compliance and new competitive ecosystems converge. Interconnection bandwidth of the banking and insurance sector in Asia-Pacific is expected to grow by 81% CAGR by 2022, ahead of Europe and North America, which are expected to reach 60% and 63%, respectively.

Applicants for digital bank licenses in Singapore have applied mainly for them as consortia, with just a few exceptions, including Ant Group, which applied alone for the digital wholesale bank license. Ant has created a fully self-contained digital financial ecosystem of its own in mainland China and may be planning to link elements of that system up with its Singapore digital bank, should it win a license. In most cases, however, parties interested in a Singapore digital bank license have joined forces. In this manner, we can see they are thinking in terms of building an ecosystem from the ground up.

Ride-hailing giant Grab, for instance, applied together with Singapore's largest telecoms firm, SingTel, for a digital full bank license. The partnership is complementary, given that Grab is a smartphone app, and SingTel is Singapore's largest carrier. Both firms are new to financial services, but see strong potential in the Singapore market and are keen to leverage their vast troves of user data within an ecosystem that encompasses network communications, ride-hailing, food delivery and digital banking. In a statement, Grab and Singtel said that their digital bank would be aimed at customers who prefer banking online and want more personalized services, as well as SMEs with unmet lending needs.

If Grab and SingTel win the license, they will have a legitimate shot at building a super app like China's WeChat. Both companies have a strong presence across Southeast Asia: Grab is the largest ride-hailing app in every Southeast Asian market except for Indonesia; SingTel is Southeast Asia's preeminent telecoms firm, with a strong presence in Indonesia, the Philippines and Thailand. Considering the high rate of smartphone penetration in Southeast Asia, a large portion of the region's 655 million people are already both Singtel and Grab customers.

Razer's consortium also has the foundations of a strong ecosystem. The gaming hardware firm's partners include the insurance firm FWD Group, venture-capital firm Insignia Venture Partners, the supermarket Sheng Siong and used-car seller Carro. Should Razer win a license, its digital bank will be poised to connect customers to an ecosystem that includes e-commerce, online entertainment and transportation, as well as retail and corporate banking.

²⁷ Rich Miller, "In a Hyper-Wired World, Interconnection Matters More Than Ever," Data Center Frontier, June 16, 2020. <https://datacenterfrontier.com/in-a-hyper-wired-world-interconnection-matters-more-than-ever>.

Nevertheless, success is far from assured for digital banks in Singapore. In the city-state, they face formidable incumbents. One recent study of digital banking in Singapore found that 67% of Singaporeans planned to maintain their existing bank account as their primary account, even if they do sign up with a digital bank. Just 1% said they would close their existing account and switch over entirely to a neobank.²⁸ That suggests digital banks could face an uphill battle growing their deposit bases.

The report found that a significant challenge for digital banks in Singapore will be winning customers' trust—an area where traditional banks are secure by default in most cases. Roughly 40% of respondents to the survey in Singapore said that they would only consider opening an account with a digital bank after the bank was well-established. At the same time, about one-third of respondents said they did not trust digital banks with their personal information.²⁹

Online fraud is increasing in Singapore amid the pandemic. Like the digitization of finance itself, this trend will not ebb when the virus is contained.

As more transactions move online, criminals are exploiting network vulnerabilities and other security shortcomings. In the first quarter of 2020 alone, criminals stole at least S\$1 million through fraudulent transactions from victims' bank accounts and mobile wallets. Fraudsters bilked an additional S\$1.3 million from people through e-commerce scams and S\$1.6 million through loan scams.³⁰

With that in mind, Singapore's digital banks must carefully balance their customer acquisition strategies with compliance requirements and security needs. Given that they do not yet enjoy the same level of trust with customers as incumbents, and that they have big ambitions, such as striving to build digital services ecosystems with banking at the core, they should invest the necessary time and resources to make those ecosystems secure. Digital banks in Singapore should base themselves in the same data center as their partners, so that all members of the ecosystem can benefit from enhanced interconnectivity, security and data-transmission speeds. Such a strategy will pay off in the long run, creating a superior customer experience and enabling a more sustainable business model.

²⁸ PricewaterhouseCoopers, "Digital banking: Singapore customers take charge," <https://www.pwc.com/sg/en/publications/singapore-customers-take-charge.html>.

²⁹ PricewaterhouseCoopers, <https://www.pwc.com/sg/en/publications/singapore-customers-take-charge.html>.

³⁰ Cara Wong, "Scam victims lost \$41.3 million in Q1; e-commerce and loan scams among most common," The Straits Times, May 4, 2020. <https://www.straitstimes.com/singapore/courts-crime/scam-victims-lost-413-million-in-first-quarter-of-2020-e-commerce-and-loan>.



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