Asia Business Council

What's Next? Harnessing Emerging Technologies for the Asian Consumer

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March 2022

Executive Summary

In Asia, as a more internet-savvy and health and environmentally conscious consumer takes center stage, emerging technologies are offering new opportunities and innovative solutions for people from diverse backgrounds and geographies. The pandemic has resulted in the increased use of digital technologies, and Asia is home to more digital consumers than any other continent. China alone boasts a digital consumer market of 900 million internet users, larger than the United States and European Union combined.[1] There are also an estimated 350 million digital consumers in the Southeast Asian markets of Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam, including 60 million new digital consumers that came on board during the pandemic.[2] At the same time, the pandemic has coincided with increased consumer awareness of health and sustainability. A survey from June 2020 found that 81 percent of Asian consumers were actively trying to improve their health and well-being, while 75 percent were trying to significantly lessen their environmental footprint.[3]

This combination of factors translates into promise for three emerging technologies that this briefing explores: the metaverse, a network of virtual worlds that is still far from realized, but which, along with Web 3, will be shaped by Asian consumers and provide new employment opportunities in the creator economy; medtech, an area of vast potential from the standpoint of better AI drug discovery and diagnostics; and food tech, specifically alternative proteins which have gained traction amid increased consumer awareness of the link between diets, health, and climate change.

The rising popularity of online entertainment, work, and socializing among Asia's "digital natives" presents opportunities in the metaverse, with "play-to-earn" blockchain gaming and the new asset class of non-fungible tokens (NFTs) becoming avenues for individual players to earn extra income and own "digital property rights." Medtech can be harnessed to address distinct healthcare challenges especially as Asia faces a graying population. Artificial intelligence (AI) has the potential to vastly improve treatment and diagnostics, while consumer-facing applications may become omnichannel healthcare providers with a full suite of services, ranging from insurance to health consultations to medicine delivery. Finally, there have been shifts in consumer choices and preferences that support the development of food tech, and more specifically, alternative proteins, to address health and environmental concerns. Keen to help transform the current food system into one that is more resource-efficient and nature-positive, consumers in Asia are joining the global movement toward plant-based meat and other non-traditional proteins. Thinking ahead, while the pandemic has accelerated the development of these emerging technologies, the changing demographics of Asia suggest that they will have a long-term impact in the coming decades.

Part I: Introduction

With 4.5 billion people, Asia accounts for roughly 60 percent of the world's population. While wealth inequality and climate disruption are very real risks to economic growth in the region, Asia is projected to account for half of global GDP and fully 40 percent of global consumption by 2040. [4,5]

The Asian consumer economy has responded with innovations in the face of the COVID-19 pandemic. Venture capital has poured into Asia, with total investments reaching $165.1 billion in 2021, up 50 percent from 2020 and surpassing the previous record of $150.2 billion in 2018.[6] Some of the largest deals in 2021 bank on the Asian consumer, including a $3.6 billion private equity round in July for Indian online shopping website Flipkart and a $2 billion venture round in February for Chinese shopping platform Xingsheng Youxian.[7] Indeed, an outsized chunk of Asian unicorns are in the e-commerce and direct-to-consumer business—18 percent, compared with just 11 percent globally.[8] Fintech, the second-biggest category, makes up another 14 percent of unicorns in the region. Where local start-ups are less focused is Internet software and services (9 percent compared to the global total of 18 percent).

Art lovers immersed in Refik Anadol's 'Machine Hallucinations – Space Metaverse' at the inaugural edition of Digital Art Fair Asia (Source: Digital Art Fair Asia 2021)

In nearly every industry, start-ups are taking shape to make everyday life better for the Asian consumer, and reshaping society in the process. Among the 25 largest unicorns in Asia by valuation is China's HEYTEA, which built a $9 billion-and-counting empire on adding a cream cheese, milk, and whipped cream concoction to green or black tea, a drink combination that originated in Taiwan.[9] Edtech unicorns in India cater to the growing demand of middle-class parents and rural students hoping to access better educational opportunities, as well as professionals turning to executive education to enhance their careers.[10] Other unicorns include start-ups that are helping urban residents find rental apartments or enabling patients to quickly and easily book online medical appointments.

Since the onset of the COVID-19 pandemic in December 2019, new and innovative technologies have been harnessed to meet consumer demand in Asia. While the more obvious examples that come to mind are technologies that enable the delivery of food and other necessities, the pandemic has also shaped developments in the emerging technologies that we explore in this briefing – the metaverse and Web 3, medical technologies, and food tech and alternative proteins.

A close look at these technologies suggests that they will bring opportunities for those in the global middle class, which is defined as households where per-capita spending is between $11 and $110 a day.[11,12] In Asia, middle class consumers are expected to grow from 2 billion in 2020 to 3.5 billion in 2030.[13] While exclusive NFTs or advanced AI applications in healthcare may only be available for a select few, examples abound of people from a wide range of backgrounds and income levels who are benefiting from these technologies – blockchain gaming can promote financial inclusion for unbanked populations in developing countries, mobile apps can provide health services for patients in rural areas, and alternative protein companies can offer affordable culinary options to environmentally-conscious consumers. The broad reach of the technologies aside, the shifting demographics in Asia and the changing face of the Asian consumer are such that these three areas of promise are poised to have a long-term effect on Asian economies for decades to come.

Viewing Jacky Tsai's 'Floral Horse' through a cell phone (Source: Digital Art Fair Asia 2021)

Part II: The Metaverse and Web 3

The metaverse and Web 3 are overlapping areas that are shaping up to be powerful extensions of a rapidly evolving internet-enabled world. The growth of Asia's digital economy has only accelerated during the global pandemic. Rising Asia is a massive source of future global GDP growth, and the commercial potential of the metaverse is thought to be $1 trillion annually. [14]

In the near term as well as in the long run, Asia's "digital natives" — those born between 1980 and 2012, including Generation Z and millennials — will play a crucial role in the evolution of the metaverse and Web 3. In particular, Gen Z can easily spend eight hours a day on the internet and is more immersed in digital culture than any other generation.[15] Many of them value digital goods as much as, if not more than, physical ones, and are comfortable with having a community of friends that they only know virtually.[16] The metaverse will likely be a natural extension of the lives that they already live.[17]

To quickly define some terms, the metaverse is an increasingly immersive evolution of the internet, made up of always-on digital worlds. Avatars – digital versions of ourselves that are our "presence" in these worlds – are infinitely customizable. Web 3 describes a blockchain-enabled facet of the metaverse where cryptocurrencies and NFTs are some popular areas seeing consumer adoption.

For their exponents, the metaverse and Web 3 have the potential to be a democratizing force that helps consumers gain control over their digital property, trade their assets using blockchains, and participate in the thriving creator economy that will help build content for Asia.

User-Generated Content: Growing the Creator Economy

Asia is a ready audience for new content and an opportunity for the creator economy. Full realization of the metaverse requires tremendous content buildout, much of which will be user-generated. Large incumbent players emphasize the crucial role user-generated content plays in their long-term plans for the metaverse.

Meta, for example, is developing design tools that will enable it to expand its current creator pool of 600,000 people, helping designers with no prior experience design in immersive formats.[18] There are roughly 1.3 billion monthly active Meta users in Asia – a large chunk of its 3 billion users overall – with India, Indonesia, the Philippines, Vietnam, Thailand, and Bangladesh ranking in its top 10 markets.[19,20] Tencent, China's social media, gaming, and payments giant, has also publicly underscored the importance of user-generated content in its plans for the metaverse.

Asia also comprises the largest market for gaming, an industry closely associated with the metaverse and user-generated content.[21] The global market for video games was a massive $175 billion in 2020, larger than streaming video and music combined.[22] Much of the industry's revenue comes from user-generated content like the sale of in-game items such as "skins" or other enhancements for players' avatars. [23,24]

Publicly traded Roblox Corporation, a gaming platform, relies entirely on independent creators and developers to design its content. Asia is the platform's fastest-growing market. Over 11 million of Roblox's nearly 50 million average daily users hail from Asia, and that number grew more than 100 percent in the fourth quarter of 2021.[25] In 2021, Roblox paid out over $500 billion to its game designers around the world. That payout to creators grew more than 50 percent from 2020.[26] Another, though much smaller, example of the creator economy at work in Asia is Zepeto, a fashion-oriented avatar platform owned by Korea's Naver Corporation where young Asian women create and sell virtual fashion items.[27]

Metaverse game creators will develop their skills alongside the evolution of creator tools like Unity, the design tool behind some of Asia's most popular games, including Call of Duty and League of Legends.[28] The Unreal Engine from Epic Games is another popular and evolving creator tool. It is the engine behind Fortnite, one of the world's most popular games, as well as less violent best-sellers like Yoshi's Crafted World, released by Nintendo.[29] AI and machine learning will also assist user-generated content creation. For example, Roblox is experimenting with using AI and machine learning to automatically translate games developed in English into eight languages, including Mandarin, French, and German.

Beyond the consumer side, the increased adoption of digital twin platforms allows designers to master commercial applications through a process of advanced simulation that runs tests on physical assets like factories using digital versions.[30] PickMaster Twin from ABB is a tool that enables digital twinning for industrial robots, allowing factory owners to test out robotic configurations on virtual production lines before committing capital to physical assets.[31] Meanwhile, Nvidia Omniverse powers Nvidia Drive Sim, a virtual world for hosting the digital twin of autonomous vehicles. These applications could help complement and enhance Asia's strength as the workshop of the world.

NFTs Confer Digital Property Rights and Potentially Increase Financial Inclusion

One aspect of the metaverse that has gained a lot of attention in the past year is NFTs. NFTs are digital assets whose ownership and uniqueness are verified by blockchains. They can be owned and traded much like physical assets. But, unlike an artist who sells a painting in the physical world, NFT creators receive a percentage of the sale price every time their NFT is sold. NFT royalty payments are perpetual and are executed automatically through blockchain "smart contracts," mostly on the Ethereum blockchain network. NFTs became familiar to many when the artwork "Everydays: The First 5000 Days" by the artist Beeple sold at Christie's in March

'NFT' and 'Just Mint It' by Hong Kong artist Sharmaine Kwan (Source: Digital Art Fair Asia 2021)

2021 for $69 million.[32] In 2021, despite the pandemic – or maybe because of it – the NFT market hit $40 billion, according to blockchain data platform Chainalysis.

NFTs have become a popular possession for "digital natives" who have grown up living their lives as much online as offline. [34] The fashion industry, through prize games like Balenciaga for Fortnight or Gucci for Tennis Clash, are appealing to the younger generation's desire to "stand out in the virtual world" with exclusive NFTs, just like how the older generation spend their purchasing power on physical goods and objects.[35]

While critics worry that NFTs are a bubble, Asia has joined the NFT craze with gusto, and the story is not all about expensive fashion collectibles.[36] According to Finder.com's Global NFT Adoption report, Southeast Asians comprise the largest percentage of NFT users, with the Philippines, Thailand, and Malaysia topping the list.[37] The case of the Philippines is particularly interesting. It ranks first in terms of NFT adoption, with over 30 percent of the population owning NFTs. [38,39]

The high ownership percentage in the Philippines is likely thanks to Axie Infinity, a "play-to-earn" online game which accounts for 90 percent of blockchain NFT gaming, a market that was about $10 billion in 2021 and is as a whole much smaller than that of traditional gaming.[40] According to DappRadar, unique active wallets in blockchain games, a measure of how many people are playing them, averaged 1.2 million in Q3 2021.[41] Although it's still a tiny fraction of the world's 2.7 billion gamers, that figure grew 44 percent over the prior year. [42]

Axie Infinity was designed by Sky Mavis, a game developer based in Ho Chi Minh City that became Vietnam's third unicorn after raising $152 million in an October 2021 series B funding round led by Andreessen Horowitz.[43] Described as "crypto meets Pokémon," Axie Infinity's ecosystem revolves around breeding, raising, and battling, digital creatures called Axies, and earning its two in-game currencies, Smooth Love Potion (SLP) and Axie Infinity Shards (AXS). Users can also buy virtual

real estate in the Axie metaverse. The "play-to-earn" aspect of Axie entices players into the game by letting them "earn" Smooth Love Potion, just for spending time in the game. Axie became so popular that players were quitting their jobs because they could earn as much as the Philippine minimum wage from playing it.[44] Some merchants in the Philippines even went as far to accept Smooth Love Potion at point of sale.[45]

People using their mobile phones to play Axie Infinity in a neighbourhood alley in Malabon, suburban Manila (Source: Getty Images)

The Axie Infinity phenomenon is often used as an example of how the blockchain's decentralized finance (DeFi) applications can help increase financial inclusion for the 1.7 billion global unbanked, some 40 percent of whom reside in Asia.[46] Sky Mavis said that over 25 percent of its players (half of whom live in the Philippines) are unbanked, and their first access to financial services is through Axie's Ronin crypto wallet.[47] Characteristic of Web 3, players don't need a bank account, just the Ronin wallet, which they use to download in-game currency to convert to fiat currencies like the Philippine peso, using decentralized exchanges like Binance.[48]

Cautious Optimism over the Metaverse and Web 3

One of Asia's thought leaders in the blockchain gaming space is Yat Siu, chairman and co-founder of Hong Kong-based unicorn Animoca Brands, which was an early investor in Axie Infinity. Yat Siu is a serial entrepreneur known for championing an open metaverse and NFTs in video games. His view is that Axie Infinity and blockchain enabled metaverse worlds like The Sandbox, owned by Animoca Brands, are the antidote to the "digital colonialism" of today's big tech platforms, which harvest and create network effects from users' digital trails.[49] He is an outspoken proponent of "true digital property rights," emphasizing that NFTs in blockchain games are truly the property of the owner.

Animoca Brands has accumulated an impressive portfolio of investments and partnerships. In addition to Axie Infinity, it has invested in OpenSea (the largest NFT marketplace), and Dapper Labs (developer of blockchain games like CryptoKitties

and NBA Top Shot). It also owns the REVV and SAND tokens and has licensing deals with Formula 1 Disney, WWE, Power Rangers, MotoGP, and Doraemon.[50]

Animoca, which is now private, had a previous incarnation as a listed company trading on the ASX, the Australian stock exchange. Even though it was delisted for noncompliance in March 2020, by November 2021 it was valued at more than $2 billion, having raised over $245 million, largely through a series of venture rounds in 2021, according to start-up database Crunchbase.[51] Indicative of just how hot the space is, and how attractive Animoca's story is to investors, in early 2022 it raised another $358 million, driving its valuation to $5 billion. [52]

Despite the optimism around Web 3 and the metaverse, its regulatory structure is still being hashed out. Different economies have different tax and regulatory regimes, with some banning cryptocurrency altogether. Fraud is an issue. Crypto research firm Elliptic estimates that more than $12 billion has been lost because of DeFi fraud, theft, and scams.[53,54] Regulation of content is also an open question. While internet censorship in mainland China means that content creation would likely have to be tailored to its market, the broader issue of how to ensure user safety in the worlds of the metaverse is still unanswered. Andrew Bosworth, Meta's chief technology officer, warned in an internal memo published by the *Financial Times* that moderating how users speak and behave "*at any meaningful scale is practically impossible.*"[55]

A bright spot where the blockchain can definitively help Asian consumers is remittances, and its use has been endorsed by the Organization for Economic Co-operation and Development (OECD) as well as several Asian central banks. As part of its Blockchain Policy Series, the OECD studied the use of blockchain technology in remittance flows from the United Arab Emirates to Nepal and concluded in 2021 that it is a powerful way of rebuilding sustainable and better livelihoods in least developed countries, in the context of COVID-19.[56] This could be very helpful for countries like the Philippines, where inbound remittances comprised 9.6 percent of GDP in 2020.[57]

On the environmental front, Singapore is pioneering the use of blockchain to broaden and deepen the market for carbon credits. In May 2021, DBS joined forces with Temasek and Standard Chartered to launch a global carbon exchange and marketplace called Climate Impact X (CIX).[58] Based on the principles of the Taskforce on Scaling Voluntary Carbon Markets, launched by former Bank of England governor Mark Carney, the aim of CIX is to use satellite technology to track projects and to use machine learning and blockchain to ensure the transparency and integrity of carbon credits.[59]

Finally, the environmental impact of blockchains is often raised as a negative. The Ethereum blockchain, on which the majority of smart contracts are enacted, is in process with improvements to Ethereum 2.0. Targeted for 2022, its functionality and scalability should increase, and its energy use should decrease. Notably, it will move away from energy-consumptive "mining" as it shifts to proof of stake from proof of work.[60]

Part III: Medical Technologies

Many economies in Asia struggle with rapidly aging societies, overburdened healthcare systems, and high costs for pharmaceuticals and medical technologies. Inequitable access is a challenge, with those in the informal sector often lacking insurance coverage. In less developed regions, too many babies still die young and too many mothers don't survive childbirth.[61] Furthermore, while healthcare systems aim to cure people who fall ill, they often do a poor job of making sure people stay healthy in the first place.

While the pandemic has strained and exacerbated existing challenges, it has also spurred innovations that give us a glimpse of what the future of healthcare could look like: fully digitalized, remote care-enabled, more personalized, and accessible to all. China's health code system, developed by Alibaba and Tencent, is well documented, though it has drawn criticism for privacy concerns.

But the pandemic has led to new business opportunities, even for companies that aren't focused on healthcare. A search on Crunchbase reveals some 100 Asia-based start-ups, many still in the earlier stages, whose business models address COVID-19 in some form—whether through testing, sample delivery, contactless payments, or the transition to the digital economy. Hospitals in Singapore have brought the health infrastructure online by establishing "virtual wards," allowing the remote monitoring of COVID-19 patients who are in stable condition.[62] And more and more patients are turning to telemedicine so that they can seek medical attention safely, conveniently, and promptly. That has helped not only COVID-19 patients but also the elderly and those who are confined to their homes.[63] Well-known medtech unicorns in Asia, such as Ping An Good Doctor, JD Health, WeDoctor, and Miaoshou Doctor in China, and PharmEasy and Cult.fit in India, are finding scalable business models in telehealth that have the potential to unlock new business opportunities by helping previously underserved consumers.[64, 65, 66]

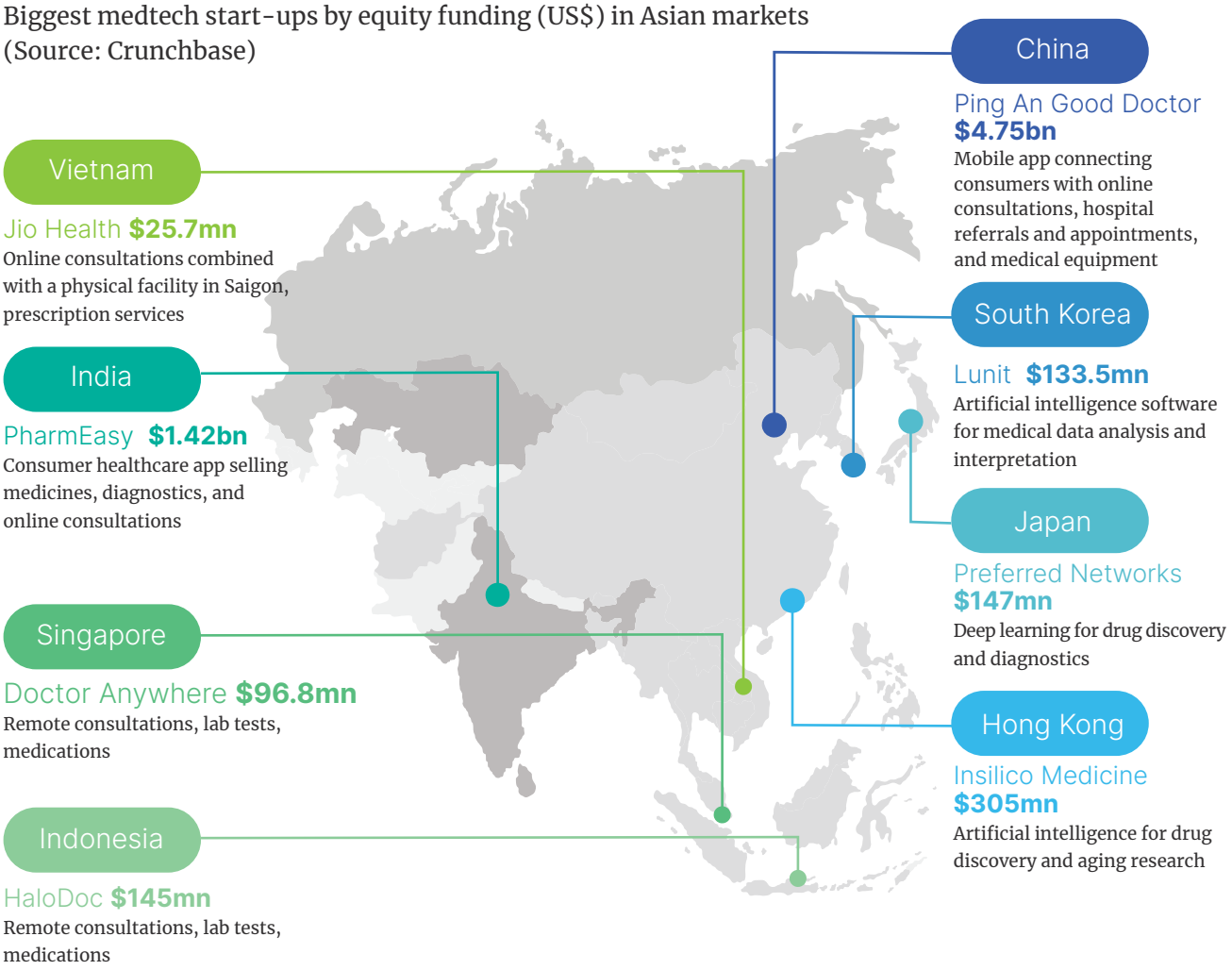
In the long run, demand for medtech will be driven by demographics. In Asia, seniors aged 60 years or over are expected to rise from 14 percent of the total population in 2021 to one quarter by 2050.[67] While Japan has become the poster child for Asia's aging societies, Southeast Asia also needs to prepare for a graying future. The proportion of seniors in ASEAN will rise to one in five by 2050, up from one in 10 in 2020. The number of working-age people for every retiree 65 and older will also fall to around four in 2050, from 9.5 in 2020.[68] Indeed, the healthcare market for seniors in Asia is estimated to be about $200 to $250 billion, covering everything from anti-aging products to robot companions to pharmaceuticals. Technology —and the new business models that come with it—can help ensure that Asian consumers have access to healthcare that is reliable and affordable.

AI Could Help Find Treatments for the Diseases of Aging

Some of the most exciting opportunities in medtech leverage on the ever-evolving

Asia's medtech leaders are focused on remote health, AI

Biggest medtech start-ups by equity funding (US$) in Asian markets
(Source: Crunchbase)



field of AI. Despite some setbacks under its new data privacy regime, China is among the world's biggest markets for AI healthcare, and medical AI companies have received policy support as part of the "Healthy China 2030" initiative." [69,70] The "National AI Team" initiative also allows companies to receive government support and access to public data resources in exchange for creating a platform for open innovation. Companies designated as members of the team are expected to promote R&D, share data and open-source software, and support small and medium enterprises.[71]

AI-enabled drug discovery has the potential to improve lives at scale. Conditions linked to aging, including cancer and cardiovascular disease, are among the major diseases without a known cure. Drug discovery and development is a time-intensive process involving substantial trial and error. Using AI to model how certain molecules act in the body could significantly speed up the identification of molecules for testing, and lower drug development costs.[72]

Private investment in AI-based drug development grew 4.5 times year-on-year in 2020 to reach $13.8 billion, according to Stanford University.[73] Asia's biggest player, XtalPi, which was founded in Beijing, is valued at some $2 billion.[74] Hong Kong-based Insilico Medicine, an earlier stage start-up, closed its series C funding in July 2021 in a round that was oversubscribed by four times. Given the substantial demand for gerontological medicine, Insilico focuses on treatments for age-related conditions such as cancer, Alzheimer's, diabetes, and sarcopenia.[75] In November 2021, the company started its first human trial of a computer-designed drug targeted at treatment of pulmonary fibrosis, a lung disease common in the elderly.

To date, no AI-developed drug has been approved, but experts say it is just a matter of time. This promising space continues to draw funding and attention, including from China's tech giants. Two Baidu executives, including co-founder Robin Li and the CEO of Baidu's venture capital arm, Li Wei, founded a startup, BioMap, in early 2021 with the goal of developing treatments for cancer and aging-related changes to the immune system.[76]

South Korea's position as a global biotechnology hub makes it another innovation center for high-tech healthcare start-ups. Standigm, which has raised some $70 million from investors in four funding rounds and has research tie-ups with major Korean companies like SK Group, uses AI to identify existing drugs that could be used for other applications. In early 2021, Standigm announced it had filed a patent to use a drug with existing U.S. Food and Drug Administration approval for a new application, rheumatoid arthritis. [77]

In Southeast Asia, the rise of early-stage start-ups suggests Singapore's biomedical innovation cluster could make the city-state a future hub for AI-driven drug discovery.[78] One of them, Gero, looks at big data from clinical and molecular databases to identify rare mutations and suggest drugs to target them. CEO Peter Fedichev, whose research at Gero has been headlined in *Scientific American* and other publications, says the data allowed the company to study aging in ways that weren't previously possible through clinical trials, since laboratory animals' lifespans are relatively short.[79,80]

AI-Driven Diagnostics Will Aid in Diagnosing and Triaging Patients

Another medical application of AI that is well on its way to becoming a reality is intelligent diagnostics. Aging populations face a higher incidence of diseases like cancer, where the prognosis is improved by earlier diagnosis. In China, the number of new cancer cases is expected to increase by 46 percent from 2015 to 2030, by one estimate.[81] AI can help improve outcomes for many, with early detection and faster diagnostic image processing to cope with increasing demand.

Shanghai-based Yitu Technologies, the designated lead on China's "National AI Team" for "vision computing"—a field of computer science that seeks to teach computers to recognize visual input—has created a platform to help doctors diagnose and treat lung and breast cancer.[82] During the pandemic, it put its technology to work to analyze CT scans of possible COVID-19 patients—a process that took just

two or three seconds per scan. While other Chinese medtech companies, such as Xtalpi, have chosen to expand their operations to the U.S., with many of them setting up offices in Boston's biotechnology ecosystem, Yitu is Asia-focused. It opened a Singapore office in 2018, banking on receptivity among regulators in Southeast Asia to incorporate AI into healthcare systems.[83]

Keya Medical, which has offices in Beijing and Seattle, uses deep-learning technology—a subset of AI that mimics the functioning of neural networks in the human brain—to conduct non-invasive evaluations of patients with coronary artery disease based on scan images. A series D company that has secured over $110 million in funding, Keya was also the first company, in 2020, to receive regulatory approval for a deep learning-based medical device.[84] It says the artery scanning technique is 90 percent accurate, and if a blocked artery is ruled out, the patient can avoid further invasive procedures.

Although AI technology is often thought of as replacing the need for human intervention, in the future it could serve as a doctor's assistant. One potential use is to assist in the triage process in emergency rooms, to cut down on waiting time and improve efficiency.[85] AI-assisted diagnostics also have the potential to improve medical access, especially in remote areas lacking qualified doctors.[86] WeDoctor, for example, provides portable medical stations that let rural patients take tests at their local clinics and return an automated diagnosis, which can then be reviewed by doctors at top-tier clinics in urban areas.[87]

Consumers are Increasingly Turning to Personalized Health

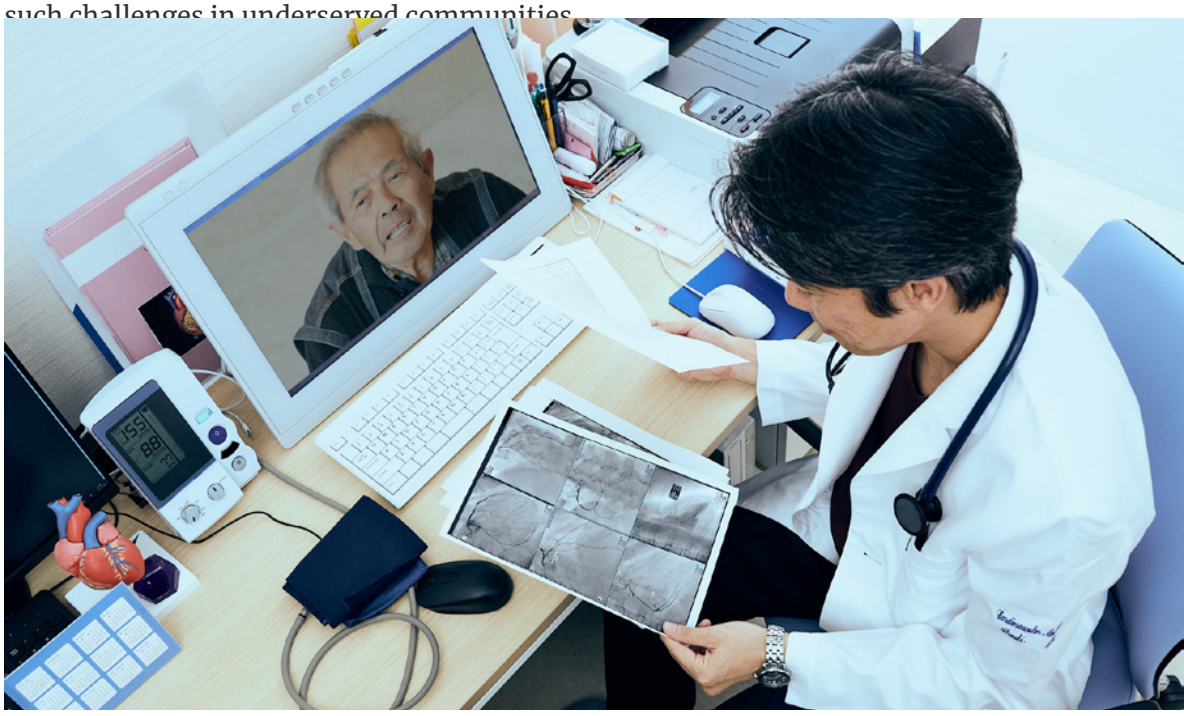
In addition to advances in pharmaceuticals and diagnostics, AI enables the creation of personalized therapies based on individuals' genes and lifestyle habits. The rapid adoption of consumer apps in Asia means this information can be leveraged to nudge individuals to practice better habits and thus remain healthy into their later years, helping to shift the needle from curative to preventative medicine.

Insilico Medicine in Hong Kong, the drug discovery platform, is one example. It has created an app that uses AI to create a personalized "longevity strategy" drawing on medical data from physical exams and self-reported data from user questionnaires, giving consumers as much insight into their personal health as possible. Also appealing to consumers is the "gamification" of health and fitness, as exemplified by Apple Health, where consumers square off against their friends in exercise competitions. Apple Health, of course, requires consumers to own the company's wearable—a nearly $20 billion market that, in addition to Apple, is mostly dominated by Xiaomi, Samsung, and Fitbit.[88] In recent years, Omron, a multinational Japanese electronics manufacturer, is finding a niche with products designed for the elderly, like its wristwatch-style blood pressure monitor.[89] In India, start-up Goqii recently closed series C funding to build out what it calls its preventative health ecosystem, which includes its fitness-focused smartwatch, GOQii Vital.[90,91]

Asian Companies Can Unlock Further Opportunities in Medtech

Given the intersection with diet, lifestyle, and other personal habits and preferences, medtech apps for personalized health could well be another area—like the e-commerce and ride-hailing super apps—where homegrown startups in Asia leapfrog established international players and take advantage of opportunities to deliver to consumers in underserved markets, such as in rural areas. Recent growth in the space suggests digital healthcare startups may follow in the footsteps of multi-service applications like Grab or Gojek to become omnichannel healthcare providers, which aim to offer patients a full range of services, from insurance to health consultations to medicine delivery. That should benefit both the companies building the underlying infrastructure and consumer tech, as well as consumers for whom quality medical care might once have been out of reach.

Southeast Asia, where geography can make physical connectivity and travel more difficult and where mobile usage rates are already high, is a natural area for expansion of such digital health services, including telehealth, helping to reach consumers who are underserved by existing medical infrastructure. Indonesian start-up Alodokter, which is backed by SoftBank and considered one of the leaders in the Indonesian medtech space, launched its ResAppDx App to use machine learning to diagnose respiratory conditions based on the sound of a patient's cough.[92] In the future, growing recognition of the need in rural areas may lead to more solutions for the unique problems facing these consumers. For example, while it remains to be seen whether it can successfully scale and move beyond early funding rounds, Sehati in Indonesia is an early-stage start-up seeking to use telemedicine to lower the maternal and infant mortality rate. Medtech compaines can potentially complement existing health services by finding new ways to address such challenges in underserved communities.



A senior communicating with his doctor through telemedicine (Source: Getty Images)

Part IV: Food Tech and Alternative Proteins

In Asia, alternative proteins are providing increasing food options and culinary experiences for consumers who are concerned about health and the environment. This is especially true among Generation Z and millennials, whose consumption patterns reflect conscious decisions to shape their lifestyle.[94] According to a recent survey, nearly 90 percent of young consumers in India aged between 16 and 40 years said that they considered the environmental footprint of products when deciding what food or beverages to buy. [95] In another survey specifically on Generation Z, 60 percent of those in China said they were trying to reduce the negative impact of their eating habits on the environment, while 76 percent of those in Indonesia said they preferred environmentally friendly brands in their purchases.[96]

The alternative proteins industry, which includes plant-based, aquatic, insect-based, and laboratory-cultured meats, is gaining traction globally. According to one estimate, the global plant-based meat market is forecast to reach $51 billion by 2025, or 2.5 percent of the total meat consumption volume, up from below 1 percent today. [97] In another estimate, market penetration of alternative proteins is forecast to reach 10 percent of the global meat industry by 2029, suggesting a market size of $140 billion. [98]

The World Economic Forum estimates that the impact would be three-fold if consumers replaced 10 percent to 15 percent of meat consumption with alternative proteins by 2030: reduction of up to 950 megatons of CO2 Eq. in greenhouse gas (GHG) emissions, reduction of up to 400 billion cubic meters of freshwater withdrawn, and freeing of up to 400 million hectares of land as a result of reduced numbers of livestock.[99]

Globally, the ongoing pandemic has led to higher awareness of health and the environment. According to an international survey by Accenture, as many as 60 percent of respondents said they have been making more environmentally friendly purchases since the onset of the pandemic.[100] Seventy-five percent of respondents in McKinsey's COVID-19 China consumer survey said they would like to eat more healthily after the COVID-19 pandemic.[101] Seventy percent said they will spend more time and money to purchase safe and eco-friendly products, while 60 percent of those in large cities also said they check ingredient labels after the onset of the pandemic.[102] Singapore is also seeing an ongoing consumer transition toward alternative proteins.[103] According to a survey by GlobalData in the first half of 2021, 67 percent of respondents said that health reasons drove their decision to switch to plant-based alternatives.[104] Safety and sustainability were also cited as other reasons. Indeed, the heightened awareness of health and environmental issues in the city-state is in line with trends in other countries.[105]

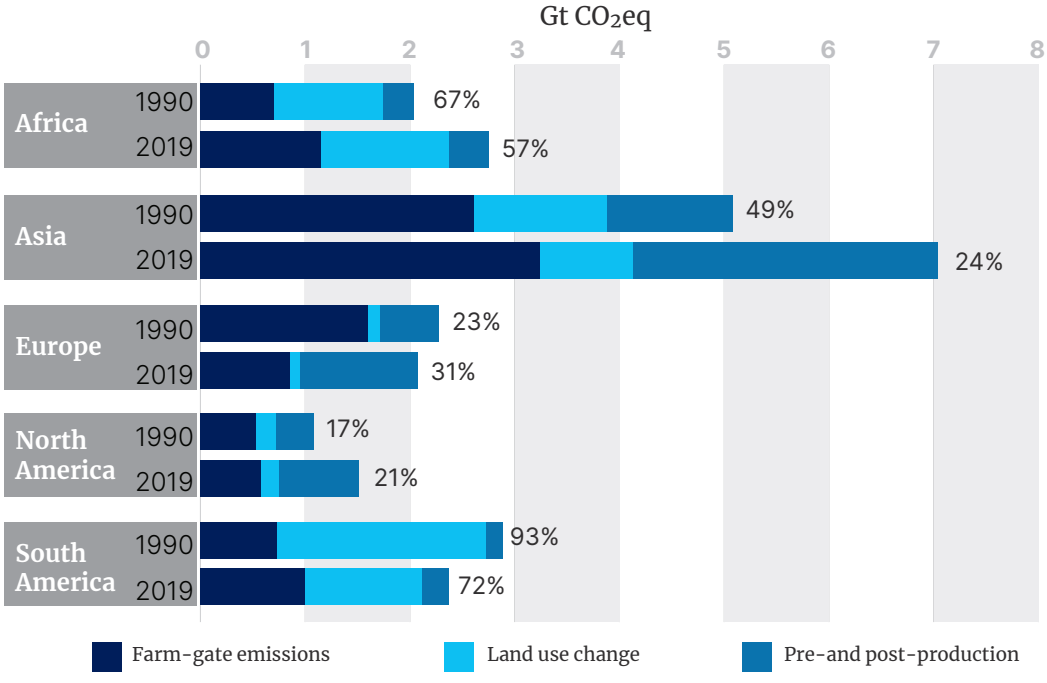
The Need for a Resource-Efficient and Nature-Positive Food System

Resource constraints and climate change are at the heart of the debate over the future of proteins. In the past two decades, rising incomes in Asia have increased global demand for proteins, which grew from 166 million tons in 2000 to 242 million tons in 2019.[106] This trend is expected to continue, with India and China expected to account for 750 million new members of the global middle class by 2030.[107] Given that the world's population is expected to reach 10 billion by 2050, the growing movement for alternative proteins has the potential to feed more people sustainably, and at scale, than the current system does.[108]

Today, protein consumption is increasingly constrained by scarce resources. Humans have breached the natural limits for producing certain proteins, and 90 percent of wild fish stock can no longer be sustainably produced.[109] This is not surprising, given that human activities such as production and consumption, land use and urbanization, as well as trade and industry, have already resulted in the loss of 50 percent of all plants and more than 80 percent of wild mammals.[110] As many as a million plant and animal species are facing extinction, at a rate that is tens to hundreds of times higher than the average in the past 10 million years.[111]

When it comes to climate change, the world's agri-food systems currently account for some 31 percent of human-caused GHG emissions.[111] In 2019, this included 7.2 billion tons of GHG emissions from within the farm gate, 3.5 billion tons from land use change, and 5.8 billion tons from supply chain processes, bringing the total to 16.5 billion tons.[113] Asia accounted for the largest share of emissions from the farm gate as well as from pre- and post- production.

Agri-food systems emissions by region and life-cycle stage



Note: The percentages indicate the share of agri-food systems in the total emissions of the region. (Source: FAO, 2021.)

In order to benefit both people and the planet, there is an increasing emphasis on the importance of achieving a "nature-positive" world in addition to finding a path to "net zero."[114] In economies like India and Indonesia, as much as one-third of GDP is generated by industries that are highly dependent on nature.[115] A "nature-positive" approach goes beyond limiting damage and minimizing negative impact to enhancing the natural eco-system, enriching biodiversity, storing carbon, purifying water, and reducing pandemic risk.[116]

Meanwhile, a related discussion is the role of alternative proteins in improving self-sufficiency in food production. In the ongoing COVID-19 pandemic, many countries have become exposed to headwinds and volatility related to trade conflicts, price inflation, and supply chain disruptions. In this context, alternative proteins are emerging as a potential solution. For example, Singapore, which lacks sufficient land mass for animal farms, has approved commercial sales of "lab grown" meat and supported the establishment of alternative protein manufacturing facilities to reduce its reliance on food imports.[117]

A Consumer-Led Movement Toward Alternative Proteins

Consumers are at the forefront of the movement to switch to meat alternatives, reflecting growing acceptance of non-traditional proteins and growing awareness of the need for resource-efficient and nature positive food systems. In 2020, a record $3.1 billion was invested in plant-based meat, eggs and dairy, fermentation alternatives, and cultivated meats.[118]

Indeed, consumers are increasingly aware that plant-based meat production has a significantly lower environmental impact than that of animal-based meats. Producing plant-based meat reduces land usage, water usage, and GHG emissions by over 95 percent compared to animal-based meats.[119] When it comes to health, while there are additives and preservatives that are used in the production process, plant-based alternatives generally have a lower fat content, and low to no cholesterol. This means that they may offer similar or even superior nutritional value when compared to traditional meats.[120]

Europe has led the way globally in embracing sustainability, and consumers are in general accustomed to plant-based meat options, which are already commonly found. In the United States, two in five consumers are eating plant-based meat alternatives daily or weekly, and most Americans have tried such products.[121]

In recent years, Asian consumers have also become increasingly aware that changes to their diet can help address the environmental crisis. After all, Asia is home to 99 of the world's 100 most environmentally exposed cities, where they are vulnerable to heavy rains, typhoons, and high temperatures.[122] Demographics are a tailwind for Asia's expanding market for alternative proteins.[123] According to a food services company that operates across Asia, students and white-collar workers are the most common demographics that have asked for more plant-

based options for catering services in schools and workplaces; the socially desirable image of an environmentally conscious lifestyle may be one of the factors driving sustained changes in consumption behavior.[124]

Across Asia, the public and private sectors are investing in the development of alternative proteins. In November 2021, the Agency for Science, Technology and Research (A*STAR) joined hands with Temasek to establish a Food Tech Innovation Centre in Singapore to accelerate commercialization of alternative meats and other new food technologies.[125] Also in 2021, Korean food manufacturer CJ invested in Israel's Aleph Farms, which produces meat out of non-genetically engineered cells isolated from a cow, while SK Inc., the strategic investment company of Korean conglomerate SK Group, invested in Berkeley-based startup Perfect Day which produces cream cheese and ice cream through bioengineering and fermentation.[126]

Growing Environmental Consciousness and Pioneering Food Tech Companies in Asia

Asia is home to pioneering companies that have helped build the regional and global food tech eco-system in the past decade. Founded in 2012, Hong Kong-headquartered Green Monday was the first to launch the Beyond Meat burger outside of the United States.[127] Counting private equity giant company TPG and conglomerate Swire Pacific among its investors, Green Monday distributes Beyond Meat products in Hong Kong, Macau, Singapore, Thailand, Taiwan, the Philippines, and other Asian economies.[128] Its food innovation arm, Right Treat, also debuted Omnipork as a sustainable and healthy alternative to pork, while its chain of cafes and grocery stores allows consumers to buy and experiment with alternative protein products.[129]

The spirit behind the core campaign of Green Monday – to encourage consumers to adopt a plant-based diet every Monday of the week – is shared by GoodDot, one of India's largest and earliest plant-based meat companies.

Based in Udaipur, GoodDot makes vegetarian substitutes for mutton, chicken, and egg.[130] Founded in 2016, some examples of its products include Vegetarian Bytz, UnMutton Keema, and Eggless Bhurji.[131] The company also has plans to introduce plant-based omelets, scrambled eggs, fish fingers, and shrimp cutlets.[131] While its meals are tailored to the Indian appetite, the company has embarked on international expansion, entering Canada, Dubai, Nepal, and South Africa, and raising funds to roll out in the U.S. and Europe.[133]

Optimistic that consumers who are conscious about health, the environment, and animal welfare will continue to shift toward the type of plant-based meat alternatives that it offers, GoodDot looks to capture demand from mainstream consumers who see themselves as flexitarian instead of serving exclusively vegan or vegetarian consumers.[134] In December 2021, GoodDot signed Olympic track and field gold medalist Neeraj Chopra as its brand ambassador, to spread "the message that small changes in lifestyle and food choices can go a long way in making the world a better place."[135]

Asian Appetite for Alternative Proteins in the Age of COVID-19

Although it may seem to be a new trend, plant-based meat has a long history of being part of the Asian diet. For example, vegetarian chicken made from bean curd sheet and vegetarian lo mei made from wheat gluten have long been part of Chinese cuisine.[136] In 2017, 1 in 2 consumers surveyed in China said they are likely to consume cultivated meats.[137]

One interesting company in China's alternative dairy space is Beijing-based Marvelous Foods.[138] The start-up rolled out its flagship store on e-commerce platform Tmall in May 2021 with signature offering Yeyo Coconut Yogurt, a product with zero added sugar and no sweeteners or artificial flavors.[139] The business opportunity is significant, as yogurt is commonly seen as snack food instead of a breakfast item in mainland China, and Chinese consumer spending per capita on snacks is only 10 percent of that in the United States.[140] In January 2022, the company secured $1.2 million in funding as it looks to capitalize on the growing demand for premium snacks among consumers in China.[141]

Another food tech start-up is Singapore-based Karana, which was founded to be part of "a wider movement to create a better food system and help address the huge destruction that industrial animal agriculture causes."[142] As a whole-plant meat company, the company offers minimally processed meats which have short ingredient lists.[143] After closing a $1.7 million seed funding round in 2020, Karana launched its first product in January 2021 – meatless pork made from young jackfruit sourced from small farms in Sri Lanka.[144, 145] The founders of the start-up chose to focus on jackfruit for its taste and sustainability, and because they saw an opportunity to increase demand for the underused fruit – 60 percent of the jackfruit crop currently goes to waste – while providing income streams to small farmers.[146]

In May 2021, the company partnered with numerous restaurants in Hong Kong, including Michelin star restaurants Arcane and Chaat, which used Karana Jackfruit as ingredients for mapo tofu and samosas respectively.[147, 148] As the word karana, which in Hindi means "to take action or to do," suggests, the company encourages consumers to achieve a better balance with nature through their food choices.[149]

Part V: Conclusion

In sum, scientists, entrepreneurs, and established businesses around Asia and globally have continued to develop and invest in emerging technologies that can be harnessed to offer new opportunities and innovative solutions for the Asian consumer. The COVID-19 pandemic has been a catalyst that has accelerated the pace of innovation, adoption, and expansion, particularly in the three areas covered in the briefing – the metaverse and Web 3, medical technologies, and food tech and alternative proteins.

With more and more consumers going online during the pandemic, there has been higher demand for enhanced virtual experiences in the metaverse and keen interest in ownership of "digital property rights" in the creator economy. This is especially true among "digital natives" like Generation Z and millennials. For a growing number of people, NFTs are a new asset class that are a store of culture and value. The "play-to-earn" blockchain gaming model, which allows individual players to earn extra income, is also cited as an example of economic empowerment for the unbanked. While questions remain on user safety, regulatory structure, and environmental concerns, the metaverse and Web 3 are unfolding rapidly in an era where so many aspects of consumers' daily lives have moved online.

Whole-plant food (Source: Karana)

The pandemic has also spurred innovation in medtech, which has the potential to make medical systems more effective and more resilient. Start-ups responded to the pandemic by providing testing, sample delivery, and contactless payments while medtech companies provided personalized services that are suitable for remote care. The pandemic also highlighted the importance of strengthening the healthcare system; AI can speed up the development of new medicines, help doctors diagnose a growing pool of patients more efficiently, automate tasks that might once have been done by a dwindling pool of working-age people, and create better and more accessible ways of delivering healthcare.

Finally, the pandemic has coincided with higher consumer awareness about the links between diet, health, and the environment. The vibrant activity in Asia's alternative proteins space reflects increased consumer acceptance of non-traditional proteins and their growing consciousness about the need to transform the food system into one that is resource-efficient and nature-positive. From policy support for food innovation from the government in Singapore, private investment in animal-free dairy and proteins from companies in Korea, to collaboration with an Olympics gold medalist to promote planet-friendly diets in India, the movement for alternative meats is gaining traction across multiple economies in Asia.

While the pandemic has accelerated the development of these emerging technologies, it is likely that they are here to stay and will only get bigger in a post-pandemic era. Estimates may differ on future market size and revenue opportunities, but the demographics of Asia are more predictable and will drive the demand for these technologies in the decades to come. Having said that, the business opportunities in different jurisdictions will depend on the regulatory approaches of their respective governments.

The face of the Asian consumer will continue to change. As "digital natives" come of age, they will spend more of their purchasing power in the virtual world of the metaverse; as seniors comprise a higher percentage of the population, they will drive long-term demand for healthcare solutions and gerontological technologies; as a younger generation of vegetarian and flexitarian consumers become increasingly mainstream, health and environmental concerns will support the movement toward alternative proteins. Meanwhile, governments will play an important role in the future development of these emerging technologies, whether through policy, infrastructure, investments, or public-private partnerships.

All in all, the capacity to evaluate emerging technologies, consumer markets, as well as government policy and regulation is necessary to stay relevant – if not ahead of – the times. By keeping abreast of the latest developments in the metaverse and Web 3, medtech, and food tech and alternative proteins, it may be possible to get one step closer to imagining and re-imagining visions for a future society.

The authors would like to thank Asia Business Council Executive Director Janet Pau for her comments.

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