The Economist Corporate Network

ASIA PACIFIC'S DIGITAL DISRUPTION

The next set of waves

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Preface

Asia Pacific's Digital Disruption: The next set of waves is an Economist Corporate Network (ECN) report, sponsored by Dentsu Aegis Network. The ECN performed the research, conducted interviews and wrote the report independently. The views and findings expressed in this report are those of ECN alone and do not necessarily reflect the views of the sponsors.

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We would like to thank all interviewees for their time and insights.

November 2016

Interviewees, in alphabetical order:

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Jonah Cacioppe, Director, **Boundlss**
Steve Chambers, CEO, **Jibo**
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1. Introduction

Key advances in digital technology are radically redefining the possibilities of marketing

The data generated by IoT-ready devices have profound implications for marketeers

Driven forward by digital disruption, the rise of mobile, social and e- (and m-) commerce represents a set of waves that is having a deep impact on consumers and the way that companies engage with them.

Building behind these, however, the next set will be nothing short of revolutionary. The Internet of Things (IoT), Virtual and Augmented Reality (VR/AR), and Artificial Intelligence (AI) all herald a new era where makers of products will look to use technology platforms to develop much closer, more direct and individualised relationships with their customers than ever before.

The IoT, a network of connected physical objects that communicate with one another, promises to reshape not just consumption, but how we live our lives. From intelligent clothing to smart home infrastructure, the data generated by IoT-ready devices have profound implications for marketeers. Deep insight into users' behavioural patterns enable more efficient, tailored product development and better support and maintenance. Connected physical products establish a direct communications channel between manufacturer and consumer, instantly creating an ongoing after-sales relationship. And almost any product can be enhanced with a layer of ancillary digital services, increasing its usefulness.

Advances in VR/AR, technologies, which today are largely driven by applications in entertainment and gaming, promise to dramatically increase the possibilities of experiential marketing, for instance by letting future home owners explore real estate projects that are yet to be built, or by offering travellers a first-hand look at travel destinations halfway around the world. In e-commerce, VR is poised to radically transform the online shopping experience by allowing consumers to browse products and customise them to their needs in richly immersive 3D environments, without the need to visit a physical outlet. Brick and mortar retailers could employ AR to help increase convenience and efficiency at the point of sale, using the technology to guide customers in-store and to provide detailed product information at a glance.

AI is a rapidly developing set of technologies that aims to impart anything from smartphone apps to voice-controlled home devices, connected vehicles and personal robots with advanced cognitive abilities modelled on the human brain, allowing digital

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devices to perform complex tasks like understanding natural language, learning a user's preferences over time, or recognising someone's moods and adjusting their responses accordingly. For the marketing profession, this means that highly customised interactions with consumers and sophisticated predictive analytics will become the norm rather the exception.

Similar to internet-enabled mobile phones ten years ago, these innovations today still suffer from the characteristic growing pains that frequently plague early stage technologies: high cost, platform fragmentation, unsolved usability problems, interoperability issues and a lack of compelling applications and content. Privacy and security concerns form an additional barrier for some consumers. All things considered, adoption levels are still low.

But with both the major technology players in the US and the Asian technology industry heavyweights already deeply involved in IoT, VR/AR and AI, it looks as though the digital experience will soon play out across a kaleidoscope of smart visual, auditory and haptic interfaces, embedded in a wide variety of connected objects. Smartphones will likely continue to play an important part, serving as a universal remote control for a diverse array of IoT devices, to act as displays for entry-level VR headsets, and to provide the platform which brings AI and conversational interfaces to the masses.

Asia is likely to play a crucial role in the development and adoption of these technologies. The region's high population growth, rapid urbanisation and growing affluence are creating the conditions for fast adoption on a large scale. As many consumers are investing in big ticket items for the first time, they are leapfrogging to smart, connected products, bypassing legacy technology.

Many of the governments in the region have vested interests in the success of these technologies. Robotics, for instance, is of vital strategic importance to China's manufacturing industry. Spillover effects from the industrial sector into the consumer domain are a well-established pattern. And after decades of honing their technological prowess and production know-how as suppliers to Western firms, Asian manufacturers are starting to churn out highly innovative products and services themselves, designed to the specific needs of their local markets.

Asia is likely to play a crucial role in the development of digital technologies

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2. Internet of Things (IoT)

Physical objects are becoming connected, transforming consumer behaviour and business models in the process

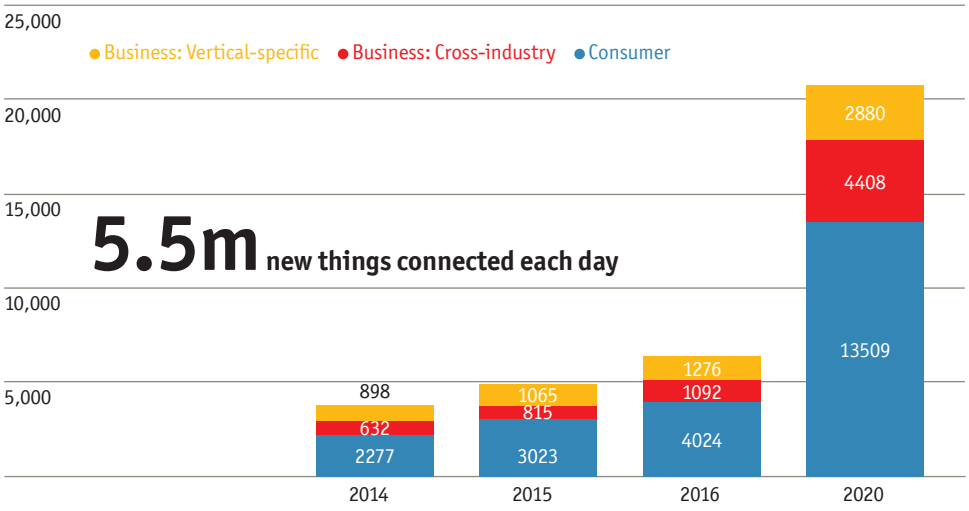
DEFINITION AND MARKET

An estimated 2.9bn people worldwide are using the internet to access information, communicate with others, conduct business and shop online. But increasingly, physical objects come equipped with sensors, embedded software and wirelessly network connectivity, which enable them to collect and exchange data.

These devices, collectively known as the The Internet of Things (IoT) are fast adding a pervasive digital layer to the physical fabric of the world. They are becoming a part of everything around us: from clothing, homes, offices, factories, vehicles, retail environments to public infrastructure.

The number of connected objects has already far surpassed that of human users. Gartner, a research firm, estimates that 6.4bn of these devices will be in use worldwide in 2016, a 30% increase from the previous year. With an estimated 5.5m new "things" being connected every day, the number of IoT devices could exceed 20bn globally by 2020.[1]

Internet of Things units installed base, by category (millions of units)



Source: Gartner, November 2015

[1] http://www.gartner.com/newsroom/id/3165317

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Machine-to-machine communication is already common practice in industries such as manufacturing, logistics and energy. Applications range from remotely controlling equipment to tracking shipments to monitoring environmental conditions. A growing proportion of IoT devices, however, are being created for use outside the industrial context: Gartner predicts that by 2020 two in three pieces of IoT equipment will be consumer devices.

USE CASES AND PRODUCTS

Asian markets play an important role in the future of IoT: according to IDC, a market intelligence consultancy, by 2020 close to one-third of all connected devices in use worldwide will be located in the region.[2] [3] Although consumer IoT products have not yet reached the mass market, they have certainly graduated from being used by only the earliest of adopters.

Close to one third of all connected devices worldwide will be in Asia by 2020

Dr Wen-Syan Li, senior vice president and head of IoT SCM and strategic projects for Asia Pacific, Japan and Greater China at SAP, an enterprise software firm, sees a strong link between the smartphone boom and consumer acceptance of IoT products. "In China, the usage of O2O (online-to-offline) apps, like ride-hailing with Didi Chuxing or ordering food for delivery with Ele.me and Meituan.com, has exploded. In that sense, people are now very familiar with the idea of services that seamlessly connect the physical with the digital world. As a result, it is now much easier for people to grasp the concept that any object imaginable—fitness devices, cars, bicycles, anything—could be digitally connected, trackable and controllable. This has led to a significant increase in acceptance of consumer IoT devices for personal and home use."

Chinese manufacturers are moving into consumer IoT with everyday products, updated for the digital age. Xiaomi, a smartphone provider, has partnered with more than 50 electronics manufacturers to create what it calls the "Mi Ecosystem", a collection of connected devices for the home that can be controlled with a smartphone app. Apart from home surveillance cameras and smart light switches, the product portfolio includes an air purifier, which was so successful it accounted for 20% of all new air-purifier sales in China within seven months of launch, according to Xiaomi.[4] There is even a smart rice cooker that can adjust its methodology and temperature to suit the particular variety of rice and the user's taste by scanning the barcode on the packaging of 200 different brands of rice.[5]

Other firms are developing consumer IoT products that are literally in constant touch with the user. For example, Clim8, a startup based in France and Hong Kong, has developed an intelligent thermal undergarment that can adjust to changes in environmental temperature as well as physical activity, to help keep the body at a personalised and optimal temperature.[6] The garment is equipped with a number of tiny sensors in the fabric that can measure additional biometric signals, potentially allowing detailed insight into the activity of the person wearing it. Florian Miguet, the firm's

[2] https://www.futurereadysingapore.com/content/dam/frs/2016-articles/internet-of-things-iot-spreads-to-asia/EDB_IOT_final.pdf

[3] http://www.idc.com/infographics/IoT

[4] http://mashable.com/2016/04/20/xiaomi-mi-ecosystem/#Hv3op1KebaqG

[5] http://xiaomi-mi.com/mi-smart-home/xiaomi-mijia-induction-heating-pressure-rice-cooker/

[6] http://www.myclim8.com

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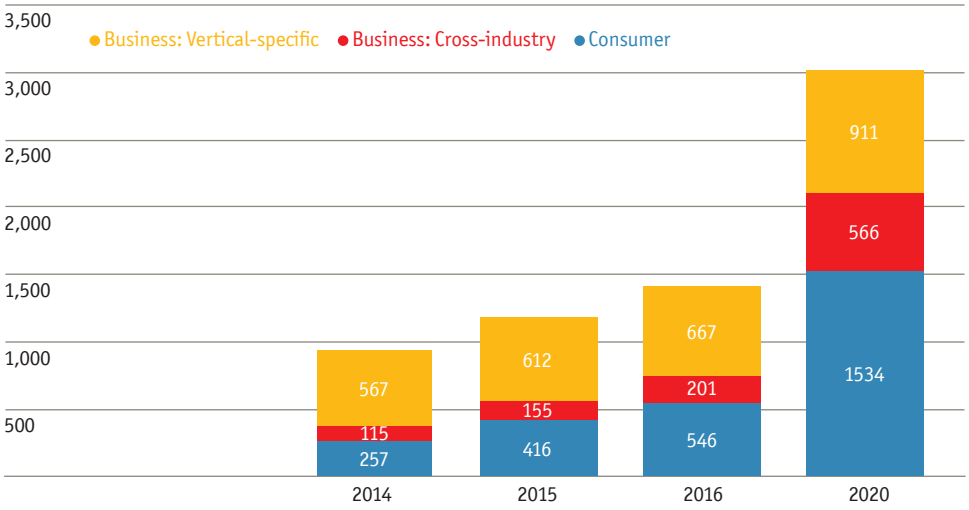
Internet of Things units endpoint spending, by category (US$bn)



Source: Gartner, November 2015

CEO, explains: "With the user's permission, this data can be shared with the clothing manufacturer, which could then look at aggregated data from tens of thousands of runners in order to rethink product and improve user experience, as well as enable brands to provide individualised coaching advice to athletes."

This focus on sophisticated data analytics plays a key role in many consumer IoT products. MLC, the wealth management division of National Australia Bank, has launched the "MLC On Track" programme for its life insurance policies. Customers that agree to wear the Garmin Vivosmart HR smartwatch and share their activity data can receive discounts of up to 10% off their premiums for meeting fitness-related goals, such as walking 10,000 steps or being physically active for one hour per day.[7]

Jonah Cacioppe, director of Boundlss, the 2016 Australian FinTech Awards Insure Tech Start Up of the Year, suggests that the convergence of IoT empowered devices, data analytics and soaring healthcare costs in Asia is creating a "compelling opportunity" for digital health. "Data analytics can really move the needle for insurers as they face rocketing costs," he notes. Moving beyond "dumbots", Boundlss combines data collected from IoT devices with input from a human fitness and nutrition welfare team, and AI to engage individuals in a conversation around health. "That conversation is, for the moment, predominantly led by human input, but as AI ability advances and technology costs fall, it is set for rapid take-off."

Benjamin Joffe, general partner at HAX, an investment company based in Shenzhen in China that focuses on hardware startups, believes insurance is an example of an industry that consumer IoT devices will play an important role in. "For every big asset you have—your house, your car, your health—you generally have insurance. Connected devices that can help insurance customers stay

[7] https://www.mlc.com.au/personal/important-updates/on-track

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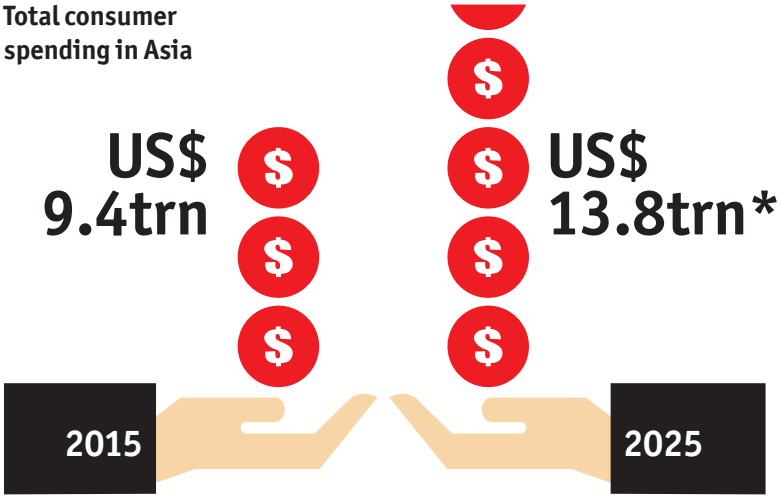
healthy, or keep their home safe by being monitored, are a highly attractive proposition for an insurance company, because they help maximise profitability. These devices can provide unprecedented insight into somebody's behavioural patterns, which makes it possible to price insurance policies in a much more precise way. There is no reason that you and I would pay the exact same premium if we have different lifestyles entirely," he explains.

Total consumer spending in Asia



* Forecast
Source: EIU Canback, The Economist Intelligence Unit.

Prashant Agarwal, director of EDGE (Group Innovation), AIA, regards these developments as "transformational" for the insurance sector. "Connectivity means that we can move from risk-based pricing to actual improvement of health outcomes." Established at the end of 2015, the EDGE LAB brings together startups, Government agencies, university experts and private sector collaborators to foster just this type of innovation. "The concept of underwriting is still very traditional" he notes, "but these innovations can make the business more responsive—'plug and play' and seamless—and new capabilities will emerge".

Vehicles are coming online too. For many of Asia's technology giants, the connected car is the next frontier. Alibaba, the dominant e-commerce platform in China, recently unveiled its first internet car, jointly developed with Shanghai Automotive Industry Corporation (SAIC), one of China's largest automotive manufacturers. The Roewe X5 model is equipped with YunOS, an Android-based operating system developed by Alibaba, and will feature a range of digital services, including personalised greetings, music and preferred destinations based on settings that can be configured from a smartphone or wearable, as well as the ability to use Alipay, Alibaba's digital payments service to pay for parking spaces or fill up with petrol.[8]

"On-board car units will be a natural place for delivery of marketing messages to develop," says Samba Natarajan, CEO Group Digital Life at Singtel, a telecommunications firm based in Singapore with operations across Asia. "Consumers spend lots of time behind the wheel, and it is a usage context with heavy consumer interaction. As opposed to many other situations, they cannot use the mobile while doing so. It's scenarios like these that will drive business cases for IoT-enabled marketing."

It may not be long before vehicles will not only be connected, but have the ability to move autonomously too, allowing passengers to spend their time aboard as they please. Baidu, China's leading search engine, is working with automotive manufacturers

[8] http://www.bloomberg.com/news/articles/2016-07-06/jack-ma-s-answer-to-apple-google-cars-begins-with-china-s-saic

[9] http://fortune.com/2016/09/28/baidu-driverless-car-timeline/

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Urbanisation and increasing affluence in Asia will drive IoT growth

to produce a driverless car by 2018, aiming to move into mass production by 2020.[9] It recently announced plans to establish an autonomous driving unit in Silicon Valley in the US and hire 100 engineers by the end of 2016.[10]

CHALLENGES AND DRIVERS

There are several factors why Asian markets could play a central part in the adoption of consumer IoT. One is the rapid urbanisation and growing affluence in the region. Particularly in emerging economies, many households now have sufficient disposable income to be able to afford things like electric household appliances or even bigger-ticket items like cars. "What we see increasingly is that the price for the smart product is the same, and sometimes even lower, than the price of the non-smart product," notes Mr Joffe at HAX, "so why would people even consider buying the one that is not smart?"

The second is the proliferation of mobile phones in the region. In 2016, Asia will have 3.4bn mobile phone subscriptions, and a growing percentage of these are smartphones, which double as a universal remote control for many consumer IoT devices. A 2016 study by Pew Research Center, a US non-profit organisation, showed smartphone penetration among the population had reached 88% in South Korea, 65% in Malaysia and 58% in China.[11]

Perhaps most important of all is the role the region plays as a supplier of connected things to the world. Manufacturing hubs such as Shenzhen and Taiwan have become the world's global supply chain for electronics components. But whereas so far the focus for many firms has been to act as suppliers to Western firms like Apple, Asia is increasingly using its production know-how built up over decades to churn out sophisticated consumer IoT itself, as Xiaomi's example illustrates.

However, barriers to consumers purchasing and using IoT devices remain. The most important one is an apparent lack of a compelling value proposition: according to a 2015 survey by Accenture, a consultancy, among people in 28 countries including seven major Asian markets, 62% of respondents stated IoT devices simply delivered too little value for money in order for them to be interested in buying them.[12]

Unsurprisingly, privacy and security concerns are also a significant deterrent. Nearly one-half (47%) of all respondents in the survey by Accenture cited fears over privacy and security. Kazutaka Hasumi, board director of the product division at SoftBank Robotics, a subsidiary of Japanese technology firm SoftBank Holdings, comments: "Consumers are largely focused on surveillance, identity theft and unauthorised use of the data they generate. But the security issue is a far larger one: it involves the unauthorised remote manipulation of devices, and it applies across the whole spectrum of IoT products. Fears of someone hacking into smart home infrastructure and causing a gas leak or taking control of an autonomous vehicle may not yet be very relevant, but they could become very real concerns."

[10] http://readwrite.com/2016/04/23/chinese-baidu-search-autonomous-car-team-us-tl4/

[11] http://www.pewglobal.org/2016/02/22/smartphone-ownership-and-internet-usage-continues-to-climb-in-emerging-economies/

[12] https://www.accenture.com/_acnmedia/PDF-3/Accenture-Igniting-Growth-in-Consumer-Technology.pdfw

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An additional problem for the IoT industry is a lack of widely shared technological standards in the IoT world, and, as a result, the inability of many devices to communicate with one another. A report by McKinsey, a consultancy, estimates that interoperability between platforms would account for 40% of the total economic value that IoT can potentially create. Furthermore, the majority of data generated by IoT devices remains unexploited. Citing an example from the industrial IoT context, McKinsey states that only 1% of the data generated by 30,000 sensors on an oil rig was made use of.[13]

Lastly, some products such as vehicles, let alone entire homes and public infrastructure, have very long replacement cycles compared to devices like home appliances or smartphones, so it will take years for IoT blanket coverage to become a reality.

Privacy and security concerns must be addressed

IMPLICATIONS FOR MARKETING

Although it may take time, IoT is ultimately bound to have a significant impact on the relationship between manufacturers and consumers.

As an increasing number of physical products are equipped with sensors, processing power and network connectivity, they are becoming capable of delivering a stream of usage data in real time. Manufacturers are gaining unprecedented insight into when and where consumers are using their products, what other devices they are using them in conjunction with, and whether things are working properly. This awards them with the opportunity to develop products more quickly, better tailor products to buyers' needs, and fix problems with remote software updates.

Shigeru Kobayashi, department general manager of innovation planning at Sharp, a Japanese electronics manufacturer, compares this to the shift from less advanced mobile phones to smartphones. As he notes: "It opened up a direct channel of communications between manufacturers such as Apple and their customers. Things suddenly didn't end with the purchase anymore, it established an actual, continuous after-sales relationship."

Manufacturers are gaining the ability to augment physical products with digital services, experiences and content. "Internet-enabled home appliances, similar to smartphones or connected TVs, enable us to provide customers with personalised services when they need them, based on their usage patterns," explains Mr Kobayashi, "whether it's a washing machine that can automatically reorder detergent because it knows it will run out in a few days, or a kitchen appliance that is able to provide a diabetes patient with dietary advice tailored to their medical condition."

But the usefulness of data provided by consumer IoT products is not limited to the usage context of the device itself. Mr Natarajan from Singtel notes the importance of behavioural and contextual data for the wider marketing and advertising ecosystem: "Sensors, for example in a vehicle, can provide a wide range of useful input for data

[13] http://www.mckinsey.com/business-functions/business-technology/our-insights/the-internet-of-things-the-value-of-digitizing-the-physical-world

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management platforms, which can be used in audience creation and targeting via other screens, such as desktop computers, smartphones and connected TVs."

Possibly the most far-reaching consequence of the proliferation of IoT is a shift from consumers purchasing and owning products to new offerings where the buyer may no longer own a physical thing, but rather be billed on a pay-per-use basis. In the aviation industry, Rolls-Royce, the UK maker of jet engines, has long operated on a model of billing its airline customers to pay a fee for every hour that an engine runs.[14] Companies like Airbnb, a vacation homes rental platform, and Uber, a transportation network, have firmly established the "on-demand everything" mindset among consumers. The coming surge in connected, smart physical objects, and the digital services built around them, will force many company leaders to rethink their business models at a fundamental level.

KEY POINTS

- IoT ready devices are rapidly becoming part of everything around us—digital and physical
- Asia is playing a leading role in the development of the IoT and is forecast to account for one-third of all connected devices in the world by 2020
- The analysis of data generated by IoT ready devices offers unprecedented insight into behavioural patterns, allowing for much more precise consumer engagement
- The shift from ownership to pay-per-use has fundamental implications for existing business models

[14] http://www.economist.com/taxonomy/term/34/www.spaceimaging.com?page=461

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3. Virtual and Augmented Reality (VR/AR)

VR and AR devices may turn out to become the next personal computing platform, enabling new forms of experience

DEFINITION/MARKET

If investor excitement is any indication, Virtual Reality (VR) and Augmented Reality (AR) may well be poised to become the next major consumer computing platform after PCs, the internet and smartphones. According to a July 2016 report by Digi-Capital, a US consultancy, total investment in VR and AR startups worldwide over the past 12 months amounted to US$2bn, double the amount of the previous period.[15]

A number of technology heavyweights have made substantial investments in the space, including Facebook's US$2bn acquisition of Oculus VR, a manufacturer of VR hardware, in 2014. Magic Leap, another AR/VR technology firm, has raised a total of US$1.4bn; its investors include Google, Qualcomm, a microchip manufacturer, and Alibaba, the Chinese e-commerce giant. Apple has acquired Metaio, a startup developing AR software, although it has yet to announce a VR or AR product.

VR and AR are often lumped together as similar technologies, because they both generally require some sort of head-mounted display (HMD). But there is a fundamental difference: VR simulates a fully immersive physical presence in a real or imagined three-dimensional environment. AR, however, supplements the view of live, actual physical surroundings with an overlay of digital assets. The Pokemon Go craze is a good exemplifier of this technology.

The lower-end of the market consists of mobile VR devices that let users turn their smartphones into VR googles by strapping them into a head-mounted unit. The phone provides the processing power and the display, while the head-mounted unit acts as the controller, handling head and eye movement tracking. Devices generally sell for US$100 or less.

Samsung, the South Korean technology firm, released a mobile VR headset called Gear VR in late 2015. It reportedly has sold more than 1m of them, making it one of the most widespread of these devices. Google has announced Daydream, its own VR ecosystem for Android phones, with a headset due to launch in November 2016. Xiaomi has released a cheap mobile VR headset for the domestic market as well, as have other Chinese manufacturers. CCS Insight, a UK research firm that specialises in mobile and wearable computing, estimates that mobile VR will account for 90% of

[15] http://www.digi-capital.com/news/2016/07/record-2-billion-arvr-investment-in-last-12-months/

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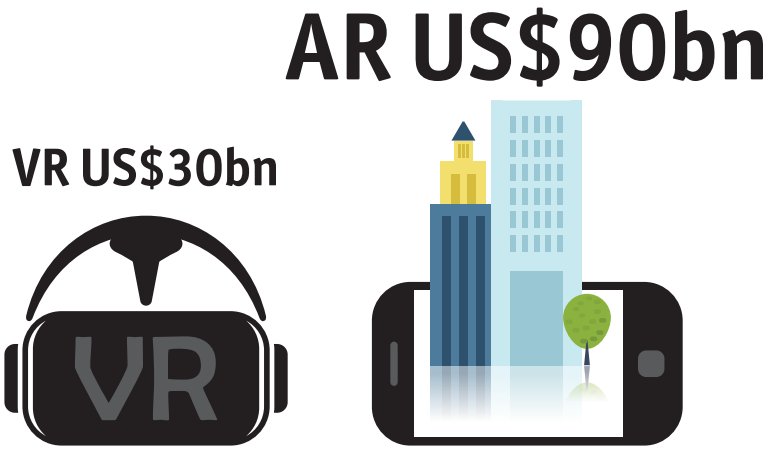
VR versus AR



Potential market size, 2020
Source: Digi Capital.

all VR HMDs sold in 2018.[16]

The main focus of these devices is single viewpoint 360-degree video content, rather than fully immersive interactive experiences: seven of the top 10 most used apps on the Gear VR are videos, and nearly 80% of people who use Gear VR consume video content daily.[17] There is a growing range of 360-degree video content available. YouTube introduced VR in early 2015 and offers video ads on the platform. Facebook added the ability for users to post and view 360-degree videos later the same year. Youku Tudou, China's leading video streaming website, which is owned by e-commerce giant Alibaba, has launched a dedicated VR channel.[18]

High-end headsets, which cost several hundred dollars, feature positional tracking that allows the user to move around in a virtual space and can deliver much more fast-moving, interactive experiences, such as 3D gaming. These devices rely on the processing power of a high-spec PC or games console and require a tethered connection. Examples include the Oculus Rift and the Vive, jointly developed by HTC, a Taiwanese consumer electronics firm and Valve, a US video game developer. In October, Sony, a Japanese electronics manufacturer, released a VR headset compatible with its PlayStation 4 games console, which has sold than more 43m units since its 2013 launch. [19]

At the annual Oculus developer conference in October, Mark Zuckerberg, CEO of parent company Facebook, announced the company's plans to release a standalone, untethered VR headset with positional tracking, designed to fill the gap between current mobile and desktop VR headsets. Mr Zuckerberg also demoed some of the related technologies Facebook is working on, outlining the potential of shared social experiences in virtual environments.

Microsoft has started shipping a developer version of its Hololens AR headset, but consumer AR products may be slow to come to market. "For VR, it took three years from the first development kits to consumer products, and AR is technically more complex than VR. It is much more difficult to create a compelling visual experience in a hybrid world than in a virtual one, and there are a variety of technical issues that are far from being solved," says Tipatat Chennavasin, co-founder and general partner at The Venture Reality Fund, a venture capital firm based in San Francisco.

And yet in the long term, AR may hold the larger potential. Digi-Capital believes the total global market potential for 2020 to be US$30bn for VR and US$90bn for AR, with revenues split among software, hardware, advertising, and other categories.[20] One

[16] http://www.ccsinsight.com/press/company-news/2251-augmented-and-virtual-reality-devices-to-become-a-4-billion-plus-business-in-three-years

[17] https://www3.oculus.com/en-us/blog/gear-vr-ecosystem-expands-to-include-facebook-360-photos-over-250-apps-and-new-video-content/

[18] http://www.allchinatech.com/youku-tudou-launches-its-vr-channel/

[19] http://www.sie.com/en/corporate/data/hardware_sale.html

[20] http://www.digi-capital.com/news/2016/01/augmentedvirtual-reality-revenue-forecast-revised-to-hit-120-billion-by-2020/

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reason why AR may ultimately turn out to be the bigger opportunity of the two is the expected higher usage frequency and duration. AR devices could be used in a fashion similar to mobile phones, worn all day long and used while performing a variety of other activities. Conversely, being fully immersed in a VR environment will limit users from doing much else.

USE CASES AND EXAMPLES

Despite the fact that VR and AR are still nascent technologies, media companies and advertisers across Asia have already started experimenting with them.

PropertyGuru, a real estate listings website active in Singapore and three other South-east Asian markets, recently launched a mobile VR showroom truck, which lets visitors explore 360-degree video for showflats in condominiums that are still under construction.[21] Shangri-La Hotels and Resorts, a luxury hotel group based in Hong Kong, has equipped its global sales offices with Samsung Gear VR headsets to let customers experience its 94 hotels and destinations in immersive 360-degree videos.[22]

In October 2015, Audi, a German car manufacturer, ran the "Drive Back in Time" campaign in Singapore, creating VR videos that allowed people to drive around iconic areas of the city in 1965.[23] Within two days, all of the slots for the on-site demonstration were booked, and 84% of the people who signed up attended. Over a period of 10 days 6,000 people experienced an Audi drive, which would have taken more than two years to achieve through regular showroom visits.[24]

Baidu, the leading search engine in China, has launched DuSee, an AR platform for smartphones that will be integrated into Baidu's apps, which are used by several hundred million people in China. Rather than relying on a VR headset, the technology uses the smartphone camera to transform flat images into three-dimensional objects on the display. One application recently shown at the 2016 Baidu Smart Marketing Solutions Conference was a collaboration with cosmetics manufacturer L'Oreal, which virtually enhanced printed greeting cards with three-dimensional representations of new products.[25]

With 40% of the 6.3m VR headsets shipped worldwide in 2016 headed for China, the country is shaping up to be one of the largest markets for VR, according to Canalys, a research firm.[26] China may not yet be an innovation leader in VR, but what it lacks in technological sophistication, it makes up for in enthusiasm. "The quality of VR devices produced in China is six to twelve months behind," says Mr Chennavasin at The Venture Reality Fund, "but the excitement for the technology and its applications is a year ahead of everywhere else."

Retailers are starting to take note. For instance, in March 2016, Alibaba announced the establishment of an in-house VR lab, named GnomeMagic Lab. The unit will be tasked with bringing the technology to the company's 400m e-commerce users, in order

Augmented reality may turn out to be bigger than virtual reality

[21] http://www.propertyguru.com.sg/property-management-news/2016/6/129451/propertyguru-launches-vr-showroom-an-industry-first

[22] http://www.shangri-la.com/corporate/press-room/press-releases/shangri-la-launches-global-sales-tool-of-the-future/

[23] http://adrivebackintime.sg

[24] https://www.behance.net/gallery/33950648/AUDI-A-DRIVE-BACK-IN-TIME

[25] http://www.marketwired.com/press-release/baidu-introduces-dusee-new-augmented-reality-platform-for-smartphones-nasdaq-bidu-2147553.htm

[26] https://www.canalys.com/newsroom/china-will-account-40-virtual-reality-headset-shipments-2016

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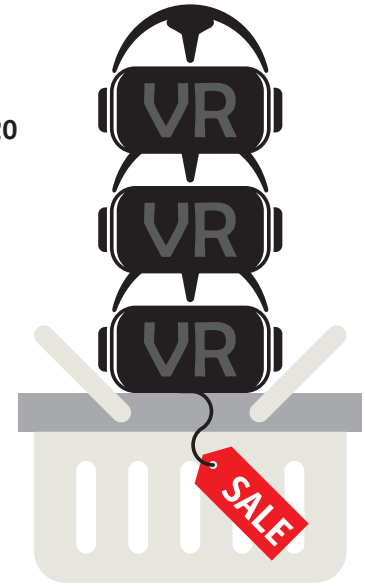
Sales of mobile VR devices by 2020

67m



Source: ABI research.

to let them virtually experience products before buying them. The lab will also explore further applications for the company's businesses in gaming and video streaming. In July at the Taobao Maker Fair in Shanghai, Alibaba showed a demo of Buy+, a virtual store that allows consumers to browse products in a 360-degree environment, and to have virtual models showcase the products on a catwalk. The company has not yet announced an official release date.[27]

CHALLENGES AND DRIVERS

The VR and AR technology sector is developing at a fast pace, and yet the total number of devices in the market is likely to remain small for several years. Price is a crucial barrier to adoption, particularly for consumers in less affluent markets. ABI Research anticipates the total number of mobile VR devices sold will reach 67m by 2020. Although 27m AR smart glasses will have shipped by the same year, much of the demand will be driven by the industrial, healthcare, and military domains.[28]

China is shaping up to be one of the largest markets for VR

Mr Chennavasin thinks the industry will grow significantly as applications broaden. "At the moment, people are still focused on the entertainment and consumption aspects of VR. Similar to the developments we have seen in desktop and mobile internet adoption, usage will really take off once VR crosses over into contexts like work, communication and education," he says.

Another obstacle is the current limited availability of content to draw users into VR. Designing and producing rich, interactive experiences for high-end systems is cost- and time-intensive. During these early days of the industry, only the most successful blockbuster VR games or films will be able to recoup such expenses.

Usage of YouTube and similar platforms only started to soar once cameras on mobile phones became ubiquitous, resulting in an explosion of user-generated content. In order for this phenomenon to be replicated in the VR space, cheap cameras that can produce stereoscopic images or 360-degree video for viewing in VR have to become much more common. Samsung and GoPro, an American technology firm, for instance, have launched consumer VR cameras, but the devices still retail for hundreds of dollars.

Compared to the mobile world, which has largely settled into a duopoly of Android and iOS, things look more complicated in VR at this point. At the operating system level, Oculus will compete with SteamVR, the operating system powering the HTC Vive, and Google's Daydream platform. For AR, Microsoft is betting on the Windows Holographic platform, which supports the HoloLens and will be open to developers to build their own compatible augmented reality AR and VR headsets. The landscape of app stores and content distribution platforms is similarly fragmented. Media companies, agencies and advertisers will have think carefully about which platforms will deliver the best return for a given objective.

[27] http://www.bloomberg.com/news/articles/2016-03-17/alibaba-taps-virtual-reality-for-3d-online-shopping-experience

[28] https://www.abiresearch.com/press/while-gaming-vr-grabs-headlines-enterprise-ar-domi/

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IMPLICATIONS FOR MARKETING

New advertising formats enabled by VR and AR may drive higher user engagement than other forms of media. According to research from Google on 360-degree video advertising on YouTube from Columbia Sportswear, an outdoor apparel brand, not only was the click-through rate higher, but it also drove 41% more views, shares and subscribes than the standard advertisement.[29]

Indeed, VR is a highly persuasive medium. Many VR users report having actually experienced something, rather than just having watched it. This seems to translate directly into their behaviour. In a recent UNICEF fundraising campaign, which used a VR simulation to expose people to the situation of a 12-year old war refugee in Syria, people donated twice as much as they did for regular campaigns.[30]

According to research from Dartmouth College, a US university, people's memories are inextricably linked to the place where they happened. Since VR is a spatial experience, this may mean content and advertising delivered in this context could be more memorable than other forms of media.

A good starting point for brands to experiment with the technology is 360-degree video content. Mobile VR devices are becoming more widespread. Compared to content for more interactive experiences, production costs are low. And several of the largest video streaming websites already support the format.

As demonstrated by Audi's Singapore campaign, VR can be useful as a means to create campaigns that combine entertainment with the opportunity for consumers to experience products. And where products are locally inaccessible or in too short supply for people to see them firsthand, virtual showrooms can help bridge the gap. Virtual environments can also serve to help consumers customise products according to their own preferences, without the need for those products to be physically present.

In fact, the ability to virtually explore items before buying them seems to be one of the applications of VR that consumers find most appealing. In a study conducted by the ConsumerLab at Ericsson, a Swedish telecommunications infrastructure provider, 64% of smartphone users from 13 countries, including four Asian markets, cited this as the most desirable VR application, ahead of maps, films, games or communication.[32]

Another important advantage of VR and AR relates to big data, and the amount and quality of information that they can potentially provide. As Mr Chennavasin notes: "Not only will you know what people click on and interact with, but exactly what they are looking at, and for how long. The potential for customer insight through data analytics is unprecedented."

Adam Sheppard is the CEO of 8Ninths, a VR and AR studio based in Seattle that has done pioneering work with Microsoft in developing an AR-based holographic trading system for Citibank. He is certain Asia will play a key role in the future of VR. "Mobile

[29] https://www.thinkwithgoogle.com/articles/360-video-advertising.html

[30] http://www.fastcompany.com/3051672/tech-forecast/how-the-united-nations-is-using-virtual-reality-to-tackle-real-world-problems

[31] http://www.theatlantic.com/technology/archive/2014/08/in-the-brain-memories-are-inextricably-tied-to-place/375969/

[32] http://www.emarketer.com/Article/Virtual-Reality-Immersive-Medium-Marketers/1013526

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VR is the tip of the spear. Consoles and gaming will bring it into the home. Most innovation is currently driven by the large tech companies, but Asia is very good at incremental innovation. It will be the biggest market for VR and AR by far, because of its demographics and its technological savvy," he believes.

KEY POINTS

- The major tech players in the US and Asia are intensifying their efforts in VR and AR; investments in related startups over the past 12 months have doubled to US$2bn on the previous year
- Mobile VR devices and 360 degree-video are shaping up to be the entry points for mass market VR
- VR is poised to play a transformational role in e-commerce and retail applications

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4. Artificial Intelligence

From virtual assistants to consumer robots, both the digital and the physical world are about to become dramatically smarter

DEFINITION/MARKET

The technology sector is in the midst of an artificial intelligence (AI) boom. According to a report from Transparency Market Research, a consultancy, the global market for AI was valued at US$126bn in 2015, and it set to grow more than 36% per year from 2016 to 2024, to reach revenues of more than US$3trn in 2024.[33]

The term AI describes a set of technologies which simulate processes that so far have been exclusive to human intelligence: perception, learning, knowledge representation and reasoning. Recent advances in machine learning and deep learning, two key areas of AI research, have vastly improved the ability of computers to glean insights from data and make predictions about the world.

Jay Onda, venture partner and director of strategic investments at Yamaha Motors Ventures & Laboratory Silicon Valley, a corporate venture capital firm, comments on the role of AI for the connected world: "When AI leverages the contextual information from your surroundings, it is possible to create an augmented reality experience. AI for virtual reality on the other hand creates a deep and personal experience where you can

Global market for AI

US$126bn
2015

US$3trn +
2024*

* Forecast
Source: Transparency Market Research.

[33] http://www.transparencymarketresearch.com/pressrelease/artificial-intelligence-market.htm

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Virtual reality is a deeply personal experience

remove yourself from your surroundings and immerse yourself in the Metaverse. The use cases and value that customers are looking for between AR and VR are on the opposite side of the "experience" spectrum, but the AI that drives the experience is similar at its core. AI is a key enabling technology that will enhance and amplify the experience on pretty much any connected device, platform and application imaginable."

USE CASES AND EXAMPLES

For instance, AI-based technologies like speech recognition and natural language processing are crucial building blocks for voice-controlled virtual assistants such as Apple's Siri, Microsoft's Cortana and Google Now, which have reached mainstream adoption by coming bundled with smartphones, tablets and other devices.

Asian technology heavyweights are driving innovation in AI as well. Baidu has developed a speech recognition engine called Deep Speech 2 and combined it with intelligent search technology to create Duer, a robotic personal assistant. The firm is conducting trials with the technology in a KFC concept store named "KFC Original+" in Shanghai. Duer takes visitors' orders, taking into account KFC's customer data to better adapt its behaviour to users' needs, as well as to improve transactional efficiency. The AI software powering the robotics has been integrated into Baidu's mobile app, which is being used by hundreds of millions of users in China.[34]

Chatbots, computer programmes that simulate human conversation, is another application that makes use of AI, as well as the exploding popularity of mobile messaging apps like WeChat, WhatsApp and LINE. Users can communicate with chatbots through an exchange of text messages. Facebook, the social networking giant, has been conducting tests of M, an AI-powered virtual assistant that runs on its Messenger platform, which has more than 1bn.[35] M can do things like suggest travel destinations, book transportation and make restaurant reservations.

But the developments springing up from Asia are just as exciting. In China, chatbots are widely deployed on the popular WeChat messaging app, which boasts more than 700m members.[36] WeChat offers much more than simple messaging. An ecosystem of official accounts on the WeChat platform allows Chinese consumers to use it for anything from ordering groceries and calling a taxi to making medical appointments. A substantial amount of real money is changing hands virtually: more than 200m WeChat users rely on WePay, a built-in payment platform, to pay for products and services. More than 12m businesses have set up shop to engage in direct, ongoing, one-to-one conversations with WeChat users in order to run promotions, sell products and manage customer relationships.[37] Many of them employ chatbots to at least partly automate interaction with customers. Among these are a number of global brands, including Nike and Burberry, that have employed chatbots in WeChat campaigns. [38] [39]

But smart assistants are quickly starting to take physical shape and moving into the home. Amazon, a US e-commerce provider, has launched the Echo, a voice-controlled, connected Bluetooth speaker that can be summoned to perform hundreds of tasks, from

[34] http://www.allchinatech.com/baidus-ai-robot-duer-now-sells-french-fries-for-kfc/

[35] http://newsroom.fb.com/news/2016/07/thank-you-messenger/

[36] http://www.tencent.com/en-us/content/at/2016/attachments/20160518.pdf

[37] http://www.emarketer.com/Article/WeChat-More-than-Basic-Messaging-App/1014328

[38] https://vimeo.com/48589953

[39] https://www.luxurydaily.com/burberry-personalizes-lunar-new-year-notes-via-wechat/

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playing music to providing the latest sports scores. The device, which runs on Alexa, Amazon's AI platform, offers integration with the company's commerce services. Users can add items to a shopping list and order them directly from Amazon. Developers can enhance Echo's capabilities by building voice-based apps called "Alexa Skills". More than 1,000 third-party skills have been created.[40] Companies that have done so to provide services via the Echo include Domino's Pizza, 1-800-Flowers and Uber.[41]

Kleiner Perkins Caulfield Byers, a venture capital firm, estimates that 4m Echos have been sold since the device made its debut in 2014.[42] Google has announced plans to launch a similar product later this year, called "Google Home".[43] Although both devices will for the time being only be available in the US and, in Echo's case, selected European markets, it may not be long before similar machines appear in Asian living rooms.

Jibo, a robotics startup based in Boston, is pursuing a more sophisticated approach. Its social robot, which will ship later this year, can turn towards someone who enters the room, or lower its head section in apology when it does not know the answer to a question. "Emotionality will be a key differentiator in consumer robots, both in terms of input and output. Users will develop a much closer relationship with devices that can tell how a user is feeling, for example by the tone of their voice, and adjust their behaviour accordingly," explains Steven Chambers, the firm's CEO. "It is equally important to impart robots with emotional expressiveness. A lot of that hinges on their ability to display movement," he elaborates. The company has raised more than US$50m from investors, including several corporations in Asia, among them electronics firms Acer and LG, KDDI, a Japanese telecommunications operator, and Dentsu, a major advertising agency.[44] [45]

In Japan, manufacturers are taking things one step further with consumer robots that are equipped with locomotive abilities. SoftBank Robotics has developed Pepper, a mobile robot designed to interact socially with humans. More than 2,000 units have been deployed in Japan at stores of SoftBank Mobile, a telecommunications firm, to greet, inform and entertain customers. Other firms using Pepper in a retail context include Nestlé Japan, Mizuho Bank and SNCF, a French train operator.[46]

In Singapore, Pizza Hut Asia has teamed up with SoftBank Robotics and MasterCard to let Pepper make personalised recommendations, take orders and process payment. Pepper will help visitors make menu selections with personalised recommendations and special offers.[47] Several thousand Pepper units have also been sold to consumers for private use.

In May 2016 Sharp released the RoBoHon, a 19.5cm-tall miniature robot that interacts with users via voice-based interface. Apart from its ability to walk, talk and dance, it is a fully functional smartphone that can make calls, take pictures and send emails. Miho Kagei, who heads the product planning department at Sharp's consumer electronics unit, outlines the larger vision behind RoBoHon. "Today, robots are only able to perform fairly specialised tasks, but this will change. With improvements in AI, robots will develop a deep understanding of the habits and behavioural preferences of the people they interact with on a daily basis. This will enable them to recognise their

[40] http://phx.corporate-ir.net/phoenix.zhtml?c=176060&p=RssLanding&cat=news&id=2174930

[41] https://www.amazon.com/gp/browse.html?node=15144553011

[42] https://dq756f9pzlyr3.cloudfront.net/file/2016_internet_trends_report_final.pdf

[43] https://googleblog.blogspot.com/2016/10/make-yourself-at-home-with-google-home.html

[44] https://www.crunchbase.com/organization/jibo#/entity

[45] http://asia.nikkei.com/Business/Trends/KDDI-buys-minority-stake-in-Boston-robot-maker

[46] https://www.ald.softbankrobotics.com/en/solutions/business

[47] http://newsroom.mastercard.com/press-releases/mastercard-powers-first-commerce-application-within-softbank-robotics-humanoid-robot-pepper/

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The march of the robots

35m

"personal use" robots forecast to be sold between 2015 and 2018

Source: The International Federation of Robotics.

current needs, even without users consciously noticing. Robots will play an active role as interfaces for consumers to make sense of their environment. People will become very close to them."

CHALLENGES AND DRIVERS

Voice-controlled assistants and chatbots already reach hundreds of millions of users through established platforms like smartphones and messaging apps, and they are starting to appear on desktop computers and connected car interfaces as well. Smart robots, it seems, still have a much longer way to go.

The International Federation of Robotics, an industry association, predicts that 35m units of robots for personal use will be sold between 2015 and 2018. But only 8,100 of these will be social companion robots, according to the association's estimates. The vast majority will be units that are only able to perform simple tasks, like vacuuming floors or mowing lawns.[48]

Robots will play an active role as interfaces for consumers to make sense of their environment

Price is a key hurdle: Pepper and RoBoHon both retail for ¥198,000 (approximately US$1,900). Key technologies that power robot mobility and object manipulation are still expensive, despite the fact that the smartphone boom has contributed to falling prices for some hardware components commonly used in robot production, like displays and sensors.

Consumer robots face another major obstacle, at least in some markets. "Each culture has a specific view on robotics. In Japan, people tend to idealise robots and view them as companions and friends. China has strong garment emphasis on the technology, because it is strategically vital to the country's manufacturing sector," explains Mr Chambers at Jibo. "In the West, there tends to be more of a focus on privacy concerns, and pop culture's message about robots seems more mixed: We have the 'Hollywoodisation' of robots as a threat to humans in films like 'Terminator', as well as robots like Baymax and Iron Giant whose purpose is to serve humans."

Mr Hasumi at SoftBank Robotics thinks it will still take some time before robots play a substantial role in marketing. "The base technologies, such as face recognition, voice recognition, natural language processing, translation etc. are actually quite mature. The challenge is to make personal assistants and robots understand who is saying what, in which current situation, and what that means in terms of a potentially necessary action. That is the fundamental issue we need to solve."

IMPLICATIONS FOR MARKETING

Despite the fact that it will likely take years for AI to unfold its full potential for marketing, one principle is becoming clear, already manifesting itself in chatbots, voice-based smart assistants and early examples of social robots: marketing will be increasingly conversational in nature. Consumers will often be the ones that initiate

[48] http://www.ifr.org/service-robots/statistics/

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contact with a brand. Each interaction between brand and consumer helps build the understanding of what that individual consumer wants and needs. The better the brands can become at having meaningful conversations with consumers, the more relevant their marketing efforts will be to them.

From helping improve targeting algorithms for digital campaigns to performing customer segmentation on large sets of customer relationship management (CRM) data, AI is starting to affect the business world in very concrete ways. Haresh Khoobchandani, general manager of business solutions at Microsoft Asia Pacific, considers the technology a key catalyst for marketing. "Just like cloud computing has democratised access to computing power and storage, AI will democratise access to intelligence. AI capacity will be provisioned as a service from the cloud. This will allow even the smallest of companies to do things like predictive analytics, which so far have only been accessible to marketing departments at large enterprises," he says.

Mr Onda at Yamaha envisions that AI will help companies improve significantly in anticipating individual consumers' needs. "We will see a lot of predictive services based on complex behavioural profiles and preferences, triggered by contextual information, delivered just in time. For example, if I'm on the train heading home for a special evening and it suddenly rains as I arrive at the station, would it be possible to have an autonomous vehicle waiting for me? It will be all about using context in order to create value in the moment."

Eventually, AI could form a smart intermediary layer between consumers and marketers that will have an important say in purchase decisions. For marketers, this means they will have to invest in the technical capabilities to communicate effectively with intelligent systems that act as gatekeepers. In a July 2015 interview with Campaign India, Tim Berners-Lee, an English computer scientist who is known as the inventor of the internet, noted: "You are essentially selling to the machine or my agent. Suddenly, that means you need to be good at data. It means that you need to make sure that you have all your products and all the scripts are described in the data that the machine understands."[49]

KEY POINTS

- AI is a key horizontal enabling technology for a wide range of applications, from voice-based interfaces to self-driving cars and consumer robotics
- Predictive services based on complex behavioural profiles, triggered by contextual information will become more widespread
- Marketing will be increasingly conversational in nature, with brands continuously refining their understanding of what an individual customer wants and needs

[49] http://www.campaignindia.in/article/sir-tim-berners-lee-the-marketing-impact-of-artificial-intelligence/423227

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