

Octopus

Making Everyday Life Easier

八達通
OCTOPUS



The Octopus Smartcard: It Came from the Subway!

Prudence Chan, CEO of Octopus Holdings Limited (OHL), checked the time. She would meet the consultants in the boardroom to hear their ideas on the future strategy of OHL and the Octopus smartcard. In the last twelve years, Octopus had extended its arms throughout Hong Kong, dominating small payments and becoming the world's leading contactless smartcard payment system operator. Ms. Chan knew the dangers of complacency, and was looking towards the next era of development. What lay ahead for the future of OHL and the smartcard? To seed the discussion, she and her senior management had recruited a team of international consultants to consider the future of OHL and the smartcard and make their recommendations for a ten year strategy. The consultants were encouraged to be innovative.

While the Octopus Card started life as Hong Kong's public transit pass, it has grown to become the digital equivalent to cash. With a population of just over 7 million people in the city-state, 95% of Hong Kong's population aged 16 to 65 have an Octopus Card, and often more than one. They can use it at over 2,500 businesses and service providers - paying quickly, conveniently and electronically for public transport, fast food, pay phones, parking, vending machines, convenience store purchases and more. The card is ubiquitous with more than 19 million in circulation, generating an average of over 10 million daily transactions and HK$90 million in transportation and retail transactions every day.[1]

In the Cantonese dialect, Octopus has a second name, "Baat daaht tùng." Loosely translated it means "goes everywhere", an apt description for a card that has, to a great extent, replaced cash in Hong Kong. Its transaction time is nearly instantaneous, faster than a credit card and far more convenient than counting Hong Kong's many denominations of coins. But its applications go beyond monetary transactions. Octopus Cards can be used as an electronic form of identification. Many Hong Kong workers clock-in and out of job-sites with the same card they use to get there. Instead of relying on keypads or key fobs for access control, businesses authorize the Octopus Card most residents already carry to unlock doors. Schools use Octopus for roll call, buying food, checking out library books, and making school payments.

Octopus adds convenience to life in Hong Kong. As a multi-functional travel card, access pass and e-purse, the card has tried to exemplify the company motto, "Making Everyday Life Easier" [see **Exhibit 4**].

1 http://octopuscards.com, accessed October 14, 2009.

Ella Chan prepared this case under the supervision of Prof. Paul Forster solely as the basis for class discussion. This case is not intended to serve as an illustration of effective or ineffective management.

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Smartcard Technology

The Octopus Card is a contactless smartcard; its microchip does not require physical contact with electrical connectors to operate. Power for read/write functions, as well as the data itself, is transmitted by a radio frequency (RF) magnetic field, also called RF induction. The smartcard chip is activated when it passes within 30mm to 100mm of a read/write device.

The electromagnetic waves generated by terminals penetrate bags or wallets, allowing cards to be passed over readers without removing them from personal stowage. The activation distance is set to a low threshold to avoid accidental charges.

All data is encrypted and authenticated by mutual handshaking between the chip and the read/write device. Software encryption is dynamically generated with every transaction to prevent fraud. Multiple applications can reside on the same smartcard. So in addition to payment people use the same card for property access, library loans or check-in functions.

Transactions are completed between terminals and cards; dialing into a bank network for authorization on every purchase is not required. Each terminal maintains its own records. An Octopus central data clearinghouse consolidates daily transactions and settles accounts with banks and affiliates [see **Exhibit 5**].

The electronic purse value and other transaction data are stored on the chip itself. There is no need to sign receipts or enter pin numbers. Smartcards are convenient and easy to use without compromising security. Most of the Octopus cards and products are anonymous, that is, no personal identity of the user is registered with the company, and the card or product is transferrable.

Octopus uses a smartcard technology developed by Sony, marketed under the brand name FeliCa derived from the English word “felicity,” to convey a double meaning of pragmatic efficiency and happiness. Octopus developed most of the terminals in-house. The terminals are generally cost competitive with those used in credit/debit card transactions.

It Came From the Subway!

The Octopus of today was formally launched in 1997 by a consortium of public transport operators who cooperated in creating the universal pass. In 2005 the company incorporated as Octopus Holdings Limited, initiating a restructuring to separate non-payment businesses from Octopus' payment-processing division, which is regulated by the Hong Kong Monetary Authority [see **Exhibit 1**]. The separation fosters flexibility for developing operational efficiencies and future business. Octopus is still owned collectively by five Hong Kong transit companies [see **Exhibit 2**].

The Octopus Card itself evolved from the fare collection system originally instituted by Hong Kong's Mass Transit Railway (MTR). From its 1979 inception, the underground rail line employed magnetic strip cards as an automated fare collection system. MTR fares are based on distances traveled rather than flat rates. Riders would enter their destination into a ticketing machine and receive a magnetic strip single journey ticket. The system necessitated many automated ticketing machines as well as cashiers at each station to facilitate fare collection.

As the world's fourth densest city, Hong Kong has a sophisticated and efficient transport network and is the world's most used transport system, carrying over 90% of daily journeys by commuters from all walks of life. For passengers, purchasing tickets for each individual journey was the major point of delay in the system, especially at peak periods. With a multi-ride pass the MTR dramatically reduced bottlenecks and more passengers could pass through the turnstiles at peak travel times.

In 1983 the rail line introduced the Common Stored Value Ticket (CSVT) to supplement single journey passes. Regular commuters could purchase magnetic strip cards that could be used repeatedly until the value on the card was depleted. CSVT improved operations by reducing the number of single journey tickets purchased. Infrequent passengers still bought single tickets but the overwhelming majority of riders opted for the stored value ticket. To incentivize CSVT adoption, the MTR offered a slight cash bonus, crediting HK$103 for each HK$100 card purchase.

As an added bonus the MTR chose to simplify the "last ride" of the CSVT. Fares were calculated as passengers fed the stored value card into a reader upon entering the train system. When they exited, the card was read again and the appropriate fare deducted from the card's balance. To eliminate issues of insufficient funds, the MTR decided to allow low value CSVTs to be used on journeys where the fare might exceed the balance on the card. Cards with remaining value are normally returned to passengers as they exit the turnstile. In cases where fares exceed the stored value, the turnstile retained the card and the passenger would need to buy a new ticket on their next journey. The concept of getting a "last ride" bonus proved a powerful motivator in adoption of CSVTs. It was a challenge amongst commuters to see how long a journey they could take

with the least amount of value left on their CSVT.

The CSVT shortened lines and improved service. It also reduced the number of coins the company collected, transitioning most ticket sales to paper money in HK$100 units.

Concurrent with the CSVT's introduction, acceptance of the ticket was extended to the Kowloon-Canton Railway (KCR), a longer haul commuter train with service up to the northern Hong Kong/China border. Riders could purchase a single ticket with the option to use it on two different rail networks. Six years later the city bus lines also began accepting the CSVT, allowing passengers to flow from bus to MTR to KCR. Interoperability between transportation modes and stored values on the CVST gave the MTR fertile ground for the creation of the Octopus Card.

Innovation and Convenience

As early as 1993, 10 years after the CSVT's successful introduction, the MTR began studying new technology to upgrade the magnetic strip card. Magnetic strip technology has limited memory and security and thus is not suitable for general payment purposes. Contactless smartcards would be the next generation. The card was required to be easy-to-use and fast, fulfilling transactions within 0.3 seconds without having to swipe, slide or otherwise physically interact with readers. There could be no sacrifice on security or reliability; transactions had to be accurate with safeguards against fraud. There had to be a real cost savings from lowering coin usage. End-of-day account settlement also needed to be simple, reducing human counting errors and bank settlement time. For customers, adding value to the card had to be simple and widely accessible. But paramount to the Octopus concept was the idea of ubiquity.

The CSVT was used on most, but not all, public transport in Hong Kong giving it wide reach. In 1994, five major public transport operators namely, the two rail lines, MTR and KCRC, bus companies KMB and Citybus; and the Hong Kong and Yaumati Ferry (HYF), established a joint venture, Creative Star Limited (renamed as Octopus Cards Limited in 2002) to oversee the contactless smartcard system's development and implementation.

From the beginning, Octopus had the goal of creating a common small value electronic payment platform allowing multi-application developments to provide even greater convenience to the public. The daily sorting and transfer of thousands of heavy coins to the bank was a significant cost. The birth of Octopus brought a fundamental shift to Hong Kong's cash culture by opening the door to electronic micropayments.

The Octopus card debuted in 1997. Passengers already accustomed to stored value cards with the CSVT, readily accepted the new technology. Incentives in the form of discounts were given to railway customers to help drive people toward the card. The overwhelming convenience of using the card and Hong Kong's cultural propensity for new technologies also contributed to the successful launch of Octopus.

After only three months more than 3 million cards were issued and the demand exceeded the supply. Customer satisfaction was off the charts. Riders experienced no compromise in service by switching to Octopus from the CVST and gained a quicker commute in the bargain.

Early Expansion

Initially taxis and the smaller independently operated buses, known as mini-buses, did not accept the new Octopus Card for fares.

In the case of taxis, there were limitations to Octopus adoption. There are about 20,000 taxis in Hong Kong. As small independent operators, the taxis did not see the benefits of the card. Having to pay for an Octopus reader in the cab was one disincentive. Another was the card was seen as increasing convenience at the taxi driver's expense. Tipping in Hong Kong was usually a matter of only a few dollars from rounding up the fare. Exact payment with Octopus would remove that small margin. As well, most taxis in Hong Kong had two drivers, operating day and night. Reconciliation was in cash. With Octopus payments there was no easy way for the two drivers to reconcile. At the time of this writing taxis still work exclusively with cash.

There are two types of mini-buses in Hong Kong, the red mini-buses (RMB) and green mini-buses (GMB). RMBs operate on non-scheduled routes and their service (such as frequency) and fare levels are not subject to regulation by the government. Most of them are independently owned and operated. Drivers resist adopting Octopus for many of the same reasons as taxis.

In the case of GMB, the outcome was different. GMB, representing 60% of 4350 minibuses in Hong Kong operate scheduled services on fixed routes at fares approved and regulated by Transport Department. Companies rather than individuals own most GMB. At the beginning, the GMB companies took a wait-and-see approach, and were not keen to equip their buses with Octopus readers. The situation was changed when operators saw they were losing some of their passengers to other bus routes because of the convenience of Octopus payments. All GMB bus lines now accept the Octopus Card.

Success in transport was a firm platform for expansion. Octopus first added more locations to add value.

They saw early on that having to go down into the subways to add funds to the card was a point of resistance. Plus, if people were worried about keeping enough value on their Octopus for their ride home, they might not use it anywhere else. To ease these concerns Octopus needed pervasive, highly visible and aboveground re-charging points.

The 7-Eleven convenience store chain became the first non-transport Octopus affiliate. The chain was happy to be involved; they earned a fee with each add-value transaction and gained potential customers when people came in to top-up their card.

With convenience in mind and addressing user concerns about running out of stored value, Octopus first introduced the Automatic Add Value Service (AAVS) in 1999. Today Octopus has contracted with all of the 21 banks and credit card companies in Hong Kong to provide AAVS to their Visa or MasterCard cardholders, making their smartcard even easier to use. The AAVS transfers pre-set amounts (HK$250 or HK$500) automatically to an Octopus Card when its stored value reaches zero. For security, the automated top-up reloads only once a day, charging a customer's selected credit card. Even in mid-transaction, the card can reload value if the current purchase exceeds the existing balance on the smartcard. The company reports over 1 million Octopus cardholders use AAVS services. That translates to about one out of every 12 credit cards in the territory is linked to an Octopus card.[2]

Benefits of Octopus Payment

In 2000, three years after launch, Octopus applied to the Hong Kong Monetary Authority and obtained the Deposit Taking Company authorization to expand the use of Octopus to non-transport applications. 7-Eleven was the first major retail merchant to accept Octopus as a form of payment. It was seen as a logical extension to the add value services they had already been providing. Soon more retailers followed suit and the transformation from transport ticket to electronic money was complete.

Purchases between $1 and $20 Hong Kong dollars are usually made with coins. Travel fare, snacks, newspapers, tea and coffee are all predominantly coin transactions. For a retailer, eliminating the costs of handling, sorting and transporting coins can improve efficiency and profitability.

Octopus has an advantage in transaction time over cash and credit cards because it does not require entering a pin number, signing receipts, or waiting for change. Retailers report an increase in sales when

2 Monthly Statistical Bulletin, Issue No. 181, September 2009, Hong Kong Monetary Authority, <http://www.info.gov.hk/hkma/eng/statistics/msb/new_msb_tables_b.htm#banking>

the Octopus card is added to accepted forms of payment.

Through Octopus loyalty programs retailers can offer their customers Octopus-based bonuses. Participating in Octopus programs provides merchants greater visibility into consumer shopping behaviors.

As a prepaid debit card, Octopus holds several benefits for its stakeholders. Consumers paid for services upfront, up to a maximum of HK$1000 and a HK$50 deposit, leaving the float with Octopus. Because users did not have to have a credit card or a bank account, card ownership was not denied to any demographic. Octopus provided a financial service to all consumers. With its limited stored value, it does not present the same security issues for issuer or user as credit cards or cash. And without the punitive surcharges associated with some of the prepaid cards elsewhere, Octopus enters consumers' wallets easily.

Its scale provides advantages in several revenue streams. Revenues from merchant processing fees were significantly less than that levied by banks and credit card companies because of the much smaller ticket sizes. Octopus also generates some revenue from licensing fees for alternative form factors [see **Exhibit 9**] and fees from identification applications, as well as from supplying systems and consulting services abroad.

International and China Operations

Octopus is highly focused on convenience, service and innovation. The Octopus Card has grown into one of the world's largest circulating smartcard payment systems and has won multiple innovation and best practices awards.

But at its inception, the card was created to solve one problem – fare collection bottlenecks. The same problems are faced in transportation systems all around the world in some degree. Octopus International Projects Limited was created to offer consultancy services abroad. In 2003 Octopus was commissioned to develop a nationwide automated fare collection service in the Netherlands, now known as OV-chipkaart.

Octopus also supported the Dubai Roads and Transit Authority (RTA) to build and implement the territory's first ever Unified Automated Fare Collection system, to be used on all public metro and marine transport.

Branching out to its closest neighbors, Octopus has implemented some limited forays into Shenzhen, China. Cross-border bus lines now accept the Octopus card for payment on Shenzhen routes. The Café de Coral and Fairwood fast food chains operating in Shenzhen now both accept Octopus for payment.

Using Octopus in Shenzhen is the same as in Hong Kong. The exchange rate for Hong Kong customers will be made known to customers with reference to the rate set by the bank for clearing and settlement. Octopus users cannot top-up cards in China using cash but AAVS functions seamlessly across the border.

Global Smartcard Applications

Smartcard innovation is occurring elsewhere in the world using models similar and different from Octopus. The base of public transport riders in urban areas is often the springboard for contactless fare systems and extended card applications, such as the Oyster Card in London, Suica in Tokyo, T-money in Korea and EZ-link in Singapore.

Sony added a built-in "FeliCa Port" on its line of VAIO laptops to enable Internet shopping and add-value for FeliCa smartcards. Holders of Tokyo's Suica card can access their transaction history, including transit routes, by passing their card over the FeliCa port. External USB devices are also available, which can be connected to PCs for the same purpose. Octopus does not currently utilize these options, however EZ-link in Singapore does.

Sony embedded FeliCa ports in the remotes of some BRAVIA televisions. In Japan TV viewers can order on-demand content through their TVs using their Suica card.[3]

The cutting edge of FeliCa based solutions is currently in Japan. NTT DOCOMO's Osaifu-Keitai (OK), or "mobile wallet", is a FeliCa based system housed in mobile phones. The contactless stored value chip is embedded in the phone and can be used like an Octopus Card. NTT's deployment of Sony's technology goes further by allowing mobile phones to interact with the FeliCa chip and adds credit card capabilities along side the e-purse functionality. Osaifu-Keitai requires cooperation between handset makers, credit card issuers, smartcard companies and the wireless network operator. Japan's NTT was able to orchestrate the necessary agreements to create the first mobile smartcard system.

The contactless chip is integrated into the handset and users can access the chip via the keypad and phone screen, using it to check values, review purchases and even top-up their e-purse via an electronic money transfer.[4] The phone then becomes a transit ticket, property key or memberships pass and can be used like cash at over 400,000 locations.

3 Shinya Saeki, "BRAVIA TV Gets FeliCa Port; Enables Electronic Settlement," Tech On, May 7, 2009, Nikkei Business Publications, Inc., <http://techon.nikkeibp.co.jp/article/HONSHI/20090427/169430/>

4 "What's "Osaifu-Keitai"?", NTTDocomo, NTT, <http://www.nttdocomo.co.jp/english/service/osaifu>

By adding DOCOMO's DCMX service, the phone also becomes a credit card, which interfaces with the phone's FeliCa chip [see **Exhibit 14**]. Converging cash, credit and communication in one place creates a powerful new electronic version of money. With one device people are able to complete almost any type of transaction, be it paying transit fare, shopping in a store or buying on-line. For example, through a DCMX enabled phone, users can browse the Internet and purchase a ticket for a concert or air travel. The ticket is downloaded to the contactless FeliCa chip within the phone. A contactless reader at the venue then verifies the ticket data on the chip, allowing access to the show or aircraft. DCMX enables a new dimension of electronic purchasing as well as electronic delivery. As of August 2009 DOCOMO reports the number of DCMX subscribers in Japan surpasses 10 million [see **Exhibit 13**], out of over 30 million Osaifu-Keitai users.[5] While Octopus has set its sights on replacing cash, NTT is shooting for the whole wallet.

In 2002, Sony and Philips announced the joint development of a technology called Near Field Communication (NFC). NFC is a short-range wireless connectivity technology standard designed for intuitive, simple and safe communication between electronic devices such as mobile phones. Bringing two NFC compatible devices within a few centimeters of one another enables NFC communication. Applications of NFC technology include contactless transactions such as payment and transit ticketing. NFC is designed to be fully compatible with Sony FeliCa and Philips MiFare contactless technologies.

The incorporation of the NFC technology into mobile handsets had a slow start because of the debates on where to store the security information – the SIM card, the handset hardware or the memory card. The lack of standardization has plagued NFC deployment; handset manufacturers were reluctant to incorporate NFC technology into their handsets before a standard was agreed. In September 2009 a new standard known as Single Wire Protocol (SWP) was announced by hardware manufacturers and telecommunication organizations as the default communication protocol between phone SIM cards and NFC chips.[6] The standard means handset makers will no longer have to wait for a critical mass of users before building phones to support one contactless payment system or another. The intent of the standard is to get more NFC capable phones out into the market and let the payment ecosystem build up independently.

Recognizing the convenience of contactless cards motivated Visa to develop the payWave contactless credit card [see Exhibit 8]. Like Octopus, transactions are completed by proximity, 25mm to 50mm.[7] In the case of Visa the currency is credit rather than debit. The contactless payWave chip is embedded in standard credit cards, mini cards with traditional magnetic strips or a key chain fob. As of 2009 payWave was rolled

5 "Subscriptions to DOCOMO's Credit Payment Service Top 10 million," NTTDocomo, August 25, 2009, NTT, <http://www.nttdocomo.com/pr/2009/001450.html>

6 Victoria Ho, "Contactless payment to hit mainstream?", ZDNetAsia, September 16, 2009, CBS Interactive Inc., <http://www.zdnetasia.com/news/communications/0,39044192,62057826,00.htm>

7 "Introducing a new wave of ease and convenience", Visa, Visa Inc., <http://usa.visa.com/personal/cards/paywave/index.html>

out across all major continents in many of the 170 countries Visa already operates, including Hong Kong [8] and the back seats of taxis in New York City.[9]

Seeking to follow on the NTT DOCOMO model, Visa is introducing a mobile phone based payWave option. Visa says it intends to drive "the convergence of two of the world's most ubiquitous consumer products, 1.7 billion Visa cards and 4 billion mobile phones." [10] Pilot programs have been launched in Malaysia, Singapore and Canada via partnerships with local wireless carries and major handset manufacturers.

Branded as PayPass, MasterCard offers a similar contactless payment system. In 2006 the company worked with handset maker Nokia and 7-Eleven to test a mobile version of PayPass in the Dallas, Texas area. MasterCard since decided to offer the service nationally in the US and tested NFC-enabled mobile phones in Taiwan, Japan and Korea. In 2008 MasterCard experimented with an internationally accepted PayPass phone with the concept of bridging different currencies with the one device most travelers carry with them abroad. MasterCard has partnered with Japan's SoftBank Mobile Corp., Orient Corp., Samsung Electronics Co., Ltd, Gemalto and Hitachi Ltd o bring the project to fruition.[11] MasterCard was already showcasing its near field enabled phone technology in Hong Kong at the 2005 International ICT Expo.[12]

In Hong Kong, Visa payWave was first introduced in 2008 through the locally branded enJoy card from Hang Seng Bank. When it was launched, payWave was only available at a handful of Hong Kong retailers. Since then, Visa has targeted high volume merchants such as drug stores and groceries.[13]

Octopus itself has co-developed a CitiBank/Octopus card, which is a standard credit card with an embedded Octopus stored value chip. The co-branded card features automatic reload functions and purchases can be credited toward Octopus or Citibank loyalty programs.[14]

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8 "Visa payWave Gains Global Momentum", Visa, July 2, 2008, Visa Inc., <http://www.corporate.visa.com/md/nr/press792.jsp>

9 "Beep, Beep! Visa and Creative Mobile Technologies Partner to Bring Faster Payments to Thousands of New York Taxis", Visa, June 14, 2007, Visa, <http://www.corporate.visa.com/md/nr/press707.jsp>

10 "Visa Makes NFC Mobile Point-of-Sale Payments Commercially Available for the First time", Visa, April 9, 2009, Visa Inc., <http://www.visa-asia.com/ap/sea/mediacenter/pressrelease/NR_SGP_090409.shtml>

11 "MasterCard to Launch First Internationally Accepted MasterCard PayPass on Mobile Phone In Japan," MasterCard, November 13, 2007, MasterCard, <http://www.mastercard.com/hk/wce/PDF/24388_JP-SoftBank_e.pdf>

12 "MasterCard Pioneers Innovation in Payments with NFC–Enabled Mobile Phones", MasterCard, April 14, 2007, MasterCard, <http://www.mastercard.com/hk/personal/en/wce/pdf/19755_Microsoft_Word_-_0411_-_HK-_NFC_release_-_Eng_-FINAL.pdf>

13 "Visa PayWave Merchants and Issuers," Visa, Visa, <http://www.visa-asia.com/ap/hk/en_US/cardholders/cardsservices/visa_paywave_merchantsissuers.shtml#Hong%20Kong%20Merchants%20and%20Issuers>

14 "Citibank, Octopus combine for Hong Kong all-in-one card", ContactlessNews, July 18, 2008, AVISIAN Publishing, <http://www.contactlessnews.com/2008/07/18/citibank-octopus-combine-for-hong-kong-all-in-one-card>

The story of Octopus is not without its casualties. Both Mondex and Visa Cash suffered setbacks in Hong Kong in the 1990s. Both had deep pockets and many partners but failed to find traction with retailers or consumers. Criticisms of the systems were the slow transaction speeds, small penetration in the retail sector, higher fees, and complicated equipment for merchants.[15] As cautionary tales, they show that there is competition in the sector, but success is not assured.

The Future

Ms. Chan reflected on the situation. Octopus, the service, plays a critical function in Hong Kong life, enabling mobility in a fast-paced society. In doing so, it is granted the benefits of scale, and a mission critical system affecting almost everybody in Hong Kong. Octopus, the business, faces competition, increased service quality demands and the need to reinvest in technologies and innovate. While Octopus enjoyed a competitive advantage in the transportation sector, the technology of smartcards was quickly converging with other technologies creating new possibilities and new competition, as evidenced by pilot projects worldwide.

How should Octopus Holdings Ltd. best position itself for the future? What new opportunities were provided by smartcard technologies? In applications and geography, Octopus had stayed close to home. How necessary was this now? What applications and markets are most promising and feasible? Where are these markets and how should Octopus getting there from here? What could the next ten years look like?

She looked at her watch. Time.

15 Victor Cheung, "The new rival to Octopus Card--the Hang Seng enJoy Card", CNET Asia, December 27, 2007, CBS Interactive, <http://asia.cnet.com/blogs/hktechphooey/post.htm?id=63001640>

EXHIBIT 1

OCTOPUS HOLDINGS LTD. STRUCTURE

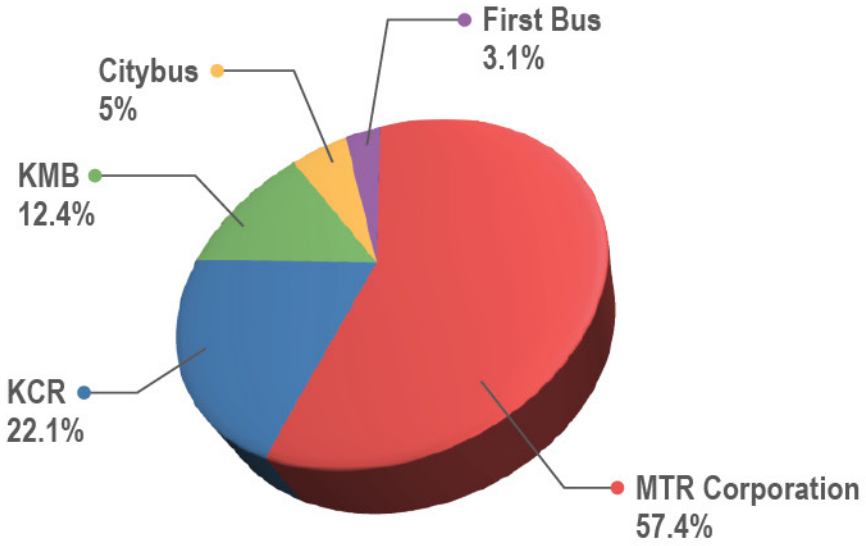


Source: Octopus Holdings Ltd.

EXHIBIT 2

SHAREHOLDER STRUCTURE

The Joint Venture of Five Major Transport Operators: % Share



Source: Octopus Holdings Ltd.

EXHIBIT 3

KEY EXECUTIVES



Source: Octopus Holdings Ltd.

EXHIBIT 4

COMPANY MISSION AND CORE VALUES

"Making everyday life easier by applying innovative ideas through secure and robust technology."

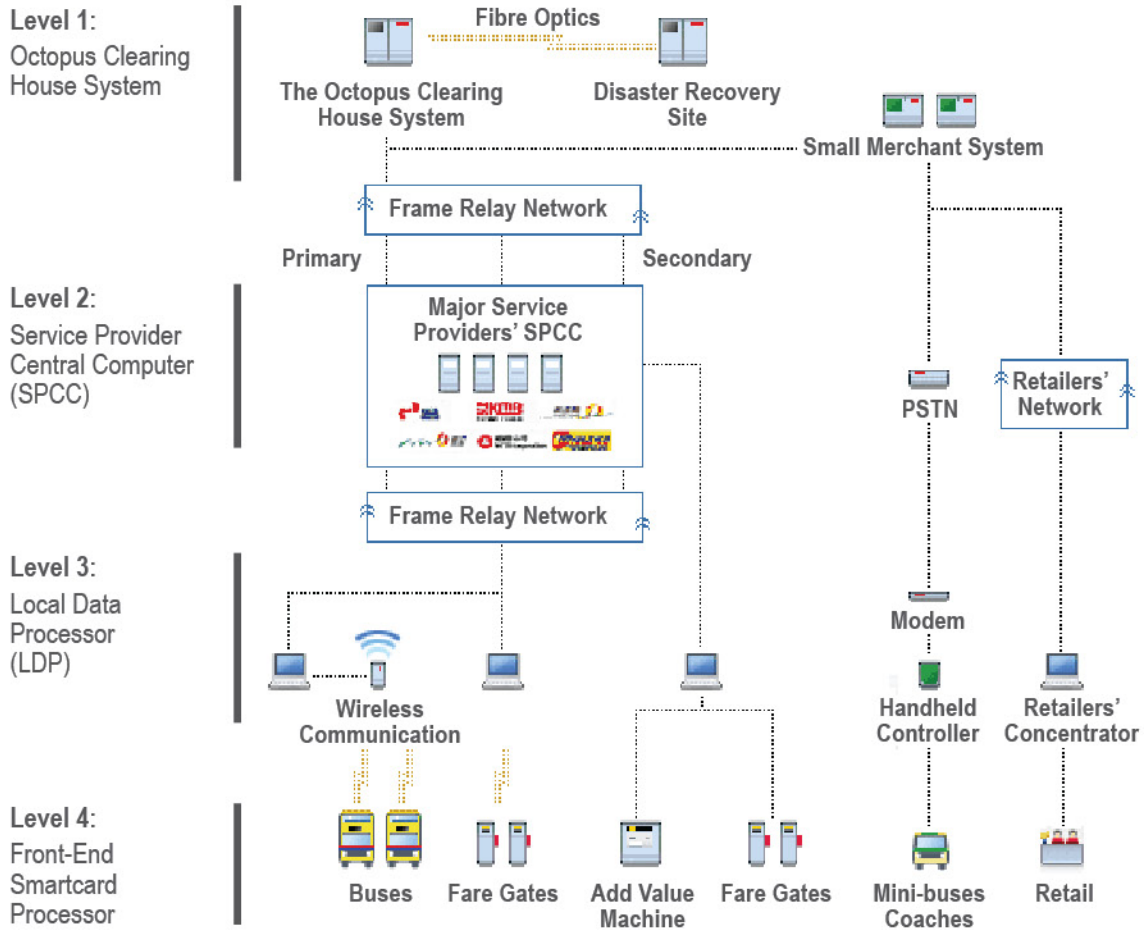
Core Values:

- Create a trusting and encouraging environment for customers, staff and shareholders whereby we can communicate, collaborate, share and support each other as equal partners.
- Continuously innovate, seeking better ways to conduct business and creating new opportunities.
- Strive to delight customers whenever they encounter Octopus.

Source: Octopus Holdings Ltd.

EXHIBIT 5

OCTOPUS CLEARING HOUSE ARCHITECTURE



Source: Octopus Holdings Ltd.

EXHIBIT 6

OCTOPUS HOLDINGS LTD. TIMELINE

• **1992** – The MTR Corporation Limited (MTRC) took the lead in reviewing its fully automatic fare collection technology and looked at devising a future development strategy for the next decade. Contactless smartcard technology was subsequently recognised as the most appropriate platform for future systems.

• **1994** – Five major public transport operators established a joint venture, Creative Star Limited (renamed Octopus Cards Limited in 2002) to oversee the contactless smartcard system's development and implementation.

• **1997** – The Octopus smartcard system was launched in September, allowing commuters to travel across six public transport systems using one single card, thereby eliminating the hassle of finding exact change for individual journeys.

• **2000** – Realising the card's vast commercial potential, Octopus applied for and obtained a Special Purpose Deposit-taking Company authorisation from the Hong Kong Monetary Authority to expand its use to a wider base of different applications.

• **2001** – A new agreement was signed amongst shareholders and the Company was transformed from its previous non-profit making status into profit making.

• **2003** – Octopus won the first overseas contract to supply its Clearing House System for the national contactless smartcard scheme in the Netherlands.

• **2005** – In October, Octopus Holdings Limited was incorporated as a holding company for Octopus Cards Limited and the newly set up subsidiaries responsible for the non-payment business of Octopus. These include Octopus Rewards Limited which launched a brand new common loyalty programme in November.

• **2006** – Octopus first accepted in Shenzhen and Automatic Add Value Service further extended to introduce HK$500 reload amount option.

• **2007** – Appointed Hang Seng as acquirer and introduced Portable Octopus Processor targeting for the smaller merchants outlets. In August, a contract was awarded to develop and implement a contactless smartcard payment system for multiple transport services in Dubai.

• **2008** – Launched a co-brand credit card with Citibank, the first credit card with Octopus function.

• **Today**, Octopus can be used in almost all Hong Kong's transportation systems and also retail outlets, wet markets, self-service businesses, leisure facilities, schools, parking and access control.

Source: Octopus Holdings Ltd.

EXHIBIT 7

OCTOPUS FINANCIALS

Consolidated Profit and Loss Account

Year ended 31 December
in HK$ million

	2008 (Audited)	2007 (Audited)
Turnover	527	465
Other operating income	61	53
Other operating income	**588**	**518**
Staff costs	(133)	(101)
Load agent fees and bank charges for add value services	(66)	(60)
Other expenses	(149)	(152)
Operating profit before depreciatin	**240**	**205**
Depreciation	(54)	(63)
Operating profit before interest and finance charges	186	142
Net Interest income	80	76
Profit before taxation	**266**	**218**
Income tax	(28)	(49)
Profit for the year	**238**	**169**

Source: Octopus Holdings Ltd.

EXHIBIT 8

VISA PAYWAVE FORM FACTORS







Source: Visa Inc.

EXHIBIT 9

OTHER OCTOPUS FORM FACTORS

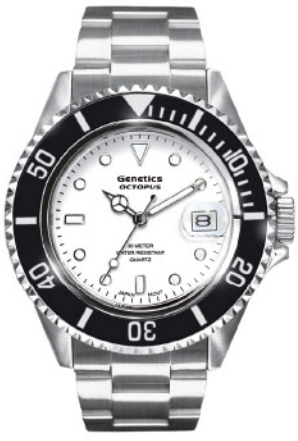


Chinese New Year Limited Edition Octopus





Octopus Jewelry and Accessories



Octopus Watch



Octopus Keychain

Source: Octopus Holdings Ltd.

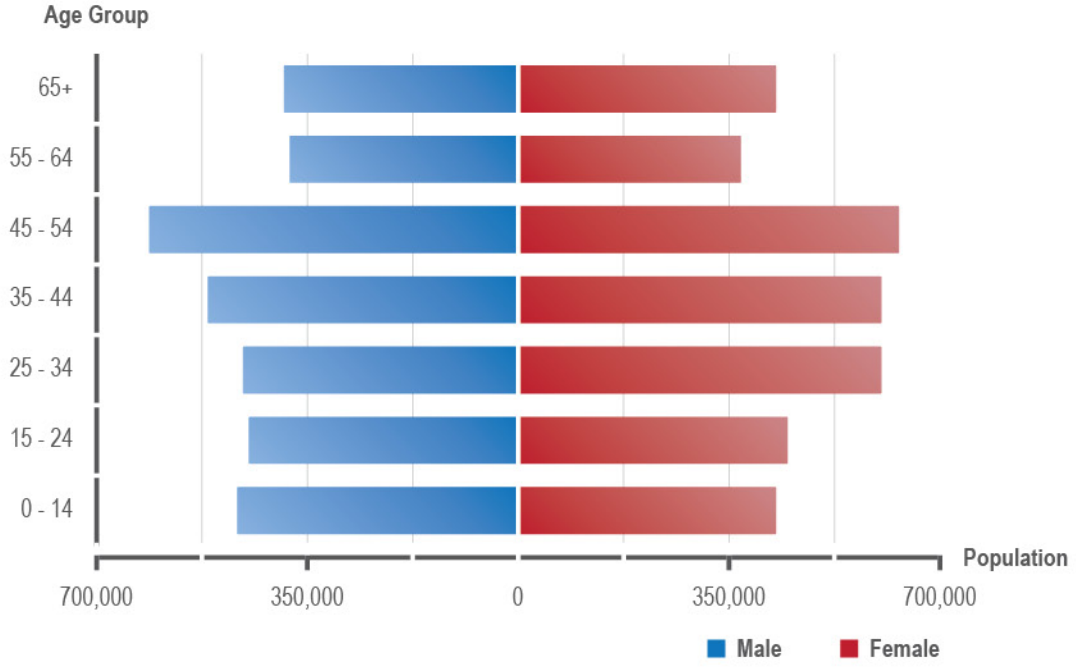
EXHIBIT 10

HONG KONG POPULATION DISTRIBUTION, MID – 2008

Population by Age Group

No. of persons: 6,893,800 *
Sex ratio: 898
Mediam age: 40

* excluding inmates of institutions and persons living on board vessels



Source: Census and Statistics Department, The Government of the HKSAR

EXHIBIT 11

NUMBER OF RETAIL ESTABLISHMENTS IN HONG KONG

Establishments

Year	Month	No.	Year-on-year % change
2008	Mar	57,016	+1.0
	Jun	56,768	+0.1
	Sep	56,306	-0.3
	Dec	55,989	-1.2
2009	Mar	56,791	-0.4

Source: Census and Statistics Department, The Government of the HKSAR

EXHIBIT 12

TOTAL RETAIL SALES IN HONG KONG

Total Retail Sales in Hong Kong

		Value			Volume	
Year	Month	HK$Mn	Index*	Year-on-year % change	Index*	Year-on-year % change
2006		219,002	108.5	+7.2	107.0	+5.7
2007		247,000	122.4	+12.8	117.9	+10.1
2008		273,126	135.4	+10.6	123.8	+5.0
2008	May	23,070	137.2	+13.0	124.3	+5.6
	Jun	22,147	131.7	+11.6	118.8	+4.0
	Jul	24,150	143.6	+13.6	130.7	+6.5
	Aug	22,695	135.0	+10.3	124.0	+3.8
	Sep	20,899	124.3	+7.1	113.8	+2.0
	Oct	20,788	123.6	+0.4	111.7	-4.2
	Nov	20,473	121.8	+1.3	109.0	-2.6
	Dec	20,333	150.7	+1.1	137.8	-0.5
2009	Jan	27,522	163.7	+7.4	149.4	+5.4
	Feb	19,834	118.0	-12.7	108.7	-13.9
	Mar	20,795	123.7	-7.7	113.0	-9.2
	Apr	21,714	129.1	-4.3	116.5	-5.4
	May	21,639	128.7	-6.2	116.3	-6.4
	Jun	21,098	125.5	-4.7	113.8	-4.1
	Jul #	22,816	135.7	-5.5	123.6	-5.4

* Index (Average of monthly indices from Oct 2004 to Sep 2005 = 100)

Notes:

The value index measures the changes in value terms, while the volume index obtained by deflating the value index by a specially constructed price index, measures the changes in real terms. The above retail statistics are complied based on Hong Kong Standard Industrial Classification (HSIC) Version 2.0 and the series has been backcasted to the base period (i.e. October 2004 to September 2005) whereas the statistics prior to October 2004 are based on HSIC Version 1.1. Users may also download "HSIC Version 1.1-based statistics" for reference. For more details on the revision of HSIC, please refer to the feature article "Revision of the Hong Kong Standard Industrial Classification" published in the November 2008 issue of the Hong Kong Monthly Digest of Statistics.

Provisional figures.

'0.0' Denotes increase or decrease of less than 0.05%.

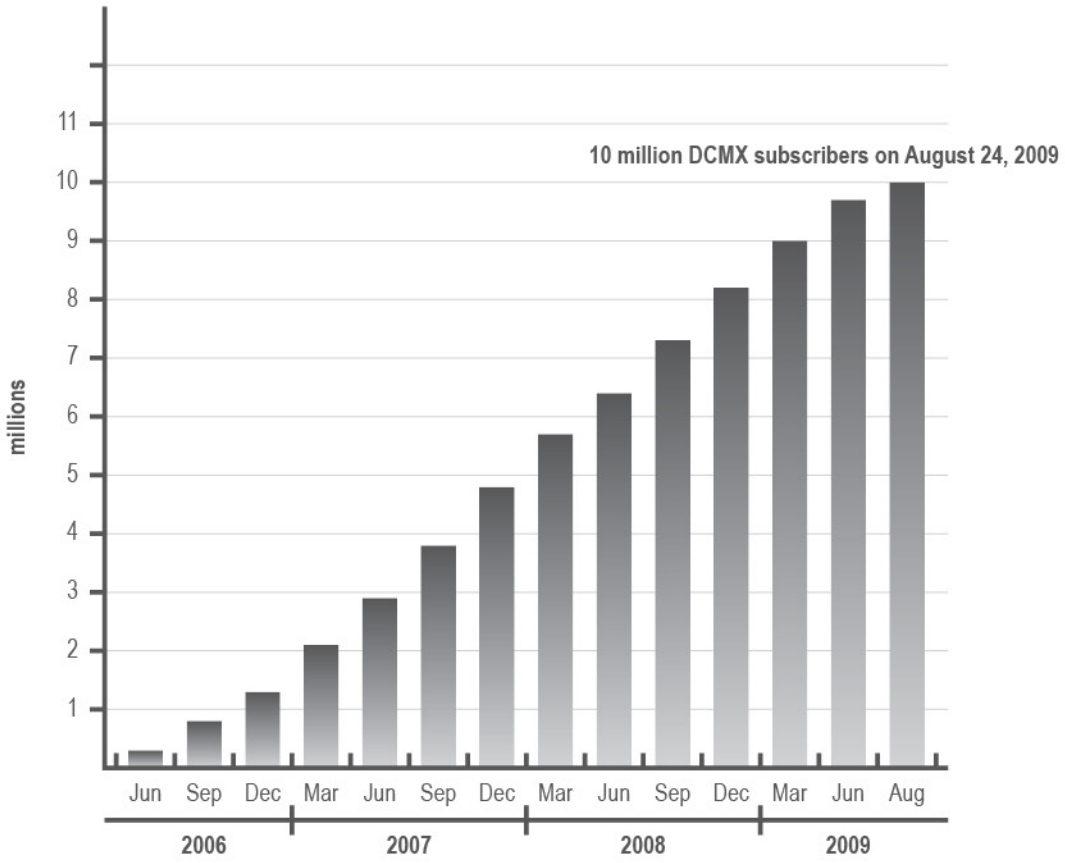
Source: Census and Statistics Department, The Government of the HKSAR

EXHIBIT 13

NUMBER OF NTT DOCOMO'S DCMX™ SUBSCRIBERS

DCMX Subscriptions

Steady Growth in DCMX Subscriptions
(Total subscriptions to DCMX mini, DCMX and DCMX GOLD)



Source: www.nttdocomo.com

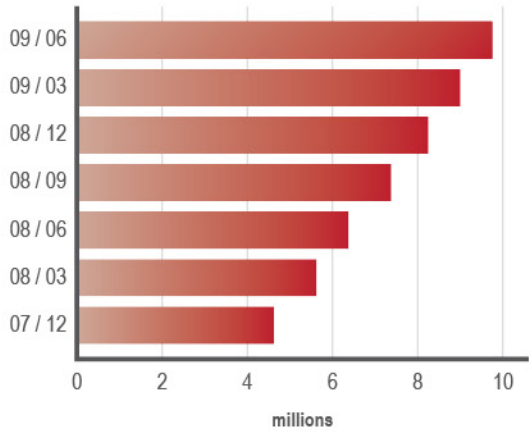
EXHIBIT 14

NTT DOCOMO'S DCMX™ LIFESTYLE APPLICATIONS FOR PAYMENTS

"One of our lifestyle applications is Osaifu-Keitai™, mobile-wallet service for e-money, e-credit cards, travel tickets, membership cards, ID, door keys and more. DCMX™, DOCOMO'se-credit card, has more than 10million members and the iD™platform for e-credit cards has some 420,000 payment terminals installed."

DCMX

DOCOMO brand for e-credit card storable in mobile phones.



10 mil. by March 2010 (forecast)
11.8 mil. in August 2009

iD

DOCOMO platform for storing e-credit cards of any brand. Phone is merely waved over merchant terminal to complete transaction.



iD payment terminals installed

- 420,000 as of June 30, 2009
- 430,000 as of March 31, 2010 (forecast)

iD deployment overseas

- Guam & China

Source: www.nttdocomo.com

EXHIBIT 15

HONG KONG ICT STATISTICS

Indicators	
Mobile phone penetration rate *(May 2009)*	168%
Household broadband penetration rates *(May 2009)*	78.7%
Personal computer penetration rate for business of all sizes *(May - September 2008)*	63.1%
Internet usage rate for business of all size *(May - September 2008)*	58.8%
Number of wireless hotspots installed by the Government and the private sector *(18 Dec 2008)*	7,905
Government ICT spending *(2009 - 10 Estimate)*	5.8 billion
R&D expenditure *(2006)*	11.9 billion *(0.81% of GDP)*
Level of satisfaction of citizens who have used online government services *(2007)*	Very Good: 4.2% Good: 61.2% Average: 32.7% Poor: 1.7% Very Poor: 0.2%
Number of visitors to GovHK *(Dec 2008)*	Around 21,000 daily visits
Number of online e-government transactions *(April - Decemeber 2007)*	About 3.6 million per month on average

Source: www.info.gov.hk/digital21/eng/statistics/stat.html

EXHIBIT 16

KEY STATISTICS ON INFORMATION TECHNOLOGY (IT) USAGE AND PENETRATION HK

Key Statistics on Information Technology (IT) Usage and Penetration HK

	2000	2003	2004	2005	2006	2007	2008
No. of households with personal computers (PCs) at home ('000)	1051.1	1479.1	1581.9	1601.3	1662.2	1671.6	1710.1
% of households with PCs at home	49.7	67.5	71.1	70.1	71.7	74.2	74.6
No. of households with PCs at home connected to the Internet ('000)	770.2	1312.8	1444.7	1476.5	1556.3	1580.2	1625.7
% of households with PCs at home connected to the Internet	36.4	60.0	64.9	64.6	67.1	70.1	70.9
% of persons aged 10 and over who had used PCs in the last twelve months	43.1	56.2	59.5	58.8	62.9	66.4	68.2
% of persons aged 10 and over who had used Internet service in the last twelve months	30.3	52.2	56.4	56.9	60.8	64.8	66.7
% of households with a mobile cellular phone (1)	-	-	-	91.5	92.5	93.5	93.5
% of persons aged 10 and over who used a mobile cellular telephone (2)	-	-	-	-	-	-	90.0
% of localities with public Internet access centres	100	100	100	100	100	100	100

Notes:

(1) Figures are available as from 2005.

(2) Figures are available as from 2008.

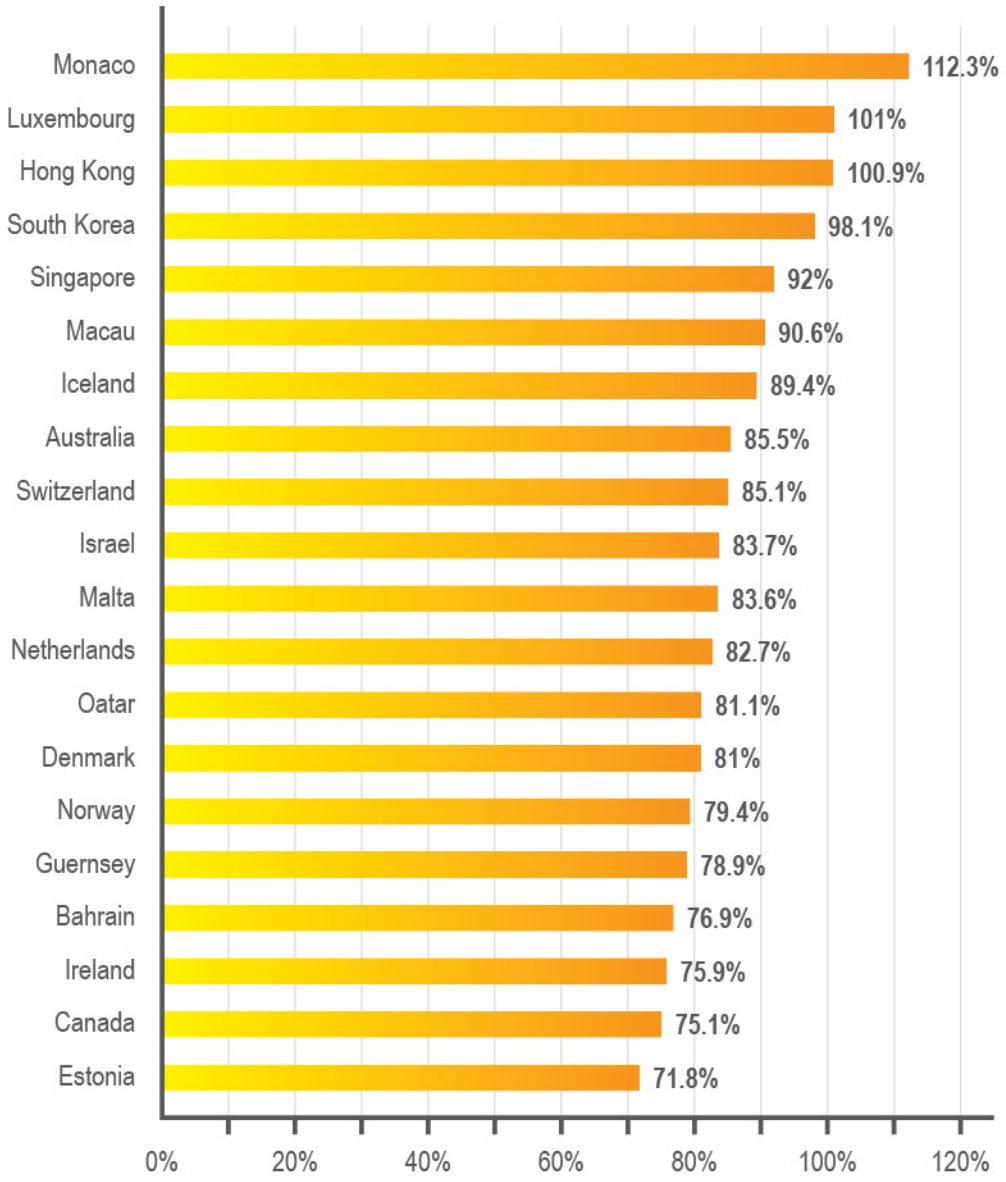
Source: Social Surveys Section, Census and Statistics Department, Leisure and Cultural Services Department

EXHIBIT 17

HOUSEHOLD BROADBAND PENETRATION

Household Broadband Penetration

Top 20 Countries - Q4 2008



Source: Point Topic Ltd.