1 Introduction

1.1 Octopus - Making everyday life easier

Octopus is an electronic payment system using a contactless smart card known as "*Octopus*" which includes Octopus cards and products. *Octopus* can be used to make payments on public transport and at a wide range of retailers and facilities. Users simply hold their *Octopus* over a reader, and the correct amount will be deducted from their *Octopus* automatically without the hassle of cash. For some residential and commercial buildings, *Octopus* is also used as access control.

1.2 The birth and growth of an innovative idea

Hong Kong is one of the world's most dynamic commercial and financial centres. It also boasts one of the world's best public transport systems. Every day, over 12.5 million passenger journeys are made throughout the city on a wide variety of public transport modes. The Hong Kong public transport network was already highly regarded in the international arena in the 1990s, and as a further enhancement the transport operators intended to introduce a new, comprehensive ticketing system.

The MTR Corporation Limited (MTR) had been operating a fully automatic fare collection system since its inception in 1979. The card media of the system was principally recirculated magnetic plastic cards used for single journey and stored value tickets, operating in an entry/exit controlled (or closed) environment.

In 1993, the MTR took the lead in reviewing its fare collection technology and devising a future development strategy for the next decade. Contactless smart card technology was subsequently recognised as the most appropriate platform for future systems.

In 1994, five major public transport operators, namely the MTR, KCRC, KMB, Citybus and the Hongkong and Yaumati Ferry (HYF), established a joint venture, Creative Star Limited (renamed as Octopus Cards Limited in 2002), to oversee the contactless smart card system's development and implementation.

After three years of system development and trials, the Octopus smart card system was finally launched in September 1997, allowing commuters to travel across multiple public transport modes using one

single card, and eliminating the hassle of finding exact change for individual journeys.

The system is innovative in its application of technology in a commercial environment:

- **Co-operation within competition**
  Developed, managed and owned by five transport operators which, despite competing for passengers, have all worked together in the interests of the public to ensure a seamless payment system.

- **A global leader**
  The world's pioneering and most extensive contactless smart card system.

- **Multi-application**
  Designed to accommodate multiple service providers from both the transport and non-transport sectors, allowing multi-application developments to provide even greater convenience to the public.

Expansion into Retails and Utilities

Realising the card's vast commercial potential, Octopus applied for and obtained Deposit-taking Company authorisation from the Hong Kong Monetary Authority in April 2000 to expand its use to a wider base of different applications, especially in the retail sector.

In January 2001, a new agreement was signed among shareholders and the shares of HYF were transferred to New World First Bus Services Limited and New World First Ferry Services Limited.

In October 2005, Octopus Holdings Limited was incorporated to cover wholly-owned Octopus Cards Limited and subsidiaries responsible for the non-payment business of Octopus, including Octopus Rewards Limited.

Octopus services are now available for virtually all Hong Kong's public transport modes. Octopus applications also encompass car parks, parking meters, fast food outlets, bakeries and cake shops, convenience stores, supermarkets, household and personal care stores, boutiques, photo finishing services, telecommunications shops, vending machines, self-service kiosks, photocopiers, photo booths, cinemas, school campuses and recreational facilities, as well as access control for residential and commercial premises.

The Octopus Rewards Programme

The Octopus Rewards programme, launched in November 2005, allows customers to earn and redeem Reward$ with their registered *Octopus* regardless of their payment means. With this common platform, participating merchants can offer tailor-made discounts or special offers

to their customers without having to introduce any new rewards system. There are over 3.2 million registered *Octopus* under the programme, and members can enjoy the benefits at around 700 outlets of 19 participating merchants.

Expansion to China and Cross-border Cards

Leveraging the success of Octopus in Hong Kong, Octopus China Investments Limited and Octopus International Projects Limited have been established to tap into business opportunities that can utilise Octopus' expertise in smart card systems in mainland China and other countries.

With the support of the authorities in Hong Kong and Shenzhen, Octopus made its debut in Shenzhen in 2006. Currently, *Octopus* is accepted at over 50 retail outlets in Shenzhen, including outlets of Café de Coral, Fairwood and Shenzhen Dutyfree Group at all Shenzhen ports.

In 2010, Octopus established a joint venture with Digital China Software Limited to develop application solutions and operational services for smart cards in mainland China. In April 2011, the joint venture signed a strategic cooperation agreement with Wuhan City Smart Card Co Ltd to participate in its operations and development.

In August 2011, Octopus and Lingnan Pass signed a framework agreement – which is part of the Guagndong-Hong Kong economic collaborations announced by the HKSAR Government after the 14th Plenary of the Hong Kong/Guangdong Co-operation Joint Conference.

Octopus launched two co-named cards with two mainland partners, namely Lingnan Pass and Shenzhentong, in July and September 2012 respectively. The "Octopus • Lingnan Pass" and "Hu Tong Xing" offer Hong Kong and Guangdong residents and frequent travelers greater convenience in cross-border commute and spending, as part of the enhanced interoperability, integration and collaboration between the two areas.

Export of Expertise to Overseas

Octopus began exporting its unique technology and experience to The Netherlands and Dubai in 2003 and 2007 respectively. The Dutch public transport e-ticketing system, developed and supported by Octopus, was launched in Rotterdam and Amsterdam in 2009, and is being rolled out on a national scale. The Dubai contactless smart card payment system for multiple public transport services developed by Octopus was successfully launched in 2009. Octopus also announced in 2009 its participation in the development of a new public transport e-ticketing system in Auckland, New Zealand.

New Octopus Service Point

The new Octopus Service Points (OSP) are located at designated MTR stations and the Link REIT shopping centres (to be installed starting from late October 2015) for customers to replace their First Generation On-loan Octopus, check their Octopus' remaining value, Reward$ balance and the latest transaction records.

In addition, they can activate their Rewards membership and download Reward$. They can also collect incomplete transaction refund (if any) onto their Octopus at this facility.

Octopus Mobile SIM

Octopus entered the era of mobile payment by launching the Octopus Mobile SIM in October 2013. This innovative service allows Octopus users to enjoy fast and convenient Octopus payment and other services, simply with one tap of their NFC-enabled smartphones on the Octopus readers.

Octopus Online Payment Service

Launched in February 2014, the "Octopus Online Payment Service" is the first ever mobile payment solution that uses contactless smartcard to process online payments on Near Field Communication (NFC)-enabled mobile devices, among the widely used contactless smartcard small payment systems in the world. It provides Hong Kong people with even more convenient, secure and flexible online shopping experiences.

Expansion to Macau

In March 2014, Octopus and Macau Pass joined hands to roll out the Octopus payment service in over 30 retail outlets in Macau, offering Hong Kong residents and travelers who carry an Octopus greater convenience and ease for retail payments in Macau.

1.3 Company profile

Octopus Cards Limited is wholly owned by Octopus Holdings Limited whose shareholders are the major transport operators in Hong Kong. Octopus Cards Limited is the operator of the Octopus system and is the issuer of *Octopus*.

The shareholding structure of Octopus Holdings Limited is as follows:

Company	**Shares**
MTR Corporation Limited	57.4%
Kowloon-Canton Railway Corporation	22.1%
KMB Public Bus Services Holdings Limited	12.4%
Citybus Limited	5.0%
New World First Bus Services Limited	3.1%

1.4 Mission

Making everyday life easier by using innovative payment technology.

2 Types, features and technology of *Octopus*

2.1 Types of *Octopus*



There are four types of *Octopus*: *On-Loan Octopus* (Child, Adult, Elder, Personalised), *Sold Octopus*, *Bank Issued Octopus and Octopus Mobile SIM*.

An *On-Loan Octopus* is an *Octopus* the company lends to a customer who needs to pay a refundable deposit that covers the card and associated costs as well as the negative value provision. A *Sold Octopus* is a specially designed *Octopus* the company sells to a customer. It holds no deposit. A *Bank Issued Octopus* is a card or product with Octopus function issued by an authorised bank or financial services company. *Octopus Mobile SIM* is a mobile phone SIM card incorporated with Octopus function. The *Octopus Mobile SIM* consists of both Octopus function and mobile telecommunication function for use on NFC (Near Field Communication) enabled mobile phones as tested by Octopus.

2.2 Features of Octopus

- **Convenient and fast**
  Eliminates the need to carry cash or exact fares. Each transaction is carried out in as little as 0.3 seconds.

- **Secure and reliable**
  High reliability and accuracy with comprehensive measures in place to safeguard the integrity and security of the system.

- **Efficient and accurate**
  Simplifies day-end cash counting activities, reducing human counting errors as well as time required for bank reconciliations.

- **Cost saving**
  Lowers cash handling cost.

- **Contactless**
  Convenience of operation, without withdrawing *Octopus* from wallets/purses.

- **Multi-usage with one single card/product**
  A wide range of applications, including public transport, parking, retail, self-service, leisure facilities, schools and access control.

- **Easy reloading**
  An *Octopus* can be reloaded at thousands of convenient locations, and the Octopus Automatic Add Value Service links the holder's *Octopus* with credit card/bank accounts.

- **Discounts/Loyalty programmes**
  Holders using *Octopus* for payments can enjoy the discounts/loyalty programmes provided by a number of service providers.

2.3 Octopus technology

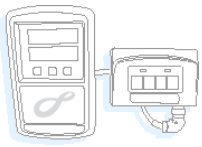
The Octopus system represents a major breakthrough in smart card payment technology. Since its launch, Octopus has undergone many enhancements, with a major achievement of integrating the Octopus Clearing House System with the systems of a wide variety of organisations and merchants offering Octopus.

The Octopus card, manufactured by Sony, has a built-in IC chip and communicates with different fare processors through the use of an Octopus reader/writer.

The reader/writer is a device comprised of a controller board and an antenna. It uses inductive radio frequency to transmit power and data signals to the processors inside the contactless smart card. The maximum operating range of the reader/writer is between 30mm and 100mm, depending on the type of model being used. Data communications to and from the *Octopus* are only established when

mutually authenticated security handshaking is verified followed by transfer of encrypted data.





The Octopus reader/writer is connected to the service provider's point-of-sale (POS) terminal or controller, and receives commands from the POS or controller on the actions to be performed (such as payment deduction and cash add-value). The transaction data is either temporarily stored in the reader/writer or sent back to the POS or controller, depending on the device type. In any event, all transaction data is sent back to the Octopus Central Computer at the end of each day for clearing and settlement.

The Octopus Clearing House System uses a complex set of business rules to validate each transaction prior to authorising settlement amounts. A standard set of reports is then sent to each participating service provider on a daily basis, and the settlement amounts are deposited into their respective accounts on the following working day.

3 Consultancy services

As a full-service smart card issuer and operator, Octopus is in a unique position to export its experience, system and proven approach to make life easier for people in many countries around the world. Octopus consultancy services offer potential parties (transport operators, governments and enterprises overseas and in mainland China) a high level of practical experience and technology know-how, coupled with reliable, high-quality support in implementing a similar smart card system, from feasibility study to project completion and operation.

Since 2003, Octopus has successfully assisted The Netherlands and Dubai to develop and implement smart card systems. Octopus is also helping Auckland, New Zealand to build a multi-modal ticketing system for public transport.

4 Contributions to Hong Kong

4.1 Customers

- Convenient, reliable and secure payment method
- Flexible reloading methods
- A wide range of applications

- Discount and loyalty schemes
- Available in different forms and sizes to suit different lifestyles

4.2 Service providers

Operational Benefits

- Secure, efficient, flexible and reliable means of revenue collection
- Shorter transaction times
- Reduced preventive and corrective maintenance
- Peripheral internal uses such as staff ID and access control

Financial benefits

- Reduced cash handling cost
- Increased usage and revenue through enhanced system user-friendliness
- Improved revenue protection through greater security by minimising fraud, and possibility of blocking transactions after card loss
- Economies of scale achieved by the sharing of a common system infrastructure by all participating operators

Business benefits

- Provision of a platform accommodating complex fare collection strategies such as intermodal discounts and loyalty schemes
- Enhanced corporate image and customer service

4.3 Social contributions

- The system can be considered as a major step towards a cashless society
- Compared to coins, *Octopus* is more hygienic, convenient and fast
- The polyethylene terephthalate (PET) material used to fabricate the card is environment-friendly. The card is reloadable without the need for disposal

4.4 Corporate Social Responsibility Programmes

As a good corporate citizen, Octopus is committed to contributing to the community through a wide variety of corporate social responsibility programmes. These include:

- The 3-year "Octopus Rehabilitation Transportation Subsidy Scheme" launched in February 2014 to subsidise low-income wheelchair users in enjoying accessible point-to-point Accessible Hire Car (AHC) service provided by the Hong Kong Society for Rehabilitation. The Scheme targets to offer 43,132 accessible and convenient passenger trips to eligible users in the 3-year period.
- Close collaboration with public transportation operators to support the Government's "Public Transport Fare Concession Scheme for the Elderly and Eligible Persons with Disabilities", offering a fast and convenient Octopus payment platform for beneficiaries to enjoy the HK$2 concessionary fare.

- Through the "Octopus Kids' Nurturing Programme" and "Octopus Ethnic Minority Children's Nurturing and Inclusion Programme", Octopus offers needy local and ethnic minority as well as newly arrived children the opportunity to learn extra-curricular activities, participate in public performances and financial management training for their whole-person development and better integration into the community.
- Octopus launched the Electronic Flag-selling Programme to provide Hong Kong Council of Social Service with 110 free portable Octopus readers complete with comprehensive technical support and users training. The Programme aims to offer another convenient fund raising channel to charity organisations and enhance their flag selling efficiency as a whole.
- The Octopus Volunteer Team formed since 2007 now comprises over 170 of Octopus' staff who participate in various community volunteering services, contributing altogether over 11,000 service hours over the years.

5 Achievements – Hong Kong's Pride

Since its launch in 1997, the Octopus brand has gone from strength to strength, proving an unequivocal success.

- One of the world's highest acceptance commercial smart card systems – **over 99%** of Hong Kong people (aged 15-64) possess an Octopus*
- High circulation – **over 31 million cards and products actively in circulation** (Hong Kong population: over 7 million)
- One of the world's most used smart card system – **over 13 million transactions a day, valued at over HK$169 million**
- One of the world's widest scope of applications – **more than 17,000** retail outlets from **over 7,700 service providers** representing a wide range of sectors. New uses for *Octopus* are regularly added
- **22 financial institutions** provide the Octopus Automatic Add Value Service to customers
- **Over 73,000 Octopus readers deployed in the market**
- Attracted a considerable number of delegations from all over the world to visit and learn about the Octopus experience, facilitating industry development
- Coverage of Octopus has appeared in media all over the world

* Figure quoted from a research conducted in Nov-Dec 2015 by Acorn Marketing & Research Consultants (International) Limited on individuals aged between 15 and 64.

6 Recognition and awards

Year	Awards
1998-2006	▪ **1998 Hong Kong Awards for Services: Innovation** - *The Hong Kong Coalition of Service Industries* ▪ **Asian Innovation Awards 1998** - *Far Eastern Economic Review* ▪ **The 1st UITP Secretariat General Award for Innovation in Public Transport** - *The International Association of Public Transport (UITP) (1999)* ▪ **Most Ingenious Service Award 2000** - *Next Magazine* ▪ **Ranked 7th in The Election of 10 Engineering Wonders in Hong Kong (2000)** - *The Hong Kong Institution of Engineers and The Leisure and Cultural Services Department* ▪ **Ten Outstanding Issues of the Visually Impaired (the Braille on Add Value Machines)** - *Hong Kong Blind Union (2000)* ▪ **2003 Hong Kong Top Ten Brandnames Award** - *The Chinese Manufacturers' Association of Hong Kong* ▪ **Best Practice Awards 2003 in Simplicity** - *Best Practice Management (2003)* ▪ **Superbrands Hong Kong & Brand Leader Award - Business Equipment & Services** - *Superbrands (2003)* ▪ **Enterprise Award of DHL/SCMP Hong Kong Business Awards 2003** - *DHL/South China Morning Post* ▪ **Hong Kong Business Mastermind - Lifestyle Innovation Business Award** - *East Week (2004)* ▪ **Brand of Hong Kong's Pride Award of Next Brand Awards 2004** - *Next Magazine* ▪ **Best Electronic Payment Service of The 1st eLife Award** - *ESDlife (2005)* ▪ **People Site Certification** - *Asia Pacific Customer Service Consortium (2005)*

	▪ **Hong Kong's Proudest Local Brand Award of Next Brand Awards 2005** - *Next Magazine* ▪ **2005 Hong Kong Awards for Industries: Innovation and Creativity** - *Hong Kong General Chamber of Commerce* ▪ **My Favourite Local Brand of Next Brand Awards 2006** - *Next Magazine* ▪ **2006 Chairman's Award of the World Information Technology and Services Alliance (WITSA) Global IT Excellence Awards** - *World Information Technology and Services Alliance* ▪ **Prime Awards for Brand Excellence 2006** - *Prime Magazine Hong Kong*
2007-2010	▪ **Corporate Strategy Excellence Awards 2007** - *East Week Magazine* ▪ **Excellent Creative Services Award of Sing Tao Excellent Services Brand Awards 2007** - *Sing Tao Daily* ▪ **2008 Consumer's Most Favourable Hong Kong Brands - Gold Award** - *China Enterprise Reputation and Credibility Association (Overseas) Ltd* ▪ **Hong Kong Local Brand Category of Yahoo! Emotive Brand Awards 2007-2008** - *Yahoo! Hong Kong Limited* ▪ **Excellent Creative Services Award of Sing Tao Excellent Services Brand Awards 2008** - *Sing Tao Daily* ▪ **Outstanding Brand during the Economic Downturn of Yahoo! Emotive Brand Awards 2008 -2009** - *Yahoo! Hong Kong Limited* ▪ **The Best Creative Buy of Metro Creative Awards 2009** - *Metro Daily* ▪ **2009 Consumer's Most Favourable Hong Kong Brands – Gold Award** - *China Enterprise Reputation and Credibility Association (Overseas) Ltd* ▪ **2009 Silver Award for Volunteer Service** - *Social Welfare Department, HKSAR Government* ▪ **Caring Company 2007/2010** - *The Hong Kong Council of*

	Social Service ▪ **2010 Capital Outstanding Strategic Performance Award** *- Capital x Capital Weekly* ▪ **2010 Asia Pacific Market Penetration Leadership Award for Contactless Smart Cards Convergence** *- Frost & Sullivan* ▪ **The Best of Smart Living Award 2010** *- eZone of Hong Kong Economic Times Publishing Group* ▪ **2010 Bronze Award for Volunteer Service** *- Social Welfare Department, HKSAR Government*
2011-2014	▪ **The Best SME's Partner Award 2011** *- The Hong Kong General Chamber of Small and Medium Business* ▪ **2011 Silver Award for Volunteer Service** *- Social Welfare Department, HKSAR Government* ▪ **Caring Company 2011/2012** *- The Hong Kong Council of Social Service* ▪ **Prestigious Corporate Brand Awards 2012 – Judging Panel and Consumer Award (Service Industry) Electronic Payment and Credit Card Category** *- Ming Pao Daily News and Master of Science Programme in Marketing, Chinese University of Hong Kong* ▪ **Yahoo! Emotive Brand Awards 2011-12 (Emotive Design Category)** *- Yahoo! Hong Kong Limited* ▪ **Starlight Award for the Most Popular Hong Kong and Macau Brands 2012** *- China Media Network* ▪ **2012 Gold Award for Volunteer Service** *- Social Welfare Department, HKSAR Government* ▪ **Team Award for Customer Service Excellence** *- Hong Kong Association for Customer Excellence* ▪ **Certificate of Merit - Financial, Legal and Business Consulting Services sector of the 2012 Hong Kong Awards for Environmental Excellence** *- Environmental Campaign Committee* ▪ **ERB Manpower Developer Award Scheme 2013-2015** -

	Employees Retraining Board ▪ **Bronze Award of the Inbound Contact Centre of the Year- 2013 (Below 20 seats)** - *Hong Kong Call Centre Association* ▪ **Hong Kong's Top 10 Prestigious Brand Award 2013** - *Ming Pao Daily News and Master of Science Programme in Marketing, Chinese University of Hong Kong* ▪ **Hong Kong's 100 Most Influential Brands for 2013** - *World Brand Laboratory* ▪ **2013 Gold Award for Volunteer Service** - *Social Welfare Department, HKSAR Government* ▪ **Caring Company 2011/2014** - *The Hong Kong Council of Social Service* ▪ **Hong Kong Famous Brands Award 2013** - *Asia Brand Development Association* ▪ **Asia Smartphone Apps Contest 2013/2014 - "Creative Lifestyle" category Bronze Award** - *Hong Kong Wireless Technology Industry Association* ▪ **2013/14 Family-Friendly Employers** - Family Council ▪ **TVB Most Popular TV Commercial Awards 2014 – Finance & Real Estate** – TVB ▪ **HKGolden IT Award 2014 – "Best Mobile App"** – HKGolden ▪ **Bronze Award of the Inbound Contact Centre of the Year- 2014 (Below 20 seats)** - *Hong Kong Call Centre Association* ▪ **Hong Kong's Top 10 Prestigious Brand Award 2014** - *Ming Pao Daily News and Master of Science Programme in Marketing, Chinese University of Hong Kong* ▪ **2014 Hong Kong Awards for Industries: Innovation and Creativity** – *Hong Kong General Chamber of Commerce*
2015-2018	▪ **Hong Kong Famous Brands Award 2014 -** *Asia Brand Development Association*

	▪ **ERB Manpower Developer Award Scheme 2015-2017 -** *Employees Retraining Board* ▪ **Gold Award in the Web Accessibility Recognition Scheme 2015 -** *Office of the Government Chief Information Officer and the Equal Opportunities Commission* ▪ **2014/15 Good MPF Employer Award -** *Mandatory Provident Fund Schemes Authority* ▪ **Bronze Award of the Inbound Contact Centre of the Year - 2014 (Below 20 seats) -** *Hong Kong Call Centre Association* ▪ **Caring Company Logo 15/16 - 5 Years Plus Caring Company Logo -** *The Hong Kong Council of Social Service* ▪ **CAPITAL Corporate Social Responsibility Awards 2015 -** *Capital Magazine* ▪ **Green Office Awards Labelling Scheme 2015 -** *World Green Organisation* ▪ **Market Leadership Award 2015 – "Market Leadership in Payment Gateway" -** *Hong Kong Institute of Marketing* ▪ **Gold Award in the Web Accessibility Recognition Scheme 2016 -** *Office of the Government Chief Information Officer and the Equal Opportunities Commission* ▪ **Certificate of Merit - Servicing and Trading sector of the 2015 Hong Kong Awards for Environmental Excellence -** *Environmental Campaign Committee* ▪ **Hong Kong Famous Brands Award 2015 -** *Asia Brand Development Association* ▪ **Top Ten CAPITAL Leaders of Excellence 2015** - *Capital Magazine*

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