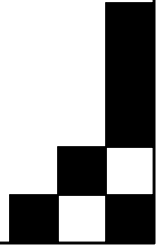


Octopus: The Growing E-payment System in Hong Kong

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Keywords: smart card, transportation, payment system, technology diffusion, Octopus, Hong Kong

A b s t r a c t

Although debit/cash cards based on smart card technology promised to bring forth the end of loose change, very few managed to gain critical mass or come close to totally eliminating coins including those supported by major credit card operators (e.g., Visa Cash and Mondex). In this paper, we discuss a specific system – Octopus – which not only gained momentum among the passenger transportation industry in Hong Kong, but also expanded into other payment channels such as fast food outlets and snack machines. We examine the factors why Octopus has been successful despite most micro-payment systems failing to gain critical mass let alone expand their customer base. Finally, we conclude that convenience factors, a specific set of societal factors and its management strategy to expand from a captive market towards a generic micro-payment system had been instrumental to the growth of this e-payment system.

A u t h o r s

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INTRODUCTION

Technology adoption and diffusion has been one of the most addressed research topics in Information Systems (IS) and Organization Sciences. Over the past two decades, new innovations and tools for improving productivity and efficiency through Information Technology (IT) have led to major transformation in organizational configurations. However, not all technological innovations received the same welcome. Sometimes, seemingly clever innovations did not grow beyond the prototype stage and technically superior innovations failed to compete successfully with their lesser competitors as in the case of VCR standards.

However, there are technologies, which may not be a perfect fit for current customers' needs, which are positioning for 'making the kill' in the future. Such technologies are created through a process called 'disruptive innovation' (Bower and Christensen 1995). Disruptive technologies are risky businesses in the sense that future customer needs and preferences can be difficult to predict accurately. Rogers (1983: 10) discusses the failure to diffuse the Dvorak keyboard, which was better designed, endorsed by the American National Standards Institute and promised to improve typists' efficiency only to find itself dominated by another standard designed to stop

people typing faster. Rogers suggests that it is the social system, the social and communication structure which gives stability and regularity to individual behaviour in a system that facilitates or impedes the diffusion of innovations in the system.

In this paper, we examine why the Octopus card, a fare-payment smart card for the Hong Kong passenger transportation system, has been so successful in gaining critical mass while other equally or better supported options such as those backed by the credit card operators did not perform equally well.

Using smart card technology to replace cash was not new to Hong Kong. Major credit card operators and financial institutions had been capitalizing on such business opportunities throughout the 1990s. Initiatives such as Mondex and Visa Cash (Westland 1998; Westland *et al.* 1997) had promised to revolutionize the future of e-payment systems. However, after a few years of trial and development, Mondex and Visa Cash had only attained limited success in terms of market share compared to the Octopus card. The Octopus card was not even technologically more secure – because it did not have the same level of security technology built into the card as its competitors' (*Hong Kong Economic Times* 2000). Neither did it have a gigantic client base compared with VISA and Mastercard although

one could argue that when the underground railway company – Mass Transit Railway Corporation Limited (MTRC) adopted the Octopus system, it had a regular and captive client base.

The history of Octopus started in June 1994 when Hong Kong's five major public transportation operators Mass Transit Railway Corp. (MTRC), Kowloon-Canton Railway Corp. (KCRC),¹ Kowloon Motor Bus Company (KMB), Citybus Ltd and the Hong Kong and Yaumatei Ferry systems (HKF) formed a joint venture company, Creative Star Limited, to develop an automated fare collection system based on contactless smart cards. The fare collection contract, valued at US\$ 55 million, was awarded to ERG Australia Limited and its subsidiary AES Prodata, which subsequently awarded the contactless card portion of the contract to Sony and Mitsubishi Corporation. These contactless reloadable smart cards, known as Octopus cards, were introduced to the general public in September 1997. An estimated 10 million passenger journeys are made each day on Hong Kong's wide variety of public transport services. The Creative Star Octopus System, when launched, was the largest integrated contactless smart card fare collection system in the world and accounted for HK\$20 million² in transactions (Industry Canada 1998).

All operators' computer networks are linked to the Creative Star Clearing House system, which apportions revenues to the operators and deposits funds into appropriate bank accounts. In mid-2000, there were 6.5 million cards in use and a further 2.6 million cards were to be issued. Card users have the capability of re-charging and using their cards for other purchases. Currently, cardholders can re-charge their card in any MTRC and KCRC station as well as any of the 368 7-11 convenience stores within Hong Kong (Leung 1999).

In 1998, Creative Star was also negotiating with Mondex and Visa Cash to incorporate an electronic purse function into its originally closed system. As of October 2000, the MTRC still owns a 67.8% stake of Creative Star Limited.

APPLICATION OF SMART CARDS IN PUBLIC TRANSPORT SYSTEMS

Application of stored value cards for fare-paying purposes in public transport systems was considered to be one of the 'killer applications' (Goldfinger 1998). The estimated number of cards was predicted to reach 200 million by 2000. Many countries have been deploying smart cards over the past five years, with Asian countries well represented. Apart from Hong Kong, the city of Shanghai in the People's Republic of China had also adopted a similar system for their underground railway system (Gemplus 2000). In Korea, a smart card based system has been operational since 1996 and there have been up to 800,000 transactions. It has since expanded to other modes of transportation (e.g., subway). Their contactless smart card (as Octopus is too) was also capable of acting as an electronic

wallet, personal identity card and a loyalty card (one that accumulates loyalty points for various loyalty programmes). In Singapore, the contactless card application in transportation is the Electronic Road Pricing (ERP) system. It was implemented in 1998 with an 'in-vehicle-unit' fitted in approximately 670,000 vehicles, making it the largest application in the world at the time (Gemplus 1999).

In France the Paris public transport system, RATP, trialled and implemented a smart card system called *Passe sans Contact* with more than 20 million transactions completed. The main reason for changing from a magnetic strip based system to the current contactless card system was the increased speed of transaction plus better passenger flow. However, the system also helped to decrease fraud. According to the project team at RATP, although the initial outlay of the new system might be more expensive than the current one, when fully operational the solution could cut costs in half and with savings close to 80 million euros (Goldfinger 1998).

London, another European city with a major transportation infrastructure, awarded a 17-year contract to build an integrated revenue collection system worth 1 billion GBP in 1998. When completed, the system, called *LT Prestige*, will be used in the bus system and underground railway stations. The first full roll-out is expected to happen in 2002. The system also aims to provide electronic wallet and other capabilities such as loyalty programmes.

In the US, there have been a number of initiatives in transportation and fare-collection. In Ventura County, California, the Ventura Transit Commission and Echelon Industries, Inc, utilized a proximity (contactless) card system for the eight transit operators in the county (Leung 1998). There are many other transportation systems in the US using a smart card fare payment system. Many of them (e.g., the TransLink system of San Francisco, the Los Angeles MetroCard, the Metropolitan Transit System of the greater San Diego area and the Chicago Transit Authority) were in the process of converting from a contact-based solution to a contactless one.

TYPICAL SUCCESS FACTORS OF SMART CARD ADOPTION IN PASSENGER TRANSPORTATION SYSTEMS

Although the smart card was potentially an ideal replacement for anything ranging from identity cards to micro-payments, not all applications had proven to be widely successful. There were at least five critical success factors that were thought to be important.

Network Goods Leverage

According to Goldfinger (1998), smart cards are predatory network goods which means the full benefit of smart cards cannot be realized if there is an alternative infrastructure (e.g., magnetic strip cards). It is estimated that a user base

of at least one million is needed before a smart card system becomes viable due to economies of scale in card production and the high fixed costs of application infrastructure such as readers and terminals. In addition, the economic value is an increasing function of its ubiquity, meaning that the more occasions, and the more convenient it is to use the system, the more valuable the system is to its stakeholders: users, merchants and system operators. The ability of the promoter to coordinate large-scale deployments of infrastructure and initiate migration from the existing non-smart card system to the smart card system is critical for success. Co-existence of the old and new system will inevitably disadvantage the chances of success of the latter due to its often-smaller critical mass and more complex infrastructure which leads to stronger user resistance. Complete migration in the shortest possible time was often a common success factor found in smart card system adoption.

Co-opetition Management

Since ubiquity and the size of user population, among others, are key success factors to a smart card system, it is therefore necessary to maximize both by extending a smart card's value proposition. Incorporating functionalities that a user prefers in a related manner, would create greater value (e.g., more convenient, less cards to handle, etc.) from the user's perspective. Consequently, it is important to foster strategic alliances and engage in co-opetition (or co-operative competition). Managing co-opetition can be tricky because sometimes the benefits from smart card deployments are not zero-sum games. For example, the costs of infrastructure borne and profits shared might not be always equally divided. Consequently, some members of the strategic alliance might feel uneasy about the final arrangement, particularly if there were threats that there would be a net loss of profit (e.g., outflow of users to other alliance members, lowered switching barriers, etc.). Such threats might lead to refusal of the migration or non-use of the system.

It is a System not a Product

If the various components of a smart card system are viewed separately as products, then often it is a more expensive system to implement than its existing non-smart card based counterpart. However, it is important to make sure the smart card and its infrastructure are being viewed as one single system. Such integration creates new functionalities that cannot be realized through its traditional counterpart (e.g., a new transportation smart card with an integrated loyalty system). As the strategic alliance grows and the functionalities increases, the critical mass will increase and consequently, the production costs per card decrease. For example, the production costs of a SIM card

for mobile phones are hardly mentioned or charged as a separated item to its users. Similarly, the production costs of a transportation contactless smart card are often higher than its magnetic strip counterpart, but the smart card system may eventually cost only one-third of the old system due to improved efficiency and lower maintenance costs. Often it is the total smart card application that generates lower transaction costs and/or more benefits.

Another observation is that additional functionalities are often vertically rather than horizontally generated (Goldfinger 1998). For example, to implement a loyalty programme in addition to the fare system in a transportation smart card system, it may be easier to do so within a particular member of the strategic alliance than across all members of the alliance. One reason for this is that a loyalty programme may have different impacts on different members of the alliance. Compared to a plain fare collection system, which only replaces the use of coins, a loyalty system involves converting usage into some kinds of reward. To standardize this conversion across all members of the alliance may be difficult due to the subjective views on whether a particular conversion is reasonable.

Standardization across Sectors

As with any infrastructure-based deployment, standardization is usually critical to its success. Examples such as railway systems, communication systems, roads and electricity systems, all illustrate that being able to carefully control the standardization process is the ultimate critical success factor and generates maximum user value. Typically, this is done via forming alliances with other players within the sector, as in many transportation smart card systems, coordinated by an authority who has direct control over all the players (e.g., the government).

Contactless Requirement

Whether a smart card is a contactless one can be critical to its success. All smart transport-ticketing systems share one crucial requirement – contactless (Goldfinger 1998). Contactless is important due to a number of reasons. First, user flow rate can be as high as one million or more per day (averaging 19 users per second). During peak hours, the flow rate can be two to three times more than this. In order to handle such flow rates it is important to ensure that the processing time per user is as short as possible. The critical delay for processing is often not the actual processing time but the human input process (in this case placing the card to the reader). Slot-based cards require the user to physically place the card into a slot and this is the major source of delay for such systems. Regardless of how much faster processing can be improved, the physical handling of the card will always be the bottleneck of the processing cycle. With contactless cards, the handling time can be

drastically reduced because there is no need to insert a card into a slot with precision.

OCTOPUS'S SUCCESS – A CONTEXTUAL ANALYSIS

Despite smart cards having the potential to bring in huge savings by improving operational efficiency and integrating the payment and clearing functionalities, few application systems can rival the scale of the Octopus system (*Hong Kong Economic Times* 2000). Other similar smart card systems that have been successfully deployed, have seen relatively limited growth (Goldfinger 1998). Apart from the public phone card in some countries, few other financial applications of this technology have yielded significant benefits or adoption rates. The Octopus system in Hong Kong, a particular example due to its application and context, has been a growing success. In the following sub-sections, we provide an analysis of what are the contextual factors that make it such a success even compared to other competitors that are backed by larger card operators.

Targeting a Sector that is Critical to the Working of Hong Kong

The passenger transportation sector in Hong Kong includes the MTRC, KCRC, the bus companies, the ferries and other auxiliary transit systems such as the 'green vans' – a public light vehicle transit system with designated routes. Due to the location of offices and the lack of choice of where to live, Hong Kong people often have to travel some distance from home to work, in some cases making multiple trips. High import tariffs coupled with exorbitant running costs make it difficult for the majority of Hong Kong people to own a private vehicle. Among the 7.5 million people, more than 70% would need to travel because of work or schooling.

Although the use of a stored-value card for daily transportation payments had been in place for over two decades in Hong Kong, the diffusion of such application beyond the Mass Transit Railway (MTRC) and the Kowloon-Canton Railway Corporation (KCRC) was a recent development. The early stored-value card used by the railway systems was only a magnetic-strip card and required insertion into a card reader slot at the turnstile. In all the other modes of public transport in Hong Kong (e.g., ferries, buses and mini-buses), payments were made by tendering the exact fare using coins into an on-board coin box. While payment by coins had been a well-accepted practice in Hong Kong, it had always been a chore because:

- One had to carry a large amount of coins and therefore it was a burden. A traveller could use up to 40 or 50 dollars of coins a day and he/she had to have the fares in exact lots of coins.

- Getting change from notes from nearby shops was an unwelcome practice because shop owners had to reserve a certain amount of coins for their customers. If they ran out of coins, they will have to queue up in banks to get change. Few liked to change coins because often they needed them for their own use.
- If one did not have sufficient change, one had to collect the fares from other travellers in the queue who would be boarding the same bus/ferry, etc., and make a collective payment. Being a high-speed society, often one just had to pay more if there was no exact change.
- Processing of coin payments (including counting the coins and depositing with the banks) could cost up to 4% of the fares collected.

Due to the specific way the Hong Kong passenger transport system was set up, people often need to take more than one mode of transport (e.g., the MTRC and the green vans) before they could reach their destinations (see Figure 1). In the past, while one might be able to use the old magnetic strip ticket with the MTRC and the KCRC, he/she would still have to prepare coins for the connecting services (e.g., the green vans). It was difficult to expand the old MTRC and KCRC system to the other modes of public transport because, of their bulky set up, which was more suitable for turnstile-based systems. To always remember to have sufficient coins in one's possession is not only a chore but also literally a burden – particularly to those who need to travel light.

By bringing together the operators of the different modes of public transport, the MTRC had cleverly orchestrated a consortium, which captured almost all passenger transits. This approach to co-opetition had proven to be a success because one only needs to use one card for all modes of transport. The doing away with the need to carry and obtain coins was a move welcomed by both the transit operators and users, therefore creating a win-win situation.

A Closed System with High Transaction Volume

One of the critical success factors for the Octopus system is having a captive market. The existence of alternatives often overcame technologically more advanced but less mature smart card systems. The Hong Kong passenger transportation system, like many transportation systems around the world, is a closed system. This means a passenger is confined to the payment options offered by the operators. Take the buses for example, before the Octopus system was deployed, the only payment option was to pay the exact fare through coins. Similar to other closed systems, when it came to payment, the bargaining power was with the operator not the user. The user could not force the operator to take credit card payments. In fact the user had to conform to the operator's choice of payment method.

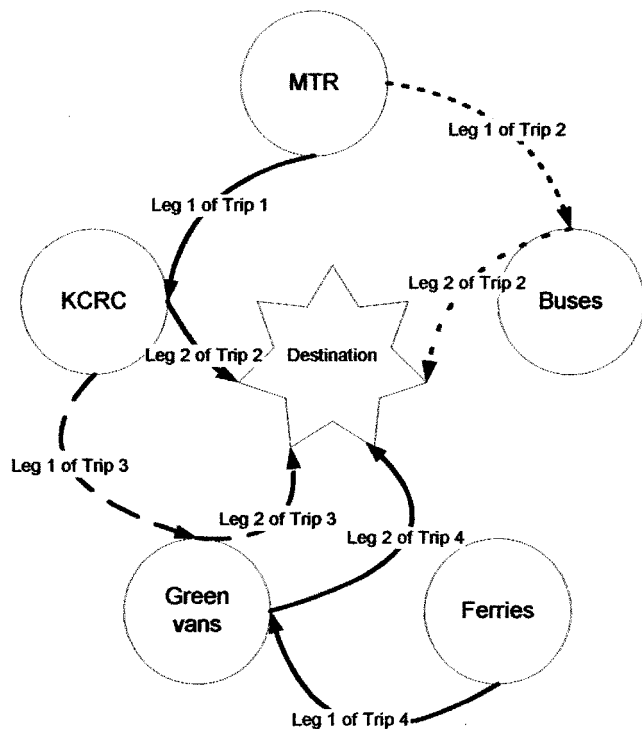


Figure 1. Some Examples of Trips Hong Kong People Make Using Public Transport

In addition to being a closed system, the Hong Kong passenger transportation system is a high transaction volume system. It was estimated that at least 10 million passenger journeys were made each day on Hong Kong's wide variety of public transport services and that by 1998 up to 3.8 million Octopus cards were issued (Chau 1997). Currently, the number of cards is estimated to be about 6.5 million (*Hong Kong Economic Times*, 2000).

A closed system and a high transaction volume have helped to bring down the processing costs per transaction and operators are confident that their investment in the infrastructure is likely to turn into profit in due course.

Short Conversion Period from Contact-based to Contactless Card

Another reason for Octopus's successful adoption was the short overlap time during cut-over from a contact-based system to a contactless system. It has been pointed out that if both the current and new systems were in existence, the chances were that the old system would jeopardize the adoption of the new one because of the existing infrastructure and habitual usage (Goldfinger 1998). In the case of Octopus, the deployment was a quick conversion of a few months with users having no option but to use the new system because of their need of transportation. Although the conversion created its own share of problems including technological and logistic ones, the consortium managed to

resolve this satisfactorily over time. For example, it was not expected that sometimes for convenience, one user might purchase two or more cards. It was estimated that up to 18% of the users carry two cards, which amounted to 650,000 extra cards. This led to a run on the cards and at one stage the original 3.5 million cards were sold out and it took between six and eight weeks to replenish the stock (Mailloux 1998).

The contactless card ultimately proved to be a success because of the coordinated deployment across the six key passenger transportation operators and Creative Star's ability to overcome the technical problems (Davis 1999). More importantly, users of the card no longer needed to search in their pockets, bags or whatever to look for the card and physically insert it into the reader slot. All that was needed was to glide the wallet (assuming that is where the card was held) over the reader in close proximity (about one centimetre above) to make payment. This was a very welcoming feature because it can be a time-consuming task (despite often only taking a few seconds) to look for a card in a wallet among all the other cards.

Also, the original magnetic strip stored-value card had familiarized the general public with a charge-card system that stored cash-equivalent values. This made the conversion only a change in card style not payment style.

Co-opetition among Octopus's Stakeholders

To realize the full benefit of a smart card system, it must achieve ubiquity or near ubiquity in terms of the availability of cards and usage. A set of compelling reasons to use the card beyond the 'nice to have' is also important. Octopus was first orchestrated by the MTRC, which subsequently became the first to implement the system. MTRC's ability to coordinate the other transport operators (stakeholders) to deploy the same system was critical to the future success of Octopus because it laid the foundation of standardization, which was usually the most difficult when deploying sector wide smart card solutions. Based on a simplistic and efficient clearing system, all the operators could see that nobody was being disadvantaged, even though often the re-charging of the cards was taking place either at an MTRC station or a KCRC one.

Although some of the operators were in fact in direct competition with each other, for example, the bus companies were opening new services and routes to cover territory of the MTRC and the KCRC; the fairness of the clearing system and the common savings gained through the smart card system outweighed any competition. Consequently, the Octopus system brought more benefits to all those involved. From an individual operator perspective, it was better to share the costs of infrastructure and processing than having to bear it all alone. The ability to build trust among the operators has been a critical success factor for the Octopus card.

OCTOPUS'S FUTURE – A STRATEGIC ANALYSIS

Octopus as an e-payment system is no longer confined to the passenger transportation section. Recently (*Hong Kong Economic Times* 2000) Creative Star was granted a licence by the Hong Kong Monetary Authority to operate as a Deposit Taking Company (DTC). This means Octopus can also serve as a transaction mechanism beyond the passenger transportation sector with up to 50% of its total revenue coming from other sources. In addition, it has already applied for and been granted the rights to conduct electronic payments for the 'fast-food' sector in Hong Kong. As a consequence, Octopus transaction systems can now be found in many fast-food outlets operated by the Maxims franchise. In fact, 368 of the 7-11 convenience chain stores are now equipped with Octopus card readers and they can perform the re-charging function. Some soft drink and snack vending machines are also equipped with the Octopus payment option.

Stepping Out from the Cocoon of being a Transportation E-payment System

Despite being a captive and high transaction volume market, the transportation sector lacked expandability. The annual increase in number of travellers and revenue was predictable and steady. The management of Creative Star, owner of the Octopus system, understood that the system's strength lay not just in fare-payment but high volume micro-payment fulfilment. At the same time, there was not a dominant player who was successful in providing a generic micro-payment mechanism. Although systems backed by major credit card players such as VISA (their Visa Cash system) and MasterCard (their Mondex system) were both aimed at addressing this level of e-payment (Westland 1998, Westland *et al.* 1997), neither seemed to be close to capturing the kind of market share the Octopus system had even though, during the trial adoption period, some Mondex cards were given away free of charge to selected customers.

After gaining critical mass through the captive passenger transportation market, they used their strategic position to launch into the fast-food sector (see Figure 2). According to a senior manager of Creative Star, the fast-food sector was chosen due to the low-cost items sold. Most fast-food shops offer low-cost dishes ranging from a few HK\$ to about HK\$30–40. Due to the low-cost and fast-moving nature, Octopus is ideal as an alternative payment channel. The focus on fast-food is a strategic move because of the East-meets-West culture in Hong Kong, the definition of fast-food can go beyond just McDonald's or the KFCs. It can also be many Chinese snack bars, which sell noodle bowls and desserts. Consequently, this might mean capturing a majority of the lower-end restaurants in Hong Kong.

In addition, there are plans to explore whether it is feasible to combine the mobile phone SIM card with an Octopus card to create a dual-function card. Since the mobile phone penetration rate in Hong Kong is almost 60%, it might be feasible for such a combined card to gain popularity.

The E-payment Trio in Hong Kong – Octopus, Mondex/Visa Cash and EPS

Apart from the Octopus card, the Mondex and Visa Cash cards are also targeting the same types of applications. A number of banks in Hong Kong together with the Government brought in a debit card system called Electronic Payment System (EPS) in the late 1980s. Consequently, the smart card payment market has a strong competition. All three types of payment card stemmed from different origins with Octopus being the only one that was not set up by a financial institution. However, starting off as a transportation card has proven to be a successful move but it is doubtful whether the same deployment would be as successful if it were in a country such as the US or Australia where personal means of transport are more popular. In Hong Kong, the Octopus card's popularity and user base have outstripped those of Mondex's, Visa Cash's and the EPS's. One possible reason is because of Octopus's ability to gain monopoly in its sector. Table 1 is a comparison of the three e-payment media in Hong Kong.

Further Develop the Auto Re-charge Capability

When analysing the lower usage groups of the Octopus system within the passenger communities, it is found that they often live in areas where there are no re-charging facilities. This means they are not living near an MTRC or KCRC station and have no 7-11 shop or Maxims fast-food store close-by. Although an Octopus card can be personalized and linked with a bank account so auto-recharge facilities can be activated, so far only one bank has formed alliance to provide this service. With this service activated, the cardholder can re-charge his/her card once the balance drops to or below zero. So far not all card readers have been activated to perform the auto-recharge function and those that have require the user to have an account established with this specific bank, which is one of the smallest in Hong Kong.

One of the common complaints has been if there is not enough funding on the Octopus card during use, one will have to go back to a re-charge station (either a re-charge kiosk or a customer service counter in a train station) to have the card re-charged. This can be a very inconvenient and time-consuming process when one is in a hurry to travel. It would be worse were one to have insufficient

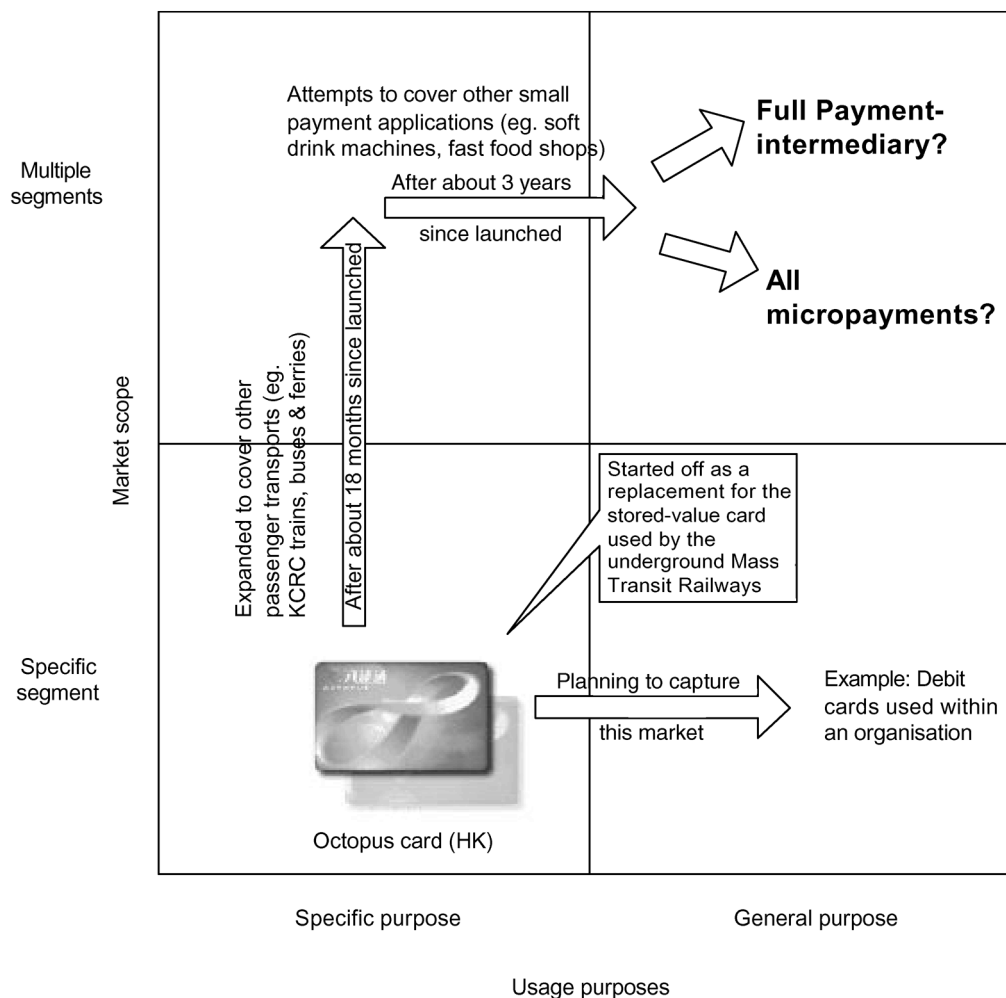


Figure 2. An Overview of the Octopus Strategy

Table 1. Comparison of the Octopus, Mondex and Visa Cash and EPS Systems

	<i>Octopus Card</i>	<i>Mondex and Visa Cash</i>	<i>EPS</i>
Originated from	Backed by MTRC and other passenger transport operators.	Backed by Mastercard and VISA.	Backed by a network of banks in Hong Kong.
Type of card	Smart, contactless.	Smart, contact-based.	Magnetic strip.
Customer base	Most passengers who use the HK transport system. Est'd. 6.5 million cards now.	Customers of Mastercard and VISA but only a selected group of customers have this facility.	In principle anyone who holds an auto-teller card with a participating bank.
Processing time per transaction	0.3 sec	3-5 secs	>5 secs
Applications	Payment of fares, payment in fast-food outlets and soft-drink machines.	Various – retail shops, minibus fares, parking meters.	Used in many point-of-sales terminals in retail shops.
Future developments	Wrist-watch transaction devices, reader attached to PCs or PDAs, card key for identification purposes.	E-wallets, Java-based cards, platform independent transaction systems.	Not mentioned.

cash to pay for the re-charge and have to look for a teller-machine to draw cash for payment.

Therefore, to further expand Octopus's micro-payment dominance, it is important to form alliances with banks and credit card operators to have the cardholder's account linked with the Octopus system and allow auto re-charge to be done more ubiquitously.

Competing with Other Internet Payment Systems

Like many other smart cards and e-cash systems, one of the potential markets is online payment. Currently most online payments are carried out using credit cards and very few prominent micro-payment operators (e.g., www.ecashtechologies.com). Octopus is currently positioning itself to take advantage of the lack of key players in this market particularly in Hong Kong and the Greater Hong Kong Region.³ One approach would be to have a personal Octopus card reader attached to a network-enabled device such as an Internet PC or PDA. Users can pay for online shopping and entertainment by simply scanning their cards using the personal card reader. The payment information will be sent to the Octopus clearing-house system while the payment status goes to the online merchant. This way the merchant will know that the customer has paid for the goods.

However, there are a number of strategic issues to be resolved. First, the reason why micro-payments are not feasible at the moment is because of the high commissions charged by credit card operators. Such fees are only artificial barriers and there is no reason why such fees cannot be reduced. If credit cards operators were willing to lower the fees for micro-payments, then it would erode the competitive advantage of the Octopus system. Furthermore, the Octopus system lacks an international infrastructure as compared to VISA and Mastercard so it may be difficult to act as a payment-intermediary when it involves international merchants and customers.

Octopus Identity Card

As more than 70% of the population are holders of an Octopus card, Creative Star is also positioning itself to capture market segments beyond the payment and financial industries. One such application is to use the Octopus card as an identity card. The carrying of the Hong Kong identity card by its citizens at all time while on the street is required by the Hong Kong Government. By 2003/4, the Hong Kong Government will have another upgrade of Hong Kong identity cards. The main purpose of such an upgrade is to make sure old identity cards are discarded and the new cards have better security. This also helps to curb identity card forgeries. In fact a primitive approach of using the Octopus card as a security card key has already been on trial

with a newly developed housing estate in Hong Kong. There are new issues to be resolved and both the legislation and technology need to be amended before this development becomes feasible. For example, a person no longer can simultaneously hold two Octopus cards for convenience reasons.

Becoming a Full Payment Intermediary

As pointed out by the marketing director of Creative Star, the most valuable part of the Octopus system is its transaction processing system and the clearing-house system. Although currently Octopus is essentially a fare-payment system of the major passenger transport operators, the core competence of handling multiple merchants with high transaction volumes and short processing time can be applied elsewhere. One possibility is that the Octopus system is to be deployed as a high-speed transaction processing and clearing house system for companies that require services such as banks, other transportation operators and ticketing operators (e.g., the Hong Kong Jockey Club). With the ability to process a high volume of interactive transactions in real-time, its applications can be extremely widespread. A potential migration strategy is illustrated in Figure 3. If adopted, Octopus may no longer serve only as a debit card but also a key card for identifying transactions.

CONCLUSIONS

The Hong Kong Octopus system had been a rare success story of smart card systems which grew from being a replacement of a magnetic strip stored-value card to an e-payment Deposit Taking Company (essentially an authorized transaction agency). Its success was a mixture of clever management strategy and a specific context of usage. Given a huge and captive customer base (at least 70% of the population), together with the need to use the transportation system daily, the Octopus card had no competitors within this sector. The consortium formed by the MTRC and other transportation operators had fended off competitors and provided a closed environment for the card to gain critical mass. This had made the Octopus card a success even compared to smart cards backed by international credit card operators such as Mondex and Visa Cash in terms of customer base and transaction volume within Hong Kong.

As the original customer base is reaching saturation, management of Creative Star, owner of the Octopus system has to determine the next phase of market development. So far it has obtained deposit-taking company status and has gained approval to target the 'fast-food' sector for their payment services. Given that the definition of 'fast-food' can simply mean cuisine that is prepared and consumed in a short time, potentially this can open up a

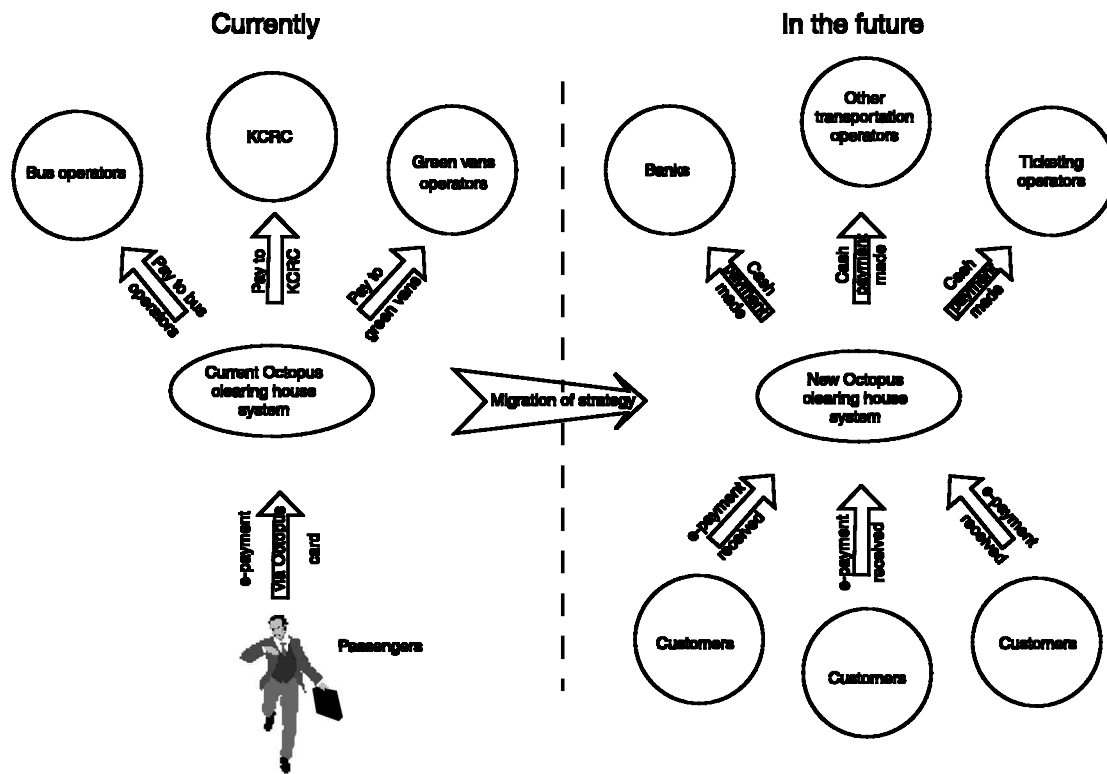


Figure 3. Potential Migration Strategy from Being a Fare-payment System to a Payment Intermediary

whole segment of the Asian restaurant market in Hong Kong.

The smart card technology also enables Octopus to become an identity card or loyalty card. Both possibilities have been trialled to examine their feasibility. Given the high penetration rate and strong reliance of the Octopus card, its cardholders are likely to be receptive to the additional roles play by the card when adopted.

Finally, the core competences of the Octopus system are its abilities to carry out high volume, real-time transaction and its efficient clearing-house system. Octopus can go beyond being just a debit card to be a transaction processing system for those who do not want to invest into building such a complex infrastructure. With all these options available, it is the management's task to maximize the future competitive advantage of Octopus by selectively adopting one or more strategies.

Notes

1. KCRC is an electric railway system that connects the Kowloon peninsula to the New Territories.
2. US\$1 is approximately equal to HK\$7.8.
3. The Greater Hong Kong Region also called the Pearl River Delta Region which includes the Shen Zhen Special Administrative Region and other surrounding towns and cities in the Guang Dong Province in Southern China.

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