A Stakeholder Perspective on Successful Electronic Payment Systems Diffusion

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Abstract

Many proposals for electronic payment systems (EPS) have been made but the great majority have failed to achieve widespread adoption. The reasons why some proposals succeed and others fail remains unclear. The successful operation of these systems depends on the cooperation of a number of stakeholders including consumers, merchants, financial institutions and infrastructure providers. In this paper we analyse the conditions for success in terms of the benefits and costs of the system to these stakeholders. On the basis of theoretical arguments, we present two hypotheses about the necessary (but not sufficient) conditions for successful diffusion of an EPS: the distribution of costs benefits and risks among stakeholders must be mutual; and a critical mass of customers and merchants must be provided for the EPS by the financial or technology infrastructure partners. We illustrate the arguments with three case studies of recent attempts to create new electronic payments systems.

1. Introduction

Electronic payment systems (EPS) have attracted much attention of practitioners and researchers due to their importance for the completion of consumer-oriented electronic commerce transactions. This has led to a rapid growth in the development of various electronic payment systems. Early research on electronic payment systems mainly focused on the technological aspects of the system, particularly those that are related to the functionality and implementation issues [5,9]. More recently, the focus of study in this area has shifted to the managerial/business aspects of electronic payment systems, as many electronic payment systems failed to be diffused within the community. These more recent studies explore such issues as reasons for use and non-use of the system, the process of adoption by the users, as well as strengths and weaknesses of the system based on various dimensions, including transaction costs, risks, size of payments, and actual payment time [6,12,16]. Thus, these studies take into account the consumer's point of view.

Few studies have considered EPS adoption from the perspective of all relevant stakeholders [2-4]. The Stakeholders are any parties that have a vested interest in the success of the system and are affected by the system and, therefore, play a critical role in ensuring the success of the system. Typically, an electronic payment system is not provided by one organization only, but by various parties (stakeholders) that are systematically arranged in a planned manner by some pre-determined rules. Customers and merchants are also considered stakeholders since they are affected by the payment system. Stakeholders have different roles, interests and hidden agendas which all affect the success of the electronic payment systems. Thus, by studying electronic payment systems from the stakeholder perspective, a better understanding of the diffusion process of the systems can be obtained [2-4,16].

In this paper, we argue that for the success of electronic payment systems, it is necessary for all stakeholders to experience mutuality of costs and benefits of the system. This means that for *each* stakeholder, the costs incurred from using the system should be justified by the benefits obtained by *that* stakeholder. Without stakeholder mutuality, it is unlikely that an electronic payment system will be

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widely adopted. In addition we acknowledge that success is also heavily dependent on the ability to reach a critical mass of system users and merchants. Only when there are enough users in the system can positive network effects be realized. We will argue that EPS, which have two separate stakeholder groups (customers and merchants) that need to achieve critical mass for success, face a difficult problem here, and that access to customers and merchants through existing operations of the financial and infrastructure providers or their allies is an important path to critical mass. Thus, we claim that both stakeholder mutuality and access to a ready made critical mass of users are two necessary conditions for success of electronic payment systems. Although other authors have analyzed multi-stakeholder electronic payments systems, especially Electronic Bill Presentment and Payment (EBPP), in terms of the effect of network effects on first mover advantage [2] and the sudden convergence of firms evaluation of benefits and costs of the technology [4], the specific issues of stake-holder mutuality and the use of installed base for critical mass considered here do not appear to have been discussed previously.

For the purpose of supporting our arguments, we surveyed and explored three electronic payment systems, including OK Cashbag (a Korean network-based payment system), mobile credit card payment (Korean case) and a recent Australian electronic payment system. Korea was chosen for the first two cases because it is among the leaders in developing innovative electronic payments systems and interesting cases of both success and failure are available. The additional Australian case is important to our argument as the EPS failed before reaching critical mass. Such failures are infrequently reported in the literature but this example was available because of the close contact of the authors with the system proprietor. This paper provides a better understanding of conditions for successful diffusion of multi-stakeholder information systems generally and will be valuable in designing appropriate alliance and launch strategies for new payments systems.

The outline of this paper is as follows. First, we discuss our theoretical arguments regarding the two necessary conditions for success of electronic payment systems. Then we present three cases of recent e-payment systems and analyze the cases in terms of their support for the propositions. Finally, we discuss some implications of the study and draw conclusions.

2. Stakeholder aspects of adoption of EPS

In this section we develop two propositions concerning EPS adoption that relate specifically to the characteristics of stakeholders involved in system operation and adoption. We recognise that there are other characteristics of EPS that affect their likelihood of adoption/non-adoption other than stakeholder issues, such as proliferation of incompatible standards. Consequently, the two propositions are expressed as necessary but not sufficient condition for system adoption as these other factors might intervene. To be more precise EPS systems may fail for reasons other than the ones we have identified; they may also succeed because additional encouraging factors are present as well as the ones we identify. Neither of these cases would undermine our argument. Only successful EPS adoptions that occur in the absence of one or both of our factors can do that and we know of no case. Even the expression “necessary” needs some caveats: we mean that when the stated condition is present, the chances of successful adoption are greatly enhanced rather than a strict binary logic interpretation.

2.1. Stakeholder mutuality

The stakeholders involved in electronic payment system adoption have a particular characteristic that they are capable of acting independently of each other and their actions are not regulated by any overarching centralised governance structure. We can call such system stakeholders *independent*. We assume that they are also rational so that they seek perceived benefits that exceed perceived costs and risks.

Two of us [11] observed previously, in the context of interorganizational information system adoption, that when such independent rational actors are expected to change their behaviour upon adoption of a proposed system, there must exist mutuality of benefits, costs, and risks among the stakeholders. Otherwise one or more stakeholders might veto the adoption. Mutuality of stakeholder benefits means that individually the benefits must exceed the costs and risks for each stakeholder. (Assuming risk-aversion of stakeholders, risks may be viewed as costs for simplicity.) The stakeholders in this previous work were independent echelons in a supply chain (retailer, distributor and manufacturer) who were implementing an electronic commerce enabled goods replenishment system called Cross-Docking. The system required certain investments (costs) by each party, exposed each party to new operational risks, and promised certain benefits to each party. We observed in the case study that the benefits to the manufacturer given its share of cost and new risk were not sufficient to justify its participation. While

the manufacturer appreciated the supply-chain wide benefit-over-cost of the initiative (the systemic benefit), its lack of individual benefit-over-cost (local benefit) hampered adoption of the system and diffusion of the idea in the industry in general. In order to achieve a mutual benefit-over-cost for all parties, product prices would have to be renegotiated, and given that the governance mechanism was the market, this would be difficult to achieve.

Compare this situation with the one that arises in a single organisation when a system implementation involves cooperation of stakeholders in separate departments or functional areas. Because the governance structure in this case is generally hierarchical, a system that costs certain stakeholders more than it benefits them may still be still implementable. This is reflected in the common recognition that certain functions in an organisation can be "cost centres" and others "profit centres". What counts in this case is that the overall benefit to the organisation exceeds the overall cost. Although certain stakeholders may engage in covert resistance to the system if they perceive low individual benefit-over-cost, they cannot directly veto the implementation the way independent stakeholders can.

This discussion leads us to our first proposition about electronic payment systems adoption:

P1: When the stakeholders in an EPS are independent rational actors, mutuality of benefits, costs and risks among the stakeholders is a necessary condition for system diffusion.

A good example of this principle at work is the success of Secure Sockets Layer (SSL) protocol versus the failure of Secure Electronic Transactions (SET) protocol for transmitting credit card information over the Internet between consumer and merchant and subsequently into the banking system [13]. SET was in many ways the perfect data encryption solution: it authenticated all parties, allowed confidential data exchange, checked message integrity, and passed information between parties on a need-to-know basis. SSL in its usually implemented form (where the consumer is not required to have a public key certificate) is less perfect since, although a confidential data exchange is still achieved, the consumer is not authenticated. The consequence of this difference is that SSL credit card transactions are classified by the credit company as "cardholder-not-present payments" (like telephone payments) since they are not electronically signed by the customer, and the merchant is thus liable in the case of credit card fraud rather than the credit card company.

The consequences of this system design difference can be analysed in terms of stakeholder mutuality. Consumers are mainly interested in security of the data exchange and authenticity of the merchant with whom they are transacting. A card holder does not care who pays in the case of fraudulent use of their card since there is a limit to their own liability guaranteed by the credit card company. Furthermore, casual buyers such as e-shop consumers are unwilling to engage in time consuming set-up to complete a single transaction; this is seen as a cost by them. Internet-based merchants have a strong benefit from wide acceptance of a secure payment system because most business-to-consumer transactions are predicated on payment for completion as the customers do not have credit with the merchant. For them, the cost of obtaining a public key certificate is amortised over the many transactions they intend to carry out. The risk of loss of payment in the case of fraud is probably an acceptable business risk. For the credit card company activating a new channel of credit card use is the benefit and they have always off-loaded the risk of cardholder-not-present transactions to the merchant anyway. One can work through the relative benefits, costs and risks for the two systems compared to an unsecured credit card payment. But it is clear that the difference between the two is that in SSL the merchant who has plenty to gain takes the risk of fraud which results in reduced cost to the consumer who has a small benefit only, while SET shifts an extra cost (of obtaining a public key certificate) to the consumer to remove the risk to the merchant. SSL has stakeholder mutuality: SET does not.

It is not surprising then that credit card payment over SSL has been one of the great EPS successes, while SET has been abandoned by its developers (all reference to SET has now been dropped from MasterCard's website). With SSL each party individually has benefits which exceed their costs. We cannot argue that this stakeholder mutuality is the reason for the success of SSL but we can argue that the disregard of stakeholder mutuality (in pursuit of a technically perfect system) probably doomed SET to failure

2.2. Stakeholder critical mass issues

Having considered the distribution of benefits, costs and risks among stakeholders in the previous section, this section considers the impact of network effects on the benefits to certain stake holders. In this section we need to recognise the difference between stakeholders that are users of EPS and stakeholders who are providers of infrastructure for its use. The

difference is that the required relationship between the latter for successful system operation can be obtained by means of an explicit formal alliance, whereas participation of the former must be encouraged by market forces.

It is widely recognised that obtaining a critical mass of system users is an important step in diffusion of systems with positive network effects [1,8,14]. If the perceived benefit of a system is low when there are few users, growth in adoption of the system will initially be low. After a certain level of adoption (a critical mass) is achieved, benefits of use increase at a rapid rate and system use accelerates exponentially until saturation is achieved. The simplest case is when there is one kind of system user (as for example with telephone systems) and utility is directly obtained from connection between similar users. In this case each new user increases every user's utility, and the rate of growth of use increases strongly with the total system use. When there are two kinds of users and utility arises only if one kind connects to the other (as for example for customers and merchants transacting via EPS or electronic catalogue hubs), the situation is more complicated: a new adopter of one type increases only the utility of the system for the other type [10]. We can expect the rate of growth of use to increase less strongly with total use in this case.

In either case system proposers would like to obtain a critical mass of users quickly. Because of the low growth of use of such system before the critical mass is obtained, from a stakeholder perspective it would be highly desirable that a critical mass of user stakeholders is provided by one or more of the infrastructure stakeholders when they form the explicit business alliance that creates the system. In the case of EPS, where there are two kinds of users required, this matter is even more pressing due to the impaired growth dynamic in the two-user case. In addition a critical mass of two kinds of users must be obtained at more or less the same time.

This leads to the second proposition:

P2: A necessary condition for success of EPS is that the infrastructure stakeholders between them provide a critical mass of each kind of user stakeholders.

Note that P2 implies that the only successful EPS are those in which infrastructure providers have access to a large number of potential users through prior system implementation or through alliances. Again this is a prerequisite for success, not a guarantee. In both the SSL and SET example above, one infrastructure provider was the credit card companies who had access to a critical mass of both merchants and consumers through their previous voucher-based operations, but only one system succeeded. In the other recent EPS success story, that of Paypal, the alliance with eBay gave an initially small company access to a critical mass of buyers and sellers. There are also many historical EPS systems that have failed because their success depended on existing banks providing a critical mass of customers and merchants and this was not forthcoming (in some cases for mutuality reasons) [15]. Digicash, and Cybercash are notable examples.

3. Three Cases of E-Payment Systems

The following three cases are compiled from various sources. The OK Cashbag case is largely based on private correspondence between one of us (SO) and the strategy department of the SK Corporation of Korea. The Mobile Phone Credit Card case is based on information from the archive of newspaper articles at the KINDS database of Korea. The OzPay case is compiled from personal communication between one of us (BL) and the proprietor of the electronic payment company.

3.1. Case 1: OK Cashbag

SK is one of the largest conglomerates in Korea and it has large merchant firms in various industries dealing directly with individual consumers. OK Cashbag (OKC hereafter) started as a customer loyalty program of SK related firms by SK Corporation and after a critical mass of members was reached, it was transformed into a payment service. SK Telecom (a mobile carrier) and SK Enclean (a gas station operator) are two major firms which interact with general consumers on a daily basis. The payment service is the extension of SK's loyalty program. OKC points, accumulated by purchasing at member shops online and offline, can be used for full payment in numerous online shops. In offline shops, only partial payment up to some proportion (this could mean offering discounts to the consumers) can be made according to contracts between the member shops and SK Corporation. OKC is widely used across a variety of industries, including consumer electronics, discount stores, confectionaries, department stores, home shopping, online shopping malls, newspaper, cinemas, hotels, duty free stores, online portals, family restaurants, telecom and gas stations.

OK Cashbag payment falls under the category of network-based payment systems in which money value is stored in the servers of SK Corporation. When a customer wants to pay using OKC at the member shops, he or she has to access the servers of

SK Corporation. Therefore, the systems of SK Corporation and the member shops should be tightly integrated to fulfill these payment needs. In general, easy-to-use application program interfaces (online) and terminals (offline) are provided by SK Corporation.

OKC works in two ways: point collection or point use. The point collection system works when a customer buys a product or service at a member shop. Then SK Corporation awards the customer OKC points according to the previous contracts with the member shop. The member shop then pays the SK Corporation for the points given to the customer and service charge. The point use systems works when a customer pays with OKC points for a purchased product or service at a member shop. Then SK Corporation subtracts the OKC points used from the customer's account, pays to the member shop for the used points and charges a fee to the member shop.

To use OKC payment services, customers have to subscribe to SK Telecom or SK Enclean, or get affiliated credit/membership cards. As of December 2003, the number of OKC subscribers to SK Telecom, SK Enclean, and other affiliated credit/membership cards reached over 11 million each and a total of about 36 million. The number of people who have at least one membership card has reached over 23 million. There are over 500 member firms with thousands of customer contact points where customers can use OKC points through their memberships. Customers can accumulate points by using SK mobile phones, filling up at SK gas stations, purchasing products/services at the member shops, collecting coupons from purchased products, or just using the affiliated credit cards.

The extension from a reward system to the payment service has required SK Corporation to find other methods of OKC point accumulation such as EFT and prepaid cards. The number of points which can be collected at one transaction is currently too small for payment of a purchase. Thus, customers can now buy OKC points by EFT and they also can buy prepaid cards of OKC points (say, $100 worth), which can be later used when paying for products/services with OKC points.

OKC is widely used across a variety of customer groups. They are normally distributed with the average age of about 40. Because OKC point program started as a reward program of SK Telecom and SK Enclean, both of which were closely related with everyday life, SK Corporation was able to obtain a large customer base in a short period of time. Between 1999 and 2003, the number of users had grown up from 8.3 million to 23 million users.

The SK Corporation retains a large base of consumer information. In the first instance, it takes in customers from two large firms, SK Telecom and SK Enclean. The former is the largest mobile carrier with about 50% of the market share of over 20 million subscribers while the latter has hundreds of gas stations across the country. Many firms have joined the OKC program because of the wide applicability of the customer information and the loyalty program itself. Many of them became member companies because they found that OKC could make existing customers more loyal and attract new customers to them. OKC membership holders can accumulate and use their points at any shops of the member companies. Between 1999 and 2003, the number of member shops had increased from 17,000 to 41,000. Due to the growth of the number of subscribers and member shops, OKC point use of $14.6 million in 2000, had grown up to $80 million.

3.2. Case 2: Mobile phone credit card

Credit cards issued by credit card firms and banks are the most widely used method of payments both online and offline, and are tightly integrated into the buying process [15]. In Korea, mobile phones installed with credit card function were introduced as a mobile payment method, for which the payment process is almost the same as that of plastic cards except that mobile phones and devices called 'dongles' to read credit card information from mobile phones replace plastic credit cards and credit authorization terminals (CAT), respectively.

Mobile phone credit cards brought new stakeholders such as mobile carriers and mobile phone makers into existing credit card payment systems. Mobile carriers thought that they could gain and hold more customers by providing a new service from advanced technology for customers. This service was expected to give the carriers a long-awaited opportunity to enter the financial sector. Facing the saturated voice communication market, the mobile phone credit card is one of the convergence services which mobile carriers have been eager to offer to widen their business domain. Mobile carriers can thus be regarded as the main beneficiary of the mobile phone payment systems.

Credit card firms also showed interests in experimenting with the mobile phone credit card systems because they found it necessary to follow up and respond to the technological changes which might dramatically change their businesses. Mobile phone makers could benefit from the sales of purpose-built phones if a number of customers adopt the services. Mobile phone credit cards can provide

conveniences to credit card holders by allowing them to carry their mobile phones only.

For the mobile phone credit card systems to work, arrangements need be made between the stakeholders about who will invest in the necessary infrastructure. The fundamental infrastructure in need of investment in this case is the dongles, which are mobile phone credit card readers. As none of stakeholders except mobile carriers could expect much gain from the investment, mobile carriers had to deal with all the investment required.

Traditional credit card readers are usually installed by VAN (Value Added Network) companies which intermediate between credit card companies, member shops and credit card holders. VANs facilitate the use of credit cards by securing and maintaining a number of member shops. Their revenue is based on the number of transactions they intermediate. They would not expect that the number of transactions would increase even if they install dongles at member shops where CAT are already available. Thus, installing dongles was unlikely to result in acquiring more member shops. For the VAN companies, it was simply a duplicate investment.

Therefore, mobile carriers installed dongles themselves. SK Telecom and KTF, two major mobile carriers in Korea, competed in this area, and they installed dongles of their own specification to the member shops of credit card companies. Three different types of incompatible credit card readers – for plastic, SK Telecom phones, and KTF phones – could be placed at one store. The installation of dongles depended on the financial capabilities of SK Telecom and KTF. No matter how capable they were, it was not, at least financially, easy for them to equip all the credit card member shops with their dongles. Although the number of member shops with dongles increased, it was still limited to big stores. The incompatibility of dongles further contributed to the lagging diffusion of mobile phone credit cards. Although mobile phone credit cards were issued to some mobile phone subscribers and mobile carriers have tried to reach more customers, customers find few places where they can use their phone credit cards. Thus, despite the large number of mobile phone users and credit card holders in Korea, mobile credit card payment has not been widely used.

3.3. Case 3: Australian electronic payment system (OZPay)

Launched in 2002, OZPay (alias) was an electronic payment system developed by an Australian software development firm. According to its owner, OZPay began initially as a system for the collection of payments. The idea of a single, integrated account-based system was based on the premise that credit card payments over the Internet were seen as inefficient. The project covered a four-year period, spanning from 2001 through to 2005 and cost approximately $2 million. The electronic payment system was released to the public in 2002 through the company's website.

OZPay allowed businesses and individual customers alike the ability to engage in electronic transactions within a secure environment. It provided member companies (merchants) with an electronic commerce solution, which enabled them to invoice and accept payments from their customers. It was aimed at catering especially to small-to-medium merchant enterprises that were involved in electronic commerce but did not have capabilities to run their own payment facilities. Member companies could link the OZPay service to their website as well as utilize the system for online product catalogues.

For individual customers, OZPay enabled them to transfer money to other people over a secure and convenient system. They could also pay bills through the OZPay system as well as make payments to organizations over the Internet. To use the OZPay system, a customer was required to open an OZPay account, and then link it to his/her existing Australian bank account. OZPay accounts were offered for free and there were no subscription fees.

An incentive for users to establish an account with OZPay was the interest paid on money that was stored within the system, which was comparable with the interest offered by banks. Furthermore, as all users have a single account in the system, money could be transferred quickly and efficiently between individual customers and companies. It also meant that minimal transaction costs would be incurred. OZPay also kept complete transaction records for its customers allowing both account keeping and records management.

OzPay's primary source of revenue was the transactions fees which were charged to both buyer and seller. OZPay did not charge a sign up or subscription fee but rather charged for each transaction. Buyers were billed each time they sent money to another user or paid their bills via the OzPay system. Sellers were charged each time they received a payment made to them by a customer as well as when they transferred money to another organization.

While OZPay accounts were essentially anonymous as they did not require authentication, the system employed a number of security procedures to protect its users. Firstly, the system required users to link their accounts to an authenticated bank account.

This meant that money could only move through authenticated bank accounts, thereby reducing attempts to launder money through the system. OZPay also created special accounts named "phish traps" which existed solely to apprehend users' attempt to defraud businesses or other users.

While OZPay was able to get a few small companies to use its system for billing customers, it encountered difficulties in obtaining a major partner. Major banking organizations did not see any incentive to enter into an alliance with OZPay as it competed with an EPS called BPay which they jointly owned. The only relationship between OzPay and the banks was use of the banks automated clearing service on a pay for service basis. Thus, partnering with a big organization was seen as a major step in achieving a critical mass of users both as individual customers and merchants. In its final year of existence OZPay approached a giant Australian web portal and attempted to negotiate a deal for the portal to use the OZPay system. However, OZPay was not considered as a driver for increase of the portal's sales. After failing in its effort to obtain a critical mass through alliances with big companies with an installed customer base, OZPay ceased its transaction activity in 2005.

4. Case Analysis

4.1. Case 1: OK Cashbag

4.1.1. Stakeholder mutuality

There are four stakeholder groups of the OKC system, namely, member firms, SK Corporation, the network provider and customers.

From the beginning of the program, the merchants dealt with identifying and understanding their customers by retaining and analyzing accurate information on customers' demographics, preferences and needs. The member firms were interested in increasing sales. They gained benefit from the customer information SK Corporation maintains. They could also take advantage of the large customer base of the SK Corporation, which they could not have if they did not participate in OKC. They were satisfied with the customer information OKC provided and the growing number of customers, which seemed to outweigh the costs they bore.

SK Corporation maintains customer information collected by the member merchants and provides the platform for the payment system. It obtains benefits through access to customer information as well as revenue generated from the service charges. With a large installed customer base, these benefits outweigh the costs required for maintaining customer information and the payment system. Lastly, customers are interested in cost-savings they can obtain from the OKC through the collection of points as well as the convenience of using the system, since the member firms are available almost everywhere in various industries. In addition, low setup effort is required of customers since OKC evolved from the loyalty program of the SK conglomerates.

Thus, with the OKC case, mutual costs and benefits are perceived and experienced by all stakeholders. For example, although participating merchants need to pay OKC the service fees, they can obtain significant benefits by being a member. Therefore, many firms have decided to participate in OKC. Both OKC and customers gain significant benefits from the system with relatively low costs. Table 1 depicts the relative significance of costs and benefits experienced by various stakeholders. Because of the stakeholder mutuality, there is strong support obtained from the various stakeholders, which contributes to the success of OKC.

Table 1. The distribution of costs and benefits among the stakeholders of OKC

	Benefits	Costs
Member firms	High	Medium
OKC	High	Low/Medium
Customers	High	Low

4.1.2. User Critical Mass

The wide use of OK Cashbag is due to the large existing customer base and the large industry coverage of the system, since it evolved from the loyalty program of a giant conglomerate that runs various businesses. Therefore, it was relatively easy for OKC to obtain of critical mass of merchants to offer the payment system since SK has a variety of businesses in the marketplace, which, in turn, enables the system to obtain a critical mass of users. In addition, other firms, which are not part of the SK group, will benefit from taking part in OKC because of its large customer base and, hence, more member firms can be obtained by the OKC. Thus, this case illustrates the benefit of the alliance that brings a critical mass of both merchants and customer to the EPC

4.2. Case 2: Mobile phone credit card

4.2.1. Stakeholder mutuality

There are six stakeholder groups in the mobile credit card payment systems. They are credit card

firms or banks, mobile carriers, mobile phone manufacturers, member firms, VANs and customers.

For credit card firms, the mobile credit card payment will give little benefit since it only shifts the payment method of customers. Thus, only small additional revenue, if any, can be expected. There are low costs involved in producing mobile phone credit cards. For mobile carriers, they expect to obtain more customers through the provision of a new service and are able to extend their business domain. However, there are high costs incurred since they need to install the dongles and other necessary infrastructure in each merchant site, as well as to provide the service and maintain the system. For mobile phone manufacturers, they can benefit from the system if many customers purchase the specially built mobile phones to facilitate the payment system. The costs for them would be for manufacturing special mobile phones and providing special hardware in their phone products.

For VAN companies, the number of transactions they intermediate is likely to remain the same with the provision of mobile credit card payment since customers will only shift the payment method from traditional credit cards to mobile credit cards. In terms of cost, they need to support the installation of the necessary dongle infrastructure, which only duplicates the existing infrastructure to support the traditional credit card payment. For member firms, they experience no benefit and cost from offering mobile card payment system. Finally, for customers, while they may enjoy the convenience of not having to carry their credit cards and possibly reduce the chance of having their credit cards stolen, these benefits are inadequate to justify the need to purchase a new mobile phone.

In summary, the mobile credit card payment system does not offer mutual benefits and costs to stakeholders. For many stakeholders, there is simply no or little benefit to gain from the system. In the case where stakeholders obtain some benefits, typically the costs involved cannot justify the benefits. Table 2 summarizes the relative significance of costs and benefits experienced by the stakeholders. The lack of stakeholder mutuality provides a strong basis for explaining the failure of mobile credit card payment in Korea.

Table 2. The distribution of costs and benefits among the stakeholders of mobile phone credit card payment system

	Benefits	Costs
Credit card firms (banks)	Nil/Low	Low
Mobile carriers	Medium	High
Mobile phone manufacturers	Medium	Medium
Value Added Networks	Nil	Low
Member firms	Nil	Nil
Customers	Low	Medium

4.2.2. User Critical Mass

In this case, at least two stakeholders, credit card firms and mobile carriers, have access to a large customer base. Both mobile carriers involved, SK Telecom and KTF, are the two largest mobile operators in Korea. Likewise, most merchants already accept various types of credit cards. Considering the huge numbers of mobile phone users and of credit card holders, mobile phone credit cards could take advantage of the existing installed base of customers and merchants from the stakeholder firms and were regarded as having a potential to replace plastic cards. Contrary to expectations, however, the mobile phone credit card system seems to have failed in attracting users from the initial stage of the service. The benefits that users can get from the system cannot be justified by the costs of replacing their mobile phones. Other stakeholders also experience a similar problem, and, as a result, there is a very few dongles installed. This case illustrates that although the stakeholders can provide a critical mass of merchants and users, the system fails to be diffused due to a lack of stakeholder mutuality

4.3. Case 3: Australian electronic payment system (OZPay)

4.3.1. Stakeholder mutuality

In the OZPay case, three stakeholders are involved which are OZPay, member firms, and individual customers. The roles, benefits and costs of each stakeholder group can be summarized as follows. Firstly, for the company establishing OZPay, it needs to have a customer base and develop the required system software used to facilitate the payment system. The latter has required a significant investment in terms of time and money. The company generates revenue based on the transactions carried out by each user and it has full access to the funds stored in the system and hence can make use of the float on the funds to generate extra revenue. Besides the costs incurred from developing the system software, the company needs to maintain the system and pay interest to each account in order to be competitive with the banking system. The OZPay

company, therefore, can only justify the costs if there is an adequate number of users.

For member firms that facilitate the use of the system, they gain benefits through the ability to bill and accept payment from their customers over the internet as online payment is a major prerequisite for increasing B2C transactions. They also benefit from the availability of complete transaction records required for account keeping and records management. In addition, the system also supports online product catalogues of member organizations. Member firms pay a small transaction fees to OZPay but face the risk of accepting fraudulent transactions, although the system designers have given a great deal of attention to minimizing this risk in the design. For individual customers who are the users of the system, they enjoy the benefits of the interest paid to their account, ability to transfer funds to other individual users and to pay bills, as well as the provision of complete transaction records. They need to pay small transaction costs and need to keep track of an additional account with OZPay. The initial setup for consumers has been made very simple. Finally, since OZPay may not be considered as a very established payment system, individual customers face the risk of losing money stored in the OZPay account.

The analysis of the costs and benefits of the OZPay stakeholders shows that for each stakeholder, the potential benefits outweigh the costs of using the system. For member organizations and individual customers, they reap many benefits from the system with low costs involved. For the OZPay, although the costs involved are high, they can be justified from the benefits, provided that there are enough users of the system, which will generate high revenue for OZPay. Table 3 summarizes the relative significance of costs and benefits among the stakeholders of OZPay. Thus, stakeholder mutuality is demonstrated in this case.

Table 3. The distribution of costs and benefits among the stakeholders of OZPay

	Benefits	Costs
OZPay	Very High	High
Member firms	Medium	Low
Individual customers	Medium	Low

4.3.2. User Critical Mass

In the OZPay case, none of the stakeholders could bring a critical mass of users. OZPay was the system software provider and promoter but participated in no other business that would provide a critical mass of customers or merchants. Similarly, since the network was provided by the Internet, and the banking system was used only as a paid service provider, there was no alliance with an infrastructure providers that could provide a critical mass of system users. OZPay also failed to establish partnerships with large organizations with an installed customer base. Therefore, after running the system for about four years, OZPay could not continue providing the system since the costs of investment could not be justified by the benefits obtained with a very limited number of users. This case provides a further support for our argument that having both stakeholder mutuality and a short cut to reaching a critical mass through the installed customer base of the stakeholders are necessary conditions for success of electronic payment systems. With the OZPay, although the stakeholder mutuality existed, a critical mass of both member firms and individual customers could not be obtained. Because of this missing necessary condition for success, OZPay has failed in its operation.

5. Conclusions

Using a multi-stakeholder perspective, we have argued that two necessary conditions for successful diffusion of electronic payment systems are mutuality of benefits, costs and risk among the stakeholders and the ability of the core financial and technology infrastructure providers to provide via their alliances, a ready made critical mass of customers and merchant. We have presented and analyzed three recent EPS schemes to illustrate and provide an initial test of these hypotheses.

Table 4 summarizes the three e-payment systems discussed. The only success case is OK Cashbag and the case analysis demonstrates that the two necessary conditions for success exited in this case. This is consistent with our analysis but does not directly test it since our claim was only that these conditions were necessary. By contrast, the mobile credit card system and OZPay each lack one of hypothesized necessary conditions for successful diffusion and have failed. Again these finding are consistent our theoretical propositions and provide an initial test of them also.

Table 4. Summary the Electronic Payment Systems Studied Relative to the Propositions

E-Payment System	P1 (Stakeholder Mutuality)	P2 (Critical Mass Provided)
OK Cashbag*	✓	✓
Mobile phone credit card	x	✓
OZPay	✓	x

* Success case

Clearly the propositions cannot be considered proved given the weak statistical force of three cases. What needs to be done next is to collect a larger sample of EPS cases and show that both hypothesized factors are always present in success cases and at least one factor is absent in all failure cases. Such a project will be difficult because failure cases are more difficult to obtain than success cases. Nevertheless, the three cases indicate that the failures occurred for the *same kinds of reasons* that we hypothesized in the theoretical part, so the cases provide some analytical support for the theory beyond their small statistical force. The two consideration presented in this paper do seem to distinguish between success and failure of most historical electronic payment systems known to the authors.

One difficulty of the current analysis is that the separation of the two hypothesized necessary condition is not entirely clean. The benefits, costs and risks of the EPS depend on the size of the installed user base. So in the failure case, to analytically separate the mutuality issue from the critical-mass issue, we had to evaluate mutuality as if a reasonable user base had been installed. In addition we implicitly assumed that all parties are risk-adverse when we treat risks as costs. There are probably differences in attitude to risk between early and late adopters which also complicate the story [2]. A fully time-phased evaluation of benefit-over-costs along the lines of [4] but including the dependency stake-holders on each other would be useful.

The work is significant theoretically because it adds to the small body of existing literature that considers electronic payments systems from a multi-stakeholder perspective [2-4] and it also extends our earlier work [11] on mutuality in inter-organizational systems. Practically, consideration of stake-holder mutuality and availability of a critical mass of customers and merchants at the stage when the core alliances are being forged could lessen the likelihood of costly failures.

6. References

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