

Emerging Online E-Payment and Issues of Adoption

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INTRODUCTION

Due to the rapid growth of e-commerce, the physical boundaries between parties in business transaction have been eliminated by the fast and convenient network connection. Nevertheless, most payment still has to be carried out off-line by conventional methods. Over the last decade, a large number of online payment solutions have been developed, but many are still remained at the trial stage; while others are competing with each other; some even failed to reach a customer acceptance stage before developers quit the business. Reasons of slow acceptance are technological, but more importantly, societal. Developers are struggling in pushing increasingly secure and convenient technological solutions to the public. On the other side, users are seeking the balance between benefits and the risks of using online e-payment, which prolongs the process of wider acceptance. This article offers a brief introduction to typical online e-payment instruments and classifications of existing payment systems. It intends to provide researchers and developers with a clearer view on e-payment by comparing various existing systems. The article also attempts to shed light on the issue of social acceptance and adoption of online e-payment.

BACKGROUND

Online e-payment refers to the process of finance or payment mainly using Internet as a medium. Making payment electronically is not new. Long before online e-payment has been introduced, financial institutions had established Automated Clearing House (ACH) to clear money transfers electronically. The electronic financial infrastructure has promoted introduction of various Electronic Fund Transfer (EFT) solutions. In a broader sense, electronic payment includes those based on private networks, such as ATM, credit card payment, POS (point-of-sale) and other payment over proprietary networks. The rapid development of B2B, B2C and C2C e-commerce gave rise to the development of new payment solutions over the open network. Thanks to the rapid development of ICTs and e-commerce, a vast

number of online e-payment solutions have been introduced. Conventional payment methods and concepts like credit card and cheque have been extended and modified to incorporate online transactions. New schemes of payment like electronic currency and smart cards have been introduced for online payment. Many e-payment systems share similar characteristics or developed upon similar protocols or payment infrastructures. Despite numerous attempts aimed at offering innovative alternatives, credit and debit cards payment based on the existing payment network and procedures remains the main payment instrument for online transactions. For instance, a report showed that in the UK some 90% of online purchases are made by credit card and debit card, although the amount only represents 3% of all card payments (Allen, 2003).

Many have realized that the limited acceptance of online e-payment is by and large a chicken and egg problem. Diffusion of online e-payment is limited by the unavailability of payment solutions accepted by wide range of transactions. Moreover, the lack of market-wide diffusion limited development of more integrated online payment solution (Allen, 2003). The phenomenon has attracted attention of researchers to investigate the factors hinder the wider acceptance of online e-payment (Abrazhevich, 2001b; He, Duan, Fu, & Li, 2006). To have a better understanding of the issue of acceptance, the characteristics of different online payment systems, and technological and social issues associated with their implementation need to be clarified.

EMERGING ONLINE E-PAYMENT TECHNOLOGIES

In response to the rapid development of e-commerce and the security requirements of the online e-payment, research groups, financial institutions and commercial firms have developed a number of online e-payment solutions since the last decade. Table 1 provides a list of some typical online e-payment methods with examples.

Table 1. Various online e-payment systems

Type of Payment	Example	Advantages	Disadvantages
Credit/Debit card	SET (Cyber Cash)	Card information not transmitted; Multiple-layer authentication.	Complexity
	SSL	Simplicity; Easy to setup; Using existing financial infrastructure.	Non-anonymity; Transaction cost relatively high.
Electronic Cheque	FSTC E-check	Able to handle large value payment.	Extra infrastructure needed; Need hardware devices to store electronic chequebook.
	NetBill	Simplicity; Able to handle small amount payment; Payer remains unknown to the payee.	Reliance on a central server; Server load limits number of participants.
	NetCheque	Choices of various NetCheque servers; Scalability.	Need to establish a hierarchy of servers.
Electronic Currency	Ecash	Payer anonymity remained.	Rely on single Ecash bank; Large database needed to store serial numbers.
	NetCash	Different currency servers allowed; Scalability.	Limited anonymity to users; Large database needed to prevent double spending.
	Millicent	Capable of handling micropayment; Communication efficiency; Low transaction cost.	Limited customer anonymity; Broker and vendor need to be trusted.
Smart Card Payment	Mondex	Portability; Anonymity; Secured fund transfer.	Need extra hardware devices.
	NACHA ISAP	Simplicity; Using existing financial infrastructure.	Need extra hardware devices; Non-anonymity.
Centralized Account System	Yahoo!Direct; PayPal; First Virtual; Nochex; iTransact	Double blind system; Payer and payee remain unknown to each other.	Lack of integrated system; Users need to register with various accounts.

Credit Card and Debit Card Payment

Extended from the conventional MOTO (Mail Order Telephone Order) transaction, credit and debit card as means of online e-payment has been widely explored. Thanks to the already developed payment schemes and established public acceptance, credit and debit card payment systems are most widely used online payment methods at present. Because cardholders need to provide card details on the Internet, which is subjected to attacks from hackers and fraudsters, security of the credit and debit card payment over the Internet is a common concern. To ensure the security, two major Internet standards have been introduced, namely SET and SSL.

The basic principal of SET (Secured Electronic Transaction) is to use digital certificate consists of a **private key** for

encrypting data or documents and a corresponding **public key** for reading the data, so that the information is transmitted to the identified parties and is secured from external parties. SET creates secured dialogue between cardholder, merchant, and acquiring bank using digital certificates, which substitute credit card number during the transaction. However, the problem with SET is the complexity of the system, in that the transaction parties have to install independent pieces of software working together to accept the certificate and ensure the authentication of each party. SET also needs the support of a complex certification authority hierarchy, and requires the cardholders to go through a registration process in order to be issued with a certificate.

SSL (Secure Socket Layer) uses encryption technology to secure any dialogue taking place between buyer and

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