Electronic Payment Systems

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Traditional Methods

• Traditional payment methods include cash, checks, credit and debit cards.
• These methods have several shortcomings
  – Checks and cash cannot be exchanged in real time
  – Credit and debit card info exchanged over the phone or by email entails security risks
  – Credit/debit cards do not support individual-to-individual payment transactions
  – Some individuals do not have access to credit cards or checking accounts because of credit history
  – The overhead of all but cash do not support low value transactions (micropayments)
Comparison of Selected Instruments

<table>
<thead>
<tr>
<th></th>
<th>Cash</th>
<th>Credit Card</th>
<th>Travelers Checks</th>
<th>Prepaid Card</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easily Exchangeable</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Acceptable to users</td>
<td>Yes</td>
<td>Yes</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Small Transaction Cost</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>?</td>
</tr>
<tr>
<td>Large Transaction Cost</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Non-refutable</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Transferable</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Buyer Anonymous</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Secure against unauthorized use</td>
<td>No</td>
<td>Some</td>
<td>Some</td>
<td>?</td>
</tr>
<tr>
<td>retrievable</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Tamper resistant</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Monetary Value</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Cash

- Cash remains the dominant form of payment because of:
  - Lack of consumer trust in banking system
  - Inefficient clearing/settlement of non-cash transactions
  - Negative real interest rates on bank deposits
Electronic Payments

- E-commerce requires payment methods that are:
  - Widely used by consumers and accepted by merchants and banks.
  - Real time, i.e. transactions are completed when consumer hits the pay button.
  - Provide support for micropayments.

Required Properties of Electronic Cash

- Must have a monetary value.
- Must be interoperable or exchangable for other digital cash, paper cash, goods or services.
- Must be storable and retrievable.
- Must be tamper resistant while being exchanged.
Approaches to Electronic Tokens/Digital Cash

- Tokens or digital cash are forms of payment backed by a bank/financial institution and offer:
  - Transaction privacy and confidentiality
  - Support for micropayments, or small fee transactions
  - Real time exchange between buyer and seller

Web Services

- Ecash
- Mondex
- Millicent
- Cybercash
- www.webcharge.com
- www.clickshare.com
- www.netchex.com
www.digicash.com

- Ecash or electronic cash
  - Provided to consumers and merchants through financial institutions around the world
  - Uses digital signature technology based on public key cryptography for security
  - Buyer remains anonymous and does not need to provide personal information over the internet
  - Ecash usage cannot be tracked
  - Easily transferable: money can be transferred to a merchant, or friends/family by email
  - No charge to consumers
Simple user transaction

Underlying exchange causes confirmation request
www.mondex.com

- Provides a digital cash service
- Uses phones, smartcards, wallets, and pos devices
- Cards can be loaded over mondex phones
- Money can be transferred using wallets
- Money can be spent at POS terminals
- Certificates back transactions
Mondex Smart Card

- Like a credit card
- Stores its value electronically in a microchip
- Holds up to five different currencies at one time
- Money can be transferred by telephone/internet to a retailer or merchant as well as other individuals
- Can be used for purchases of any size
- User remains anonymous -- no record of transaction
- Secure in difficulty of duplicating the microchip

Mondex phones can be used to transfer cash
A wallet is used to transfer amounts between two cards

Multiple functions allow different collections of different currencies to be checked or transferred

www.millicent.com

- Users can fund their account by:
  - Online credit or debit card
  - Directly billing ISP statement or telephone bill
  - Anonymous, prepaid cards
- Account can hold any currency
- Millicent will handle refunds, currency conversions, delivery problems, actual payments
www.cybercash.com

- Cybercash offers services for businesses
- Cybercash also offers a wallet for users
- Everything is authenticated
The InstaBuy service uses CyberCash's Agile Wallet™ technology. The Agile Wallet platform is a secure electronic server for consumer payment and purchase information which enables safe completion of transactions. The InstaBuy service is the first service to be launched using Agile Wallet technology.

First, the InstaBuy service securely stores the shopper's payment information:

To make a purchase, the shopper simply enters the purchase amount and presses the "Pay" button.

For each purchase, the shopper's payment information is automatically verified. A single click completes the purchase.

- Consumers never need to enter their purchase information again—whether they are buying from the same merchant or any other merchants using the InstaBuy service.
- Indeed, the Agile Wallet framework places a virtual shopper's payment information directly into the shopper's wallet.
Services to Vendors

• A variety of organizations provide services to vendors
• These include:
  – Credit card support
  – Digital cash support
  – Transaction management and reporting
• Suppliers include
  – Cybercash
  – Millicent

www.cybercash.com

• CyberCash CashRegister
  – Supports major credit cards as well as debit and purchase cards
  – Flexibility to process offline orders
  – Automatically logs every transaction including sales, credits, and voids
  – Fast transaction processing speed for large volumes
www.cybercash.com

- CyberCash CashRegister (cont)
  - All transactions are encrypted and digitally signed
  - Customers are notified in “real time” of rejection/approval of transactions

www.millicent.com

- Must have a website to participate
- Vendor can be apart of the Millicent network or
- Can integrate Millicent software directly into their own website to eliminate fees
- Offers pay-per-click, earn-per-click, and subscriptions
Banking Services

- Banking Services
  - Offers 24 hour, seven day a week online banking
  - Uses encryption customers security
  - Password protection
  - No transaction fees
- Major online banks include:
  - www.compubank.com
  - www.sfnb.com
  - www.citibank.com/us/