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Internet Technology and E-Business

Dr. Peter R. Gillett

Associate Professor

Department of Accounting & Information Systems
Rutgers Business School – Newark & New Brunswick

Overview

- Digital Transactions
- E-Payments
- Business Models on the Web
- Auctions and Brokerage
- Virtual Communities
- E-Commerce Hubs
- Marketing & Purcahsing

Issues for Digital Transactions

- Key Issues
  - Privacy
    - Eavesdropping & spying
    - Rights?
  - Protection against impersonation
  - Message Integrity
  - Non-repudiation
- Authentication and Certification Authorities

E-Payment Systems

- Electronic Cash
  - Online
  - Offline
- Electronic Wallets
- Stored Value Cards
  - Smart Cards
- Credit and Charge Cards

E-Payment Systems

- *"The State of the Art in Electronic Payment Systems" (http://www.semper.org/sirene/publ/AJSW_97PayOver.IEEE.pdf)*
- Check-like systems: ATM, Credit/Debit Cards
- Integrity and authorization
- Out-band authorization ('phone, mail, . . .)
- Password authorization
- (Digital) signature authorization
- Confidentiality

E-Payment Systems

- Allow micro-payments!
- Will micro-payments facilitate many of the present day Internet models?
- The cost of cutting a physical check and the cost to Visa/MC, etc.
- Key attacks:
  - Fake terminal
  - Freshness and replay (using nonces)

Why Digital Cash?

- Three Key Needs for Digital Cash
  - Privacy
  - Authenticity
  - Non-repudiation
- Key features of “legacy” cash
  - Portable
  - Recognizable
  - Readily accepted
  - Transferable
  - Untraceable
  - Anonymous
  - Changeable

Why Digital Cash?

- E-Cash: usual payment system, but untraceable and anonymity
- Generally, digital cash is implemented using Public Key Systems!
- What problems are posed with anonymity?
  - Is digital cash counterfeiting worse then the usual physical counterfeiting?
  - What are some other risks of digital cash?

Digital Cash: Cons

- Token Forgery
- Multiple Spending (oh, that disk crash!)
- Social Costs
  - Ease of spending it all, very easily

Digital Cash: Pros?

- The right thing for the Internet
- Get rid of the dirty money, etc.
- Perhaps, some of anonymity should be eliminated!
- In fact, each piece of paper money we have does have a unique number on it

Cryptography for Digital Cash

- The need for a banking intermediary
- Simple withdrawal
  - Alice sends a withdrawal request to the bank
  - The bank creates and digitally signs an e-coin
  - The bank sends the coin to Alice and debits her account
- The hard part is person-to-person transactions simulating me handing my friend $5

Cryptography for Digital Cash

- Payment from Alice to Bob
  - Alice emails Bob the e-coin
  - Bob forwards the e-coin to the bank
  - The bank verifies its own e-signature
  - The bank verifies the e-coin has not already been spent
  - Bank marks the e-coin as “spent”
  - Bob’s account gets the money
  - Bob gives Alice the bicycle . . .

Cryptography for Digital Cash

- Blind Signatures!
- Zero-Knowledge Proofs
  - Prove you know something without revealing it!

Digital Cash

- Checkfree
- Clickshare
- Digicash (eCash)
- eCoin.Net
- InternetCash
- Millicent
- PayPal
- Scrip
  - Beenz
  - Flooz

Digital Cash and Banks

- Transferability issue with multiple banks
  - Swedish Mail (SM) and Mark-Twain Bank (MT) propose digital cash
  - How are these currencies transferable?
  - At what rates?
  - Who verifies the transfer?
- Traditional cash: the payer's default does not tarnish the cash!
- Hopefully, central banks will not default

Digital Cash and Banks

- Ramifications of bank's liability for digital cash?
- May cause different "exchange" rates!
- Key is international use of banks
  - National settlement systems
  - By-and-large: internationally no loss-sharing agreements

Too many forms of Digital Cash?

- Host of payment systems, cryptography protocols, etc.
- Credit cards have limited individual liability in the US
- Need for a common protocol?
- International clearing houses?

Economic Consequences of E-Cash

- Opportunity for small business?
  - For individuals to use it, it must be cheap and accessible
  - Also, for B2B, to a lesser extent
- Issues of taxation
- Money laundering
- Exchange rates
- State/country money supplies
- Cross-country financial crisis

Economic Consequences of E-Cash

- Very low cost transactions
- Micro-payments possible
- Large transactions made up of many smaller transactions
- No borders and no records!
- Most of our money is already electronic in many ways
- World currency?

Economic Consequences of E-Cash

- Is digital-cash a form of privately issued currency?
- Can a bank in some far-away land have valid cash all over the world?
- The possibility of confusion abounds!
- Whose cash will you accept?
- Can a central bank act as a meta-intermediary for all e-cash transactions?

Electronic Wallets

- Server-side
- Client-side
- Store
  - Shipping and billing information
  - Credit cards names, numbers, expirations
  - Electronic cash
- Competing Standards

Smart Cards

- What is a Smart Card?
- Embedded chip for cryptography and storage of cash
- Most are made in Gemenos, France
- Economics:
  - 2000: $2.4 Billion, 2004: $8 Billion
  - Cellular?
  - Popular in Europe for years
  - Big US players getting in…

Smart Cards

- How do they work?
- Store either or both
  - Amounts
  - ID for accounts (less common)
- Problems:
  - Readers and other devices, cumbersome and costly
  - Theft?

Smart Cards: Pros and Cons

- Pros
  - Security
  - Ease of use
- Cons
  - Hardware
  - Peer-to-Peer hard

E-Payment Systems

- Advantages of Credit Cards
  - Fraud protection
  - Worldwide acceptance
  - Currency conversion
  - Convenience
  - Deferred payment

E-Payment Systems

- Disadvantages of Credit Cards
  - Not everyone can get one!
  - Merchants need to become authorized
  - Set-up costs and procedures for merchants
  - Transaction fees preclude minor purchases
  - Generates information trail on purchasing patterns, locations, etc.
  - Security concerns

Business Models on the Web

- Brokerage
- Advertising
- Infomediary
- Merchant
- Manufacturer
- Affiliate
- Community
- Subscription
- Utility (fee-for-transaction)
- Disintermediation and reintermediation

Business Models on the Web

- Which are B2B and which are B2C?
- In either light, which are really new to the Internet and which are add-ons to brick and mortar businesses?
- Which will survive?

Auctions and Brokerage

- Why so important on the Internet?
- Five key elements of auctioning
  - Offer in various states: final offer, all or none, etc.
  - Many participants, buyers, sellers, etc.
  - Open information exchanges
  - Well defined process flow
  - Settlement and confirmations well defined

Auctions and Brokerage

- Auction Types
  - English (Open-cry) auction: start low, encourage competition
  - Yankee auctions
  - Dutch auction: start with a “high price” and keep lowering it
  - Vickrey auction: the auction winner gets the item at the second highest bid price
  - Double auctions: stock markets
  - Sealed Bid Auctions and the Internet

Auctions and Brokerage

- Pros of Auctions
  - Many bidders
  - Information
  - Buyers and sellers benefit
  - Others?
- Cons of Auctions
  - Location (not on the Internet)
  - Others?

Virtual Communities

- Most are B2C strategy implementations
- Some B2B have taken hold
- Milacron Milpro example: machine tools and lots of small customers
- Site includes:
  - Catalogue
  - Ordering, tracking and locating services
  - Machinery flea-market
  - Discussion rooms

Virtual Communities

- What advantages does Milacron get?
  - Customers (B2B, no less!) stay longer
  - Check site regularly
  - Sticky web site
  - Build customer loyalty
  - Get the opinions of diverse customer base
  - Branding using a web site

Virtual Communities

- Advertising and sponsorship models?
- Very sticky
- Information gathering
- Opportunity to sell and build a brand

B2B E-Commerce Hubs

- Dell and Cisco: disintermediate middlemen
  - Sell direct over the Internet
- Are e-hubs becoming the new middlemen?
- Estimated $20 Billion in 2002 e-hub commerce
- B2C hubs are one-way hubs (Sarnoff networks)
- B2B hubs are often two-way hubs (Metcalfe networks)

B2B E-Commerce Hubs

- It is argued that the benefit of B2C hubs increases linearly with regard to the number of customers
- The B2B hubs increase in square terms to benefit all participants
- The issue is point-to-point: the B2B hubs focus on moving information/goods between different businesses. The B2C focus on moving goods/information to consumers

B2B E-Commerce Hubs

- Amazon: for the consumer no difference if 100 customers or 1 million.
- For an industrial auction, the more suppliers and customers the better
- Also, true on eBay
- Domain expertise
- Customer acquisition and retention
- Many more efficiencies than in traditional situations

E-Hub Types

- Contextual market places
- Vertical e-hub: v-hub
  - Focuses on one industry
  - Why?
- Functional e-hubs
  - Focus on same function or business operation
  - Why?

V-Hubs

- Examples: Altra Energy, brand-x.com, cattle offerings world wide, chemdex, sciquest, e-steel, flora-plex, imx mortgage, paperexchange, plasticsnet
- Likely success
  - If large amount of fragmentation between buyer and sellers
  - If big inefficiencies in supply chains

V-Hubs

- Success factors
  - Can create critical mass of suppliers and buyers
  - Domain knowledge and industrial deals
  - Information organization: master catalogues, specifications
  - Ability to leverage v-hubs offerings
- Industry trade groups, etc.

F-Hubs

- Examples: I-mark.com, processors.com, mro.com, employease.com, celarix.com, bicdom.com, adauction.com, youtilities.com
- Likely successes
  - Standardization of industry or area
  - Workflow and process knowledge expertise
  - Complement process automation
  - Ability to customize processes for each firm served
- Different industries do things differently

Marketing, Sales and Promotion

- Creating Web presence
  - Web presence goals
- Meeting the needs of Web Site visitors
- Trust and loyalty
- Usability testing
- Identifying and reaching customers
- Creating and maintaining brands

Purchasing and Support

- Purchasing → Procurement
- Logistics
- EDI
  - ASC X12 Standards
- VANs
- Open EDI via the Internet
  - New standards?
- Financial EDI - EFTs

Purchasing and Support

- Supply Chain Management
  - Value creation
  - Technology
- Software
  - ERP
  - B2B Commerce Software
  - Supply Chain Management Software

Purchasing and Support

- Supply Chain Management via the Web
  - Share information about customer demand
  - Rapid notification of design changes and adjustments
  - Provide specifications and drawings more efficiently
  - Faster processing of transactions
  - Reduce the cost of handling transactions
  - Reduce errors in entering transaction data
  - Share information about defect rates and types