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***Internet Technology and
E-Business***

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Overview

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

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 than 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 (Metcalf 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, youilities.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