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Internet Technology and E-Business

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Outline

- XBRL
- Internet Auctions Concluded
- Spiders, Bots and Intelligent Agents
- Artificial Intelligence
- Systems Development for the Internet

Steve Balmer on XML

- As quoted in Cnnfn.com: "The power of what's implicit in the XML revolution we think is mammoth," (27-Feb-01)
- Further: "In some sense, we have really reoriented soup-to-nuts a lion's share of what we're doing at MS around seizing the opportunity in this revolution."
- How does this sync with what we have said about XML?

Steve Balmer on XML

- Goals: dominant position for PC software and .net software
- Five business areas
 - * Productivity
 - * Enterprise
 - * MSN
 - * Non-PC (PDAs)
 - * Small and midsize business apps

XBRL

- eXtensible Business Reporting Language
- Standard produced by XBRL.ORG (created by AICPA)
 - * <http://www.xbrl.org>
 - * **NOT W3C!**
- XML-based language for expressing business information digitally
- Uses common business semantics
- Currently XBRL 2.0 Specification
- Use in conjunction with XSLT

XBRL

■ Membership

* Accounting software firms

- ◆ ACCPAC
- ◆ Great Plains
- ◆ Sage Software
- ◆ etc.

* Accounting firms

- ◆ Arthur Anderson
- ◆ BDO Seidman
- ◆ Deloitte & Touche
- ◆ Ernst & Young
- ◆ Grant Thornton
- ◆ KPMG
- ◆ PwC
- ◆ etc.

* Organizations

- ◆ AICPA
- ◆ CICA
- ◆ IFAC
- ◆ NIVRA
- ◆ ICAEW
- ◆ Universities
- ◆ etc.

XBRL

■ Membership

- * **ASPs**
 - ◆ Count-net
 - ◆ Ekeeper
 - ◆ Netledger
 - ◆ etc.
- * **Consultancies**
 - ◆ etc.
- * **Financial Institutions**
 - ◆ Fidelity Investments
 - ◆ JP Morgan
 - ◆ Morgan Stanley
 - ◆ etc.
- * **General software firms**
 - ◆ IBM
 - ◆ Microsoft
 - ◆ Oracle
 - ◆ Peoplesoft
 - ◆ SAP
 - ◆ etc.
- * **Others**

XBRL

■ Business Case

- * Output data in a variety of formats
- * Reuse data over time
- * Conduct peer group review
- * Automated language conversion
- * Automated currency conversion
- * Automated printer & screen-friendly outputs
- * Data integration

XBRL

- Provides a standard means for financial reporting
- “Glue” between producers and consumers of financial information
- XBRL Specifications
 - * XML standard to represent accounting knowledge
- XBRL Taxonomies

XBRL

■ Principal products so far:

- * Financial Statements
- * General Ledger

■ Goals:

- * XBRL for
 - ◆ Business Event Reporting
 - ◆ Tax Filings
 - ◆ Edgar Filings
 - ◆ Audit Schedules
 - ◆ ...

XBRL - Elements

■ Item

- * Describes a single financial fact
- * May contain descriptive attributes
- * No nested items

■ Group

- * Generic grouping mechanism
- * Usually contains descriptive attributes

■ Label

XBRL – Other Elements

- Period
- Schema Location
- Unit
- Scale factor
- Precision
- Additional Attributes

XBRL - Example

```
<group type="ci:statements.balanceSheet">
<... statement information ...>
  <group type="ci:balanceSheet.assets">
    <csh:label>ASSETS:</csh:label>
      <group type="ci:assets.currentAssets">
        <csh:label>Current assets:</csh:label>
          <group type="ci:cashCashEquivalentsAndShortTerm
Investments.cashAndCashEquivalents">
            <label href="xpointer(..)" xml:lang="en">Cash and cash
equivalents</label>
            <item id="BS-01" period="2000-06-30">4846</item>
            <item id="BS-02" period="1999-06 30">4975</item>
          </group>
        </group>
      </group>
    </group>
  </group>
```

Internet Auctions

- Fixed prices in retail are a “new invention” in the last 100 years
- What advantages are there for negotiated prices?
 - * The market fixes the price by supply and demand (recall the cardinal rule of pricing!)
- What advantages are there for fixed prices?
 - * Costs and marginal costs are well understood

Internet Auctions

- The Dutch Flower Markets: an interesting lesson in history!
- “Extraordinary Popular Delusions and the Madness of Crowds” --- Mackay;
 - * Dutch Tulip Mania: what about the Internet bubble?
- Dutch flower markets are very esteemed and well established
- Owned by the Dutch flower growers association

Internet Auctions: Dutch Flowers

- Flowers: a leading industry in Dutch Economy
- About 11,000 growers and 5,000 buyers
- Around 8 billion blooms for about \$ 3.2 billion
- Heavy world competition: Kenya, Spain, Israel, India and Columbia.
- High regulation and land costs make Holland expensive for flowers
- Global diffusion of agribusiness and cheap plane flights are all adding to the pressure

Internet Auctions: Dutch Flowers

- Tele Flower Auction: new computer competitor. World-wide bids and offers
- The “Dutch Auction” turns out to favor the sellers
 - * Clock: high speed puts pressure on buyers
 - * Small lots favored too
- Also, the traditional Dutch Auction has had a large influx of foreign flowers: increased by 70%+
- An interesting event: sending a sample for marking into lots

Auction Lessons

- Auctions, in some cases, don't have to be “open air” events
- What about the NY Stock Exchange?
- It is claimed that e-auctions are still increasing in volume over 10%/year
- Initially eBay grew over 12%/month

Auction Lessons:

from article by D. Lucking-Reiley

Site	Monthly Revenue
eBay	\$ 70 MM
First Auction	\$5 MM
Onsale	\$ 5 MM
uBid	\$ 2 MM
Going-Going Sold	\$ 1.8 MM
Auction Vine	\$ 1.5 MM
Encore Auction	\$ 1.3 MM

Internet Auctions: Dutch Flowers

- Was this all converging to an Internet market?
- What do buyers favor?
- The Tele Flower Auction (founded by East African Flower Import Organization)
- Simulates the Dutch Auction via Internet
- What to do?
 - * Focus on higher cost flowers, etc.

Internet Bots

- For non-human interaction Internet tasks
 - * Web spiders for search engines
 - * Mundane and tedious tasks
 - * Massively distributed tasks
- For serving human visitors
 - * Helping a web surfer find a product
 - * Replace humans for mundane tasks: no replacement for good design!

Artificial Intelligence

- Intelligent agents?
- What is intelligence?
- Recall Alan Turing's replacement of the question "Can machines think?"
- Behavior on the Internet: what is expected?
- MUDs and the Internet: who is who?
- What effects can this have?

MUDs and Business

- How can we use MUDs for business?
 - * Just games or serious opportunities?
- What logistic opportunities?
- What marketing opportunities?
- Risks
 - * Fault tolerance: disconnect
 - * Information gathering
- See: <http://www.mudconnect.com/>

Autonomous Agents

- Bandwidth going way up
 - * More opportunity for agents and distributed computing
- Mobile devices: go and get the info!
- Intra/extra-nets
- Are agents really just “subroutines” ?
- Byzantine Generals issues
 - * Who to trust
 - * What does failure look like?

The Sociology of Bots

- The example of “Julia”
- Bots talking to bots in MUD . . .
- Lessons:
 - * Complex discourse can be simple to create
 - * Domain: bandwidth limited discussions
 - * Expectations in this domain: players interested in interacting about a game, etc.
 - * Anthropomorphism: built in

An Agent or A Program?

- How do we define an Agent?
- Franklin & Graesser
 - * **MuBot:**
 - ◆ Autonomous execution
 - ◆ Domain oriented reasoning
 - * **AIMA (AI: a Modern Approach):**
 - ◆ Anything that can perceive and act about its own environment
 - ➔ Net environments can be different than 'typical' human environments
 - ➔ What is reasoning?

An Agent or A Program?

- * **Maes Agent:**

- ◆ In complex, dynamic environments and autonomously solve goals

- * **KidSim:**

- ◆ Persistent software that uses own methods (ideas?) to solve problems

- * **Hayes-Roth:**

- ◆ Perceive dynamic conditions, take action to effect conditions, reason to interpret perceptions & solve problems

An Agent or A Program?

- * **IBM Agent:**

- ◆ Carry out some set of tasks with autonomy and employ “knowledge” of user’s goals

- * **Wooldridge & Jennings:**

- ◆ Autonomy, social ability, reactivity and pro-activeness

- * **SodaBot:**

- ◆ Dialogues
- ◆ Negotiate transfer of information

An Agent or A Program?

■ Franklin & Graesser say:

- * “An autonomous agent is a system situated within and a part of an environment that senses that environment and acts on it, over time, in pursuit of its own agenda and so as to effect what it senses in the future”

■ Is a thermostat an agent?

■ What about societies of agents?

An Agent or A Program?

■ Agent Classifications

* Properties

- ◆ Reactive, Autonomous, goal-oriented, continuous
- ◆ Communicative
- ◆ Learning
- ◆ Mobile
- ◆ Flexible
- ◆ Character

An Agent or A Program?

■ Agent Classifications

- * Taxonomies
- * Binary classifications
- * Subagents and societies

■ Charles Petrie

- * NB: Franklin & Graesser do not define intelligence!
- * Their definition is NOT mathematically formal
- * Autonomy v. intelligence
- * Mobility

Mobile Agents

- Viruses
- Self-modifying programs that travel over the Internet
 - * Why might this be useful?
 - * How dangerous is this?
- What about PDAs and mobile devices for mobile bots?
- Proxies and the bandwidth bottleneck
- Scalability and Linda-Like languages

Mobile Agents

- Is this just distributed computing?
- Agent servers
 - * Taking commands and sending back results
- How about the unintended consequences?
- It is conceivable that there may be bots “living” on the Internet for centuries!
- What about that word: “living”?

Agents that Buy and Sell

■ Why bots “fail”

- * Only extract price (what about the other parts of the value proposition)
- * Made explicit?: special member programs/prices
- * Generally, very small shops want to be in price-compare bots; larger firms offering more do not want to have only their price scanned by bots
- * What are the “same” or substitutable items?
- * Counts out negotiation: I ask \$50 or best offer

Agents that Buy and Sell

- Agents helping in negotiation:
 - * AuctionBot, Kasbah, Tete-a-tete
 - * Terms and conditions, where things are, etc.
- Finding potential buyers and sellers
 - * How can the Internet help?
- Forming instant coalitions to bid on contracts and leverage the economies of scale

Agents that Buy and Sell

- Kasbah's negotiating strategies:
 - * Matching buying agents and selling agents
 - * Buying agents' suggested heuristic:
 - ◆ Anxious: increase bid linearly
 - ◆ Cool-headed: increase bid quadratically
 - ◆ Frugal: increase bid exponentially
 - * Also adds a "Better Business Bureau" feature like in eBay

Artificial Intelligence (AI)

■ Symbolic

- * Theorem Proving (Search: Branch & Bound)
- * Unification “Pattern Matching”
- * Logic Programming (Dealing with Constraints)
- * Case Based Reasoning (CBR)

■ Neural Networks (Artificial NN = ANN)

- * McCulloch & Pitts
- * Pattern Recognition
- * Generalization & Forecasting

Artificial Intelligence (AI)

■ Genetic Algorithms (GA)

- * Start with “Genetic String”
- * Evolve to solution
- * Fine-tuned local search

■ Fuzzy Logic

- * Fuzzy Logic: Simulates “loose” reasoning
- * Express approximate notions

■ Machine Learning

Artificial Intelligence (AI)

■ Expert Systems

- * Get expert knowledge
- * Mimic experts
- * Use many types of AI

Artificial Intelligence (AI)

■ Expert Systems

- * User Interface
- * Domain Database
- * Knowledge Base
- * Inference Engine
 - ◆ Forward Chaining
 - ◆ Backward Chaining
- * Explanation Facility

Artificial Intelligence (AI)

■ Expert Systems

- * Knowledge-based systems
- * Rule-based expert systems
 - ◆ Expert system shells
 - ◆ AI programming languages
 - ➔ LISP
 - ➔ PROLOG
- * Frames, Semantic Nets, Objects
- * Case-Based Reasoning

Artificial Intelligence (AI)

■ Expert Systems

* Knowledge Engineering

◆ Knowledge acquisition

- ➔ Books, Manuals, etc.

- ➔ Knowledge elicitation

 - Interviews

 - Verbal Protocol Analysis

◆ Knowledge representation

* Verification and validation

Artificial Intelligence (AI)

■ Advantages of Expert Systems

- * Scarce human expertise
- * Releases human experts for more difficult cases
- * Improved accuracy of judgments
- * Greater consistency and consensus
- * Training of novices
- * Preserves expertise within organization

Artificial Intelligence (AI)

■ Disadvantages of Expert Systems

- * Suitable human experts hard to find
- * Experts disagree
- * Knowledge elicitation difficult and time-consuming
- * Expensive to maintain and modify
- * Potential for deskilling jobs
- * Hard to validate fully
- * User acceptance

Intelligent Behavior

- Learning from experience
- Making sense of ambiguous or contradictory messages
- Responding appropriately to new situations
- Use reasoning to solve problems
- Understanding and dealing with complexity
- Applying knowledge to change the environment or situation

What is Intelligence?

- Hard to define properly
- A. M. Turing: “The Turing Test”
 - * Replaced Question of Intelligence with this probabilistic testing notion

Interrogator



Expert Systems

- Classical AI
- Diagnose disease
- Troubleshoot mechanical problems
- Large complex systems
- Sometimes perform very well
- Own the expert knowledge

Analog Devices: Example

- Case-Based Reasoning
- Fuzzy Logic: “the best”, “sort of”, “less than”
- Reduce paper, phone, fax,...
- Saved \$2 Million in 1998 in direct expenses

Advantages of Artificial Intelligence

- Permanence
- Can be less expensive than “natural” intelligence
 - * Replication
 - * Speed & accuracy
 - * Long lasting & runs 24/7
- Consistent & thorough
- Documentable (ANN?)
- Ease of duplication and dissemination

Advantages of Natural Intelligence

- High creativity: “out of the box” thinking
- Long & varied experiences
- Directly use many different sensory experiences
- Can learn many new things quickly
- Can hire natural Intelligence on a consulting basis

Programs vs. AI

Processing	Algorithms	Symbolic Computing
Input	Must be complete	Can be incomplete
Search	Algorithmic	Heuristics
Explanation	Rarely	Given
Focus	Data	Knowledge
Reasoning	No	Yes

Commercial AI Systems

- Expert Systems
- Natural Language Processing
- Speech Understanding
- Robotics
- Vision Systems
- Computer Aided Instruction
- Handwriting Recognition
- News Summaries

GE's Locomotive ES

- David Smith retiring
- Usually: send apprentices to become experts
- Built an Expert System to learn from David
- Expert System can teach locomotive engineers
- Installed in every railroad repair shop
- Has probes for info. humans can't interpret

Building a Large Internet Site

- What problem are you trying to solve by building (or re-designing) a web site?
- Design it: this is an iterative process
- Build a prototype: perhaps use a web-page builder
- Analyze and test it
- Design the real-thing!

Systems Analysis

- Start with business analysis: what problems is your site solving?
- Understand the problems we are solving: can they be solved without the Internet?
- Build on and interface to the present foundations
 - * Legacy systems?
 - * Personnel, etc.

Systems Design

- Design Documents: use the Internet for development of the Internet!
- Logical systems design: Incremental - ERP, client/server: prototype stage!
- Physical systems design: machine in Newark, etc.
- Ergonomics and marketing to your users
- Milestones and incremental development check points
- Beware of runaway projects!

Development & Programming

- Specifications
- Development paradigm and environment
- Team building
- Communication among developers
- Hooks for growth!
- Rewards & longevity
- Internet software is very complex!
- Recall, a Boeing 747 has about 1 million parts
- A modestly large software project has 10 million lines of code!

Testing

- Q/A Quality Assurance Groups
- Documentation of testing!
- Unit testing
- User testing
- Regression testing
- Integration testing
- Maintenance and continued testing

Outsourcing

- Specifications
- Your business!
- Rise and fall on development demands
- Run fast and sleek
- Specializations
- Problems too!