What is Information Systems Management (ISM)?

ISM addresses 2 major areas:

- The Technology of Management: information technology to efficiently operate enterprises
- The Management of Technology: the management, development, and commercialization of technologies

Why is ISM important?

- Success requires an understanding of both technology and the context in which it is used
- The business environment in which it competes
- ISM is a rigorous engineering program which teaches technology/product development, how to market ideas and products, and develops Information systems to support an enterprise's needs
Undergrad ISM degree:

**Base:** foundation of mathematics, science, engineering, and computer programming courses.

**Specialization:** business, economics, information systems, and the management of technology

**Electives:** (e.g., Robotics, Nanotechnology) and Economics (e.g., Business Strategy, Finance)

**Internships and Projects:** local technology companies, research projects in the School of Engineering

Internship Program

**Typical (quarter-long) projects:**
- Document Capture Project (Liz Watt, Ming Chao): Create a custom software application for Seagate to automate customer purchase orders
- Forecasting Accuracy Tracking Process to improve Sales Performance
- Development of the eBusiness mySeagate Portal: Work with the eBusiness, Marketing, and Information Technology teams to identify, document and validate the business, customer, and technology requirements for the portal

Seagate is hiring our interns for full-time positions. We also have interns at Cisco, Sun, and Borland

Jobs for ISM majors

**Management of Technology (Seagate, Cisco, Apple, Sun, small start-ups):**
- Systems engineer or Business analyst
- Project Manager

**Technology of Management (Seagate, Cisco, Microsoft, Oracle, SAP):**
- Information systems/technology engineer
- Business systems developer
- Enterprise software developer

TIM (ISM) Grad Program

- Sample of Research
  - Personalized Search Engines
  - Knowledge Management in Enterprises
  - Market Mechanisms for the Future Internet
  - Resource Allocation / Scheduling in Call Centers or Service Facilities

Next steps

For more information about the program visit our Web-site [http://www.soe.ucsc.edu/programs/ism/](http://www.soe.ucsc.edu/programs/ism/)

Contact one or both of the following:
- Subhas Desai, Undergraduate Director (phone: 408-735-0820; e-mail: sdesai@soe.ucsc.edu)
- Monique Vairo, Undergraduate Advisor (phone: 831-459-2565; e-mail: monique@soe.ucsc.edu)

OSI Layers

<table>
<thead>
<tr>
<th>Layer</th>
<th>Functions</th>
<th>Protocols/Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Customer applications and user interfaces</td>
<td>Internet Explorer, Outlook Email, Real Player, ...</td>
</tr>
<tr>
<td>Presentation</td>
<td>User interface protocols</td>
<td>TCP, UDP, Internet Protocol (IP), ...</td>
</tr>
<tr>
<td>Session</td>
<td>Session management</td>
<td>Ethernet, Wi-Fi, SONET, ...</td>
</tr>
<tr>
<td>Transport</td>
<td>Data transfer</td>
<td>Modulation Schemes: QAM, OFDM, etc...</td>
</tr>
<tr>
<td>Network</td>
<td>Link and network configuration</td>
<td></td>
</tr>
<tr>
<td>Link</td>
<td>Physical medium</td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>Physical channel</td>
<td></td>
</tr>
</tbody>
</table>
Some Typical Topologies

Home Network

Small/Medium Business

Large E-Business

ISP Topology

Network Service Provider

Web Caching
- Speed up web page loading by storing previously seen components locally

http://www.ucsc.edu

Cache on Hard Drive
**Akamai Case**

**Internet Bottlenecks**
- **First Mile (Server Capacity)** - 70% of website performance problems according to one study
- **Backbone** - Plentiful, but some shortage within metropolitan areas
- **Peering** - Exchange of traffic between NSPs
- **Last Mile to home**
  - 56 K modems are slow
  - Shared LAN limitations

**Solutions**
- **Expand Bandwidth**
  - Being done
- **Mirroring web cites**
  - Put exact copy of same web page to multiple servers
  - Tricky to duplicate content
- **Caching**
  - Problem: Stale Content
  - Problem: Hard to count "click throughs"
- **Content Distribution Networks...**

**Freeflow**
- Deployed in 1999
- **Akamai Infrastructure**
  - 13000 servers in 954 networks by 2001
- **Customers**
  - Large Commercial Websites
- **Revenue model** - $2000 per mbps served
  - (For comparison, normal Internet access cost 500 mbps at time)

**2000 Financials**
- **$196 Million Loss** (before special charges)
- **$90 million revenue**
- **20% gross margin, after deducting**
  - server depreciation
  - payments to network partners
  - Data center space
  - But, most expenses of shouldn't grow at same rate as number of customers, so margin should improve
- **$201.5 million SG&A**
  - (selling general and administrative)
  - (largely sales force cost)
  - Again, this might not grow at same rate as the number of customers.
- **$40 million R&D**
Competition

- Hosting firms (substitute)
  - Exodus
- Other CDNs
  - Sandpiper, Adero, Mirror Image
- Content Alliances
  - Akamai’s competitors banded together to share networks

2001 Market Changes

Bad
- Dot-coms bust
- Customers leave
  - "churn rate goes to 22% per quarter"

Good
- Hosting firms go bust (exodus)
- Some CDN competitors go bust.
- Competing CDN alliances mired in problems

EdgeSuite

- Assemble dynamic pages at edges rather than just serve heavy objects
- Value proposition
  - Performance improvement
  - Cost and complexity reduction
  - Scalability
  - Security
- Pricing – higher than old service
- Soon edge suite dominated revenue

Technology

Dynamic CDN technology: ESI (edge sides includes)

Develop as open standard why?

Akamai not big and credible enough to force a de-facto standard on market

Marketing

- Difference in selling old vs new products:
  - Old product
    - Geared toward speeding up websites
    - Revenues of their clients depended on speed
    - Easier to get sale
  - New Product
    - Simplify company IT function
    - Cost vs. revenue center
    - Harder sell. More data driven.
      - Consequently new product needs more professional sales force
- Channels?
  - Distribution Partners (IBM) credibility
  - Direct Sales Force too
## Recent Performance

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue</th>
<th>Total Cost and Operating Expenses</th>
<th>Net Income (Deductors)</th>
<th>Net Income (Addition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>$325,646</td>
<td>$317,139</td>
<td>$3,507</td>
<td>$2,049</td>
</tr>
<tr>
<td>2005</td>
<td>$370,104</td>
<td>$372,730</td>
<td>(24,627)</td>
<td>(24,627)</td>
</tr>
<tr>
<td>2006</td>
<td>$294,477</td>
<td>$294,477</td>
<td>(24,020)</td>
<td>(24,020)</td>
</tr>
<tr>
<td>2007</td>
<td>$278,382</td>
<td>$278,382</td>
<td>(24,020)</td>
<td>(24,020)</td>
</tr>
</tbody>
</table>

(In thousands, except share data)