Information Systems

Fundamental Driving Forces
- Apply to the information systems and services industry
- Are restructuring the role of IS management
  - Reactive to proactive
  - Technology-driven to user-driven
  - Centralized to "federated"

Key Business Trends:
- Shorter product life cycles
- More customization/specialization
- Narrower market segments
- Higher impact of technology
- More competition from overseas vendors

Blocking Factors
- Infrastructure gridlock
- Lack of qualified in-house personnel
- Existing applications portfolio
- Organizational response time

Create opportunities for the information services industry

Strategic Values
- Information
- Information systems (IS)
- Information technology (IT)

Information Systems Major Issues
- Rising management expectations
- Demands for increasingly complex solutions
- Managing the technology investment
- Integration of data/technology/applications
- Delivery of "mission-critical" systems
Information Systems
Driving Forces
1. Bottom line return
2. Rapid response and deployment
3. Expanding wealth of technology
4. International competition
5. Unstable organizational environments
6. Integration

Where's the Productivity?

IS Trends
• IS to reduce costs
• IS for competitive advantage
• Mission-critical systems
• Inter-enterprise systems
• Integrated customer-oriented systems

IS Issues
• Reporting structure
• Scope of responsibility
• Budgetary authority
• Senior management people expectations

Make vs. Buy

Development
• Where performed?
• By whom?
Telecommunications

• Responsibility?
• Integration?

Other Issues

• Education and training
• Standards and policies

Internal IS Considerations

• Who owns the data?
• Who gets benefit from its use?
• Is information an "asset"? Or is it free?

Information Systems Priorities

• Clear expectations of IS
• Identify mission-critical processes
• Application development—use all alternatives

Information Systems Priorities

• Data management—company-wide orientation
• Technology architecture—network management
• Central IS—consulting role

Complexity of the Requirement
Breadth of the Relationship

Law 1
Rate of supply > rate of absorption

Buying Process Changing
- Involves
  - Users
  - IS management
  - Finance
  - Corporate management
- More specialists

Complexity
- Computers
- Office Systems
- Service Software Support

Limits to Growth
- Absorption rate
  - Implementation
  - Education and training
  - Organization changes
  - Resistance to change
  - Logistics

Technology is a Mixed Blessing
- Technology adds complexity
- Poor application is counter-productive
- Change process with systems

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Ranking of Key Technology Trends
1. Integrated data bases (relational)
2. Platform independence/systems connectivity
3. CASE technologies
4. Expert systems
5. On-line transaction processing

Ranking of Impact of New Technologies
1. Image processing
2. Voice recognition
3. Natural language processing
4. Self-teaching expert systems

Technology Trends
- Not a driving force
- Evolutionary vs. revolutionary
- Three phases of technology application
  - Comparative advantage
  - Comparative parity
  - Comparative necessity

Without Change There is No Benefit from IS

The Human Element
- Changing systems is a process
- Evolution not revolution

Concerns
- Ergonomics
- Health
- Deskilling
- Organization
- Redundance
- Progress
CIM—The Human Element

- U.S.
  - Technology as a fix
- Japan
  - Technology plus people

V.P. Humatics

Corporate Organization

- IT and IS will change the organization
- How will it operate?
- People
  - How many?
  - When?
  - What skills?

Key Future Trends—Impact on IS

<table>
<thead>
<tr>
<th>Trend</th>
<th>Impact on IS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business integration—within companies</td>
<td>Centralization of infrastructure planning</td>
</tr>
<tr>
<td>Business integration—between companies</td>
<td></td>
</tr>
<tr>
<td>Decentralization of technology</td>
<td></td>
</tr>
</tbody>
</table>

Industry Structure Model

- Information-oriented
- Service-oriented
- Product-oriented
Information-Oriented
- Heavy involvement in enterprise planning
- Strong technology strategy
- Mixed systems development roles
- Strong core operations

Service-Oriented
- Varied involvement in enterprise planning
- Mixed technology strategy
- Centralized systems development roles
- Strong core operations

Product-Oriented
- Varied involvement in enterprise planning
- Varied technology strategy
- Varied systems development roles
- Varied core operations

Evolution of CIO Role
- Role will not disappear
- Same objectives/problems
- More focus on strategy/planning
- Less focus on systems development/operations
- Stronger focus on telecom/network

IS Organization in the 1990s
Not Centralized
Not Decentralized
Federated
Brought together "by agreement of each party to sublimate its power to the central authority in common affairs." - Webster
### Federated IS Organization

<table>
<thead>
<tr>
<th>Federal Government</th>
<th>Corporate IS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defense</td>
<td>Competition</td>
</tr>
<tr>
<td>Treaties</td>
<td>Partnerships</td>
</tr>
<tr>
<td>Regulation</td>
<td>Standards</td>
</tr>
<tr>
<td>National programs</td>
<td>Corporate systems</td>
</tr>
<tr>
<td>National policies</td>
<td>Corporate policies</td>
</tr>
</tbody>
</table>

### Corporate Information Systems Organization Style

- Smaller
- Expert based—technology and business
- Consulting style—information engineers and solution builders
- Marketeers for technology

### IS Responsibilities—1990s

- Support organizational units at all levels in use of:
  - Information
  - Information systems and services
  - Information technology

### Communications

- Executives
- Customers (users)
- Staff

### Federated IS Organization

<table>
<thead>
<tr>
<th>State Government</th>
<th>Unit IS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citizens</td>
<td>Customers</td>
</tr>
<tr>
<td>Local issues</td>
<td>Business support</td>
</tr>
<tr>
<td>Operating programs</td>
<td>Operating systems</td>
</tr>
<tr>
<td>Policy implementation</td>
<td>Policy implementation</td>
</tr>
</tbody>
</table>

### IS Responsibilities—1990s

- Treat "users" as customers
- Analyze "make" or "buy" decisions
- Consult on strategy and direction
Information Systems Technology Trends

- Integrated data bases (relational)
- Platform independence/systems connectivity
- CASE technologies
- Expert systems
- On-line transaction processing capabilities

U.S. Information Systems Expenditures, 1990

IS Market Structure—1980s

Key Trends for the 1990s

- Changing market channels
- Internationalization of offerings
- Standards a growing influence
- Vendor consolidation
- Professional services—"the glue"

Impacts

- Looking outside for solutions
- Buying process changing
  - Users
  - IS management
  - Corporate management
  - Finance
  - Partnerships with vendors

Information Systems Budget Impact of Economic Slowdown

4th Quarter 1990
Planning for a Recession

No Plan | Yes, Corporate Plan
---------|---------------------
78       | 22

78% have restrictions in place now.

Information Systems Budgets

More than 5% decrease: 10%
Minus 5% to plus 5%: 57%
More than 5% increase: 37%

Current Spending Restrictions Organization-Wide, 1990

- 54% have restrictions in place now.
- Of those with restrictions:
  - 42% closely monitor all expenses
  - 31% limit or have frozen hiring
  - 21% limit or have frozen capital spending

1991 Spending Restrictions Organization-Wide

- 58% plan for restrictions in 1991
  - Only 4% above those with 1990 restrictions

1991 Spending Restrictions Organization-Wide

- For the 4%, plans include:
  - Across-the-board cuts
  - Staff reductions
  - Reducing new development

IS Budget, 1990 vs. 1991 Staff

Dec. 5%+: 16
Dec. 5% to Inc. 5%: 77
Inc. 5%+: 17
IS Budget, 1990 vs. 1991

Hardware

- Dec. 5%+: 8
- Dec. 5% to Inc. 5%+: 28
- Inc. 5%+: 64

Percentage of Respondents

5%+

5%

100

IS Budget, 1990 vs. 1991

Software Products

- Dec. 5%+: 6
- Dec. 5% to Inc. 5%+: 58
- Inc. 5%+: 36

Percentage of Respondents

5%+

5%

100

IS Budget, 1990 vs. 1991

Outside Services

- Dec. 5%+: 18
- Dec. 5% to Inc. 5%+: 68
- Inc. 5%+: 14

Percentage of Respondents

5%+

5%

100

IS Budget, 1990 vs. 1991

Telecommunications

- Dec. 5%+: 11
- Dec. 5% to Inc. 5%+: 71
- Inc. 5%+: 18

Percentage of Respondents

5%+

5%

100

1991 Economic Impacts on Hardware Spending

- Mainframe: 14
- Midrange: 14
- LANs: 18
- PC/Workstation: 34

Percent Delaying Expenditures

5%+

5%

40

Systems Downsizing

- 52% implementing downsizing
- 20% planning or considering
Recessionary Impacts
• Recessionary impacts
  - 53% no impact
  - 39% would increase spending
  - 8% would slow

Recessionary Impacts on Information Services
• Question: "If moderate recession, what impacts?"
• Consulting
  - 42%—Spending down more than 10%
  - 39%—Spending unchanged

Recessionary Impacts on Information Services
• Processing Services
  - 59%—Spending unchanged
  - 33%—Increase spending more than 10%

Recessionary Impacts on Application Development
Accelerate projects 24
Delay projects 35
Cancel projects 9

Recessionary Impacts on Information Services
• Systems Development
  - 41%—Spending down more than 10%
  - 27%—Spending unchanged

Recessionary Impacts on Information Services
• Systems Integration
  - 29%—Spending down more than 10%
  - 47%—Spending unchanged
Recessionary Impacts on Information Services

- Systems Operations (Outsourcing)
  - 50%—Spending unchanged
  - 33%—Increase spending more than 10%

1991 Spending—Impacts Have Begun

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>1991 Budget</th>
<th>Recession Spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process manufacturing</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Federal government</td>
<td>n/c</td>
<td>-</td>
</tr>
</tbody>
</table>

+ = Budget/spending up
n/c = No change
- = Budget/spending down

INPUT

1991 Spending—Impacts Probable

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>1991 Budget</th>
<th>Recession Spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Banking and finance</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>State &amp; local government</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

+ = Budget/spending up
n/c = No change
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INPUT

1991 Spending—Minimal Impacts Expected

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>1991 Budget</th>
<th>Recession Spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insurance</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Medical/health care</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Business/consumer svcs.</td>
<td>+</td>
<td>n/c</td>
</tr>
</tbody>
</table>

+ = Budget/spending up
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1991 Spending—Minimal Impacts Expected

<table>
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<tr>
<th>Market Sector</th>
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<tbody>
<tr>
<td>Utilities</td>
<td>n/c</td>
<td>n/c</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>n/c</td>
<td>n/c</td>
</tr>
<tr>
<td>Education</td>
<td>+</td>
<td>n/c</td>
</tr>
</tbody>
</table>

+ = Budget/spending up
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- = Budget/spending down

INPUT

3/7/91
Users: Recession-Related Topics
- Recession vs. current restrictions
- Negotiating and trade-offs
- Speeding vs. slowing development
- Inside vs. outside development
- Inside vs. outside systems operations

Vendors: Recession-Related Topics
- Vendor vs. user spending restrictions
- Implications of user downsizing
- Inside vs. outside development
- Inside vs. outside systems operations
- Sector-by-sector questions

Information Technology Implementation Trends

Information Technologies Surveyed
- Image processing
- Cooperative processing
- CASE
- Distributed DBMS
- Object-oriented programming

Information Technologies Surveyed
- LANS, WANS, MANS
- Open systems
- SAA
- UNIX
- Data center management

Technology Implementation IS vs. Business Inhibitors

3/7/91
Technology Status and Timing
Networks/Communications

LAN Interconnections

LAN Use—Active
Central Applications

LAN Use—Active
PC Applications
**Effectiveness of LAN Interconnections**

<table>
<thead>
<tr>
<th>Level</th>
<th>Percent of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - very effective</td>
<td>19</td>
</tr>
<tr>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>3</td>
<td>42</td>
</tr>
<tr>
<td>2</td>
<td>26</td>
</tr>
<tr>
<td>1 - not effective</td>
<td>0</td>
</tr>
</tbody>
</table>

**Status of Image Processing**

- **Not Considered To Date**: 13%
- **In Production**: 18%
- **Prototype**: 5%
- **Planned**: 11%
- **Under Consideration**: 33%
- **-91**

**Image Processing in Use by Industry**

<table>
<thead>
<tr>
<th>Industry</th>
<th>In Use (Percent)</th>
<th>Planning (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insurance</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Transportation</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>Discrete Mfg</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Process Mfg</td>
<td>10</td>
<td>23</td>
</tr>
</tbody>
</table>

**Image Processing Applications**

- **Account Payable**
- **Document Management**
- **Drawings**

<table>
<thead>
<tr>
<th>Application</th>
<th>In Use</th>
<th>Planned or Considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Archives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
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**Image Processing Applications**

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<td></td>
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<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Issues for Image Processing

Cost/Cost Effectiveness Integration Training Software Other

Note: Multiple responses allowed

Percent of Responses

Effectiveness of Image Processing Systems

5-very effective

0

4

21

46

1-not effective

0

37

37

30

20

10

0

Percent of Responses

Application Development Issues

Issues
Funding Re-engineering Human resources availability End-user application development

Overall Importance
6 1 2 4

Controlling Application Maintenance Resources

Limited resource allocation 71
Purchased software replacement 43
Re-engineering of applications 38

% Using

Average Percentage of Resources

Allocation of Development Resources

Maintenance Enhancement New Development

0 10 20 30 40 50

INPUT

INPUT

INPUT

INPUT
Controlling Application Maintenance Resources

| Maintenance only function | 34 |
| Contract out              | 22 |
| Assign to user            | 18 |
| Recode                    | 13 |

Controlling Application Maintenance Resources

| Limited resource allocation | 2.7 |
| Contract out                | 2.7 |
| Assign to user              | 2.6 |

Controlling Application Maintenance Resources

| Re-engineering of applications | 3.1 |
| Maintenance only function      | 2.8 |
| Purchase of software replacement | 2.7 |

\* 1 = not effective, 5 = very effective

CASE Activity by Industry

<table>
<thead>
<tr>
<th>Industry</th>
<th>% Using</th>
<th>% Considering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discrete Mfg.</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Process Mfg.</td>
<td>14</td>
<td>32</td>
</tr>
<tr>
<td>Utilities</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Insurance</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Transportation</td>
<td>9</td>
<td>16</td>
</tr>
</tbody>
</table>

Issues in Using CASE

<table>
<thead>
<tr>
<th>Issue</th>
<th>Using</th>
<th>Considering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff acceptance</td>
<td>✓✓✓✓</td>
<td>✓✓</td>
</tr>
<tr>
<td>Cost/training</td>
<td>✓✓✓</td>
<td>✓</td>
</tr>
<tr>
<td>Integration</td>
<td>✓✓✓</td>
<td>✓✓</td>
</tr>
<tr>
<td>Planning</td>
<td>✓✓✓</td>
<td>✓</td>
</tr>
<tr>
<td>Proven results</td>
<td>✓✓</td>
<td>✓</td>
</tr>
<tr>
<td>Methodology</td>
<td>✓✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Effectiveness of CASE

5-very effective: 10
1-not effective: 48

Percentage of Responses

3/1/91
Consolidation of Data Centers

- In Process: 15%
- Planned for 1991: 8%
- Not Planned: 27%
- Considered and Rejected or Deferred: 50%

Data Center Objectives

- Consolidation of Centers
  - 1990
  - 1991
  - 1993
  - 1995

- SO Vendor

Information Technology Trends Observations

- Inhibitors differ between IS and top management
- Technologies apparent to top management adopted faster
- Learning curves remain—witness image processing and CASE

Advance of Technology versus Planning Focus

- 1970
- 1995
- Client/Server
- LANS
- PCs
- On-Line
- RJE
- Central Processing
Advance of Technology versus Planning Focus

User Involvement in IS Planning
- End-User
- Middle Mgmt.
- Operations Mgmt.
- Top Mgmt.

1970 - 1995

Revolution
- Downsizing
- Outsourcing
- Networking

1991 Issues
- IT justification
- Impact of the economy

IS Function
Information Systems View
- President
  - Oper.
  - Fin./Acctg.
  - Sales/Mkt.
  - IS

IS Function
General Management View
- President
  - Oper.
  - Fin./Acctg.
  - Sales/Mkt.
  - IS

IS Function
The View in 2001
- President
  - Oper.
  - Fin./Acctg.
  - Sales/Mkt.
  - IS

4/30/92
Question
What thresholds are crossed with technology improvement?

Technology Forecasts
• Printing 100 MIPS computer this decade
• Using 100 MIPS computers in hand-held devices
• Megabit transmission rates common and affordable