Enterprise Systems

Information Technology For Management 6th Edition
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Based on lecture slides by L. Beaubien, Providence College

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Integration: Internal vs. External

- Internal integration refers to integration within company between applications, and/or between applications and databases.
- External integration refers to integration of applications and databases among business partners.
- Enterprise Resource Planning (ERP) vs. Supply Chain Management (SCM) / Customer Relationship Management (CRM)
- Enterprise Systems span all or some functional areas in an organization.
Enterprise Resource Planning

- A software application which is built around an integrated database and which supports all the major functional areas and business activities of an organization, no matter where its facilities are located.
The vision of having an integrated IS began on the factory floor
- MRP used inputs of forecast inventory levels and lead times
- MRP II incorporated more links to other functions order processing and product costing
- ERP is viewed as an extension of MRP II provided better visibility of operational data
There are two constraints that affect how we have traditionally designed organizations.

- No integrated data
- No universal communications
As a result, we created functional organizations, slow communications, and fragmented business processes.

Significant communication has to go up before it goes across.
Organizational Structure

The stovepipes participate in the end-to-end business processes, but they do not see how it all fits together.
Pieces of the end-to-end business process are held in stand-alone databases.
The information systems are fragmented, just like the organizations and processes. Different phases of the product cycle will use redundant, conflicting databases.
To make things worse, each top manager has a different incentive.

Organizational Structure

- **CEO**
  - **VP Finance**
  - **VP Marketing**
  - **VP Manuf'ing**
  - **VP Logistics**

<table>
<thead>
<tr>
<th>Incentive</th>
<th>CEO</th>
<th>VP Finance</th>
<th>VP Marketing</th>
<th>VP Manuf'ing</th>
<th>VP Logistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep costs down</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>High employee utilization</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>High machine utilization</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sell lots of units</td>
<td></td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Profitability</td>
<td></td>
<td>?</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Minimize leased space</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Units produced</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This difference in incentives creates a phenomenon called “suboptimization,” in which every manager meets his/her objectives, but the overall objectives of the company are not met.
Who is responsible for the product end-to-end?

CEO

Costs
- Leases
- VP Finance

Units Sold
- VP Marketing

Employee Utilization
- Machine Utilization
- Units Produced
- VP Manufacturing

Costs
- Employee Utilization
- VP Logistics

Product Life Cycle

Market Share

Profitability
There are several alternatives to organizational design.

- Divisional structure
- Hybrid structure
- Matrix structure
- Teams
Organizational Structure

Divisional by Geography.

1. **CEO**
2. **VP North**
   - Fin
   - Mkt
   - Man
   - HR
3. **VP South**
   - Fin
   - Mkt
   - Man
   - HR
4. **VP East**
   - Fin
   - Mkt
   - Man
   - HR
5. **VP West**
   - Fin
   - Mkt
   - Man
   - HR
Organizational Structure

Hybrid solution - mixing functional and divisional.
The matrix organization combines the features of both functional and divisional organizations. It is frequently used for projects, programs, and products. Has higher demands for communication and coordination.
Teams represent a refinement of the matrix organization.
Network organizations are designed from the ground up around an improved business process.
New end-to-end responsibility is supported by the integrated database.
Activity

- Find one ERP vendor, and look through the list of functionalities as well as industry solutions (if any) offered.
- Do you think anything is missing?
Eventually, companies realized that an ERP was needed to truly integrate the organization and allow reengineering of its business processes.

- **HR Processes**
  - Hire
  - Fire
  - Pay
  - Train

- **Financial Processes**
  - Pay bills
  - Collect Bills
  - Pay taxes
  - Compute costs

- **ERP**
  - Customer Data
  - Product Data
  - Location Data
  - Employee Data
  - Market Data
  - Cost Data
  - Billing Data
  - Order Data
  - Production Data

- **Manufacturing Processes**
  - Design product
  - Build product
  - Assemble product
  - Test product
  - Order materials
  - Store materials

- **Marketing Processes**
  - Determine price
  - Sell product
  - Take an order
  - Deliver product

**Enterprise Resource Planning**
An integrated database must be based on a logical model of the company and its data - a data model.
Properties of ERP

- Integrated in nature – when data are entered into one of the functions, information in all related functions is changed.

- They are modular in structure. A company can implement all the modules or a subset of them.
  - Best of Breed approach: Integrating modules from different vendors.
  - Implementing it is more complex because of the interfaces that need to be established. (Ex: Peoplesoft (Oracle) + SAP)

- Open architecture. Bolt-ons such as DSS can be integrated easily.
  - DSSs offered by ERP vendors are not good enough (Ex: SAP’s APO, data mining)

- Customization. ERP systems can be adapted to different companies and their needs.
<table>
<thead>
<tr>
<th>In support of ERP...</th>
<th>Criticizing ERP...</th>
</tr>
</thead>
<tbody>
<tr>
<td>An ERP system is a solution panacea for all the IS woes of an enterprise and will be the only IS an enterprise needs to conduct its business.</td>
<td>The application of an ERP system is the domain of only the very large companies.</td>
</tr>
<tr>
<td>The ERP approach simplifies and standardizes systems across the enterprise, making it easier to upgrade systems in the future. (The most common reason)</td>
<td>ERP systems became popular solely because of the Y2K problem; with Y2K a distant memory, the future of ERP is bleak.</td>
</tr>
<tr>
<td>An ERP system typically reduces the cost of IT operations and the number of personnel needed to maintain the organizational IS.</td>
<td>An ERP system and its implementation are very expensive. The system needs extensive modifications, or the company needs to go through a major reengineering process to use it.</td>
</tr>
<tr>
<td>An ERP system forces all processes to be integrated and a high level of data integrity to be achieved.</td>
<td>Installed ERP systems are typically slow and cannot meet the transaction needs of most companies. (They are very inflexible)</td>
</tr>
<tr>
<td>ERP is an excellent decision support tool that will provide a competitive advantage.</td>
<td>ERP systems have not provided the returns on investment that were originally predicted.</td>
</tr>
<tr>
<td>ERP systems embed all the best practices for various processes, allowing a firm to configure the systems quickly and easily so as to minimize implementation costs.</td>
<td>Many firms have gone out of business primarily because of the implementation of an ERP system.</td>
</tr>
<tr>
<td>ERP systems allow for better global integration. (The second most common reason)</td>
<td>ERP systems increase the IT costs and staff head counts.</td>
</tr>
<tr>
<td></td>
<td>Multiple additional systems are needed for smooth functioning, in spite of an ERP implementation.</td>
</tr>
</tbody>
</table>
The organization’s culture can fight the implementation and effective use of the ERP.

Not invented here

- Fight introduction of third-party software
- Refuse to follow the ERP’s business model, insisting that the company’s way is unique and must be continued.

Shoot the messenger

- ERPs require reengineering of business processes.
- But reengineering requires a frank analysis of weaknesses and problems.
- Organization does not want to hear the bad news.
**ERP and Culture**

**Empire building**
- ERPs require reengineering of business processes.
- Some paper-based empires will go away.
- Other departments will be outsourced.
- Middle management will shrink.

**Cards close to vest**
- ERP’s integrated database makes all the data more visible and accessible.
- Some empires depend on other people not knowing what they do.
ERP and Culture

It’s not my job

• Integrated database expands jobs.
• Integrated database removes excuses.

Work harder, not smarter

• Organization has a bias against asking questions
ERP and Culture

The culture is reinforced by the official and unofficial reward systems. Traditional reward systems contributes to isolation and ERP will suffer.

Individual goals
Individual rewards

- Low Costs
  - VP Finance
- Units Sold
  - VP Marketing
- Machine Utilization
  - VP Manuf-ing
- Employee Utilization
  - VP Logistics

- Not invented here
- Shoot the messenger
- Risk averse
- Cards close to the vest
- Empire building
- It’s not my job
The use of common goals and shared rewards helps to break down the walls between departments.

New

- Market share, Profitability, Stock price
- Cost goals
- Volume goals
- Utilization goals

Old

- Not invented here
- Shoot the messenger
- Risk averse
- Cards close to the vest
- Empire building
- It’s not my job
ERP and Culture

Change Management activities

• Forums with top management
• Training sessions
• Team building activities
• Communications programs
### Implementation Cost Breakdown

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Average Cost</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consulting</td>
<td>30%</td>
<td>20–60%</td>
</tr>
<tr>
<td>Hardware/Infrastructure</td>
<td>25%</td>
<td>0–50%</td>
</tr>
<tr>
<td>Implementation Team</td>
<td>15%</td>
<td>5–20%</td>
</tr>
<tr>
<td>Training</td>
<td>15%</td>
<td>10–20%</td>
</tr>
<tr>
<td>Software</td>
<td>15%</td>
<td>10–20%</td>
</tr>
</tbody>
</table>

**Costs of Implementing ERP**
Costs of Implementing ERP

One large company stated that it spent around $100M on the installation of SAP.

<table>
<thead>
<tr>
<th>Unit Measure</th>
<th>Unit Cost</th>
<th>Num Units</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/W</td>
<td>$4,000</td>
<td>5,000</td>
<td>$20,000,000</td>
</tr>
<tr>
<td>H/W</td>
<td>$3,000</td>
<td>3,500</td>
<td>$10,500,000</td>
</tr>
<tr>
<td></td>
<td>$75,000</td>
<td>8</td>
<td>$600,000</td>
</tr>
<tr>
<td>Network</td>
<td>$10,000</td>
<td>500</td>
<td>$5,000,000</td>
</tr>
<tr>
<td></td>
<td>$2,000</td>
<td>500</td>
<td>$1,000,000</td>
</tr>
<tr>
<td></td>
<td>$2,000,000</td>
<td>1</td>
<td>$2,000,000</td>
</tr>
<tr>
<td>Internal labor</td>
<td>$100,000</td>
<td>100</td>
<td>$10,000,000</td>
</tr>
<tr>
<td>Consulting</td>
<td>$625,000</td>
<td>50</td>
<td>$31,250,000</td>
</tr>
<tr>
<td>hourly rate</td>
<td>$250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hours/yr</td>
<td>2.500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>years</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultant Expenses</td>
<td>$100,000</td>
<td>50</td>
<td>$5,000,000</td>
</tr>
</tbody>
</table>

**Total:** $85,350,000
ERP Implementation

- Successful companies
  - involved their heavy end users throughout the implementation process instead of providing training at the very end
  - viewed ERP system as a business solution not an IT solution
  - analyzed their operations thoroughly before the implementation and identified any discrepancy between current practices and ERP system (business processes and rules such as those used in case of credit violation, pricing, and inventory sourcing)
  - formed implementation teams
    - Dedicated teams in large firms vs small firms
    - Knowledge transfers
Democratic and transformational leadership is needed at certain points. At other points, leadership must be autocratic and transactional.
Decisions go lower in the organization. Some jobs go away. Other jobs get expanded.
Discussion

- ERP systems implement best practices, and thus allow for learning in management concepts. What might be drawbacks in this?

- If customizing is not enough to adapt the software to a company's needs, the program code can be changed. What might be problems resulting from this?
Supply Chain Definitions

- **Supply chain**: The flow of materials, information, money, and services from raw material suppliers, through factories and warehouses to the end customer; includes the organizations and processes.
- **Supply chain management (SCM)**: The planning, organizing and coordinating of all supply chain’s activities.
- **E-supply chain**: A supply chain that is managed electronically usually with Web-based software.
The Flows in the Supply Chain

- **Materials flows:** These are all physical products, raw materials, supplies, and so forth, that flow along the chain. The concept of materials flows include reverse flows - returned products, recycled products and disposal of materials or products.

- **Information flows:** All data related to demand, shipments, orders, returns, and schedules.

- **Financial flows:** All transfers of money, payments, credit card information and authorization, payment schedules, e-payments and credit related data.
An Automotive Supply Chain
Example: American Hospital Supply Corporation (AHSC)

- AHSC sold products through travelling sales people who filled in order forms and mailed to HQ
  - a typical customer: a hospital with 800 beds
    - 30,000 different products
    - about 10 separate purchasing units (pharmacy, cafeteria, etc.)
    - about 50,000 orders per year
  - difficult to process
  - prone to errors
The Problem Customer (early 60s)

- One customer complained heavily about delivery speed and errors
- A creative manager in AHSC developed the following system
  - a dataphone (IBM 1001) was installed at the hospital’s purchasing department
  - the dataphone could process preprinted cards and pass the data over the phone line
  - the dataphone was connected to a card printer (IBM 026) at the AHSC distribution center
  - the hospital was given preprinted cards for every single item they purchase from AHSC
The Problem Customer (early 60s)

- these cards were placed in the storage area right above the safety stock of each item
- as items were consumed, when a card was reached, this prompted an order
- the card was taken from the shelf and placed in a box
- at the end of the day, all of the cards in the box were ‘passed’ to AHSC
- these copied cards were fed into a AHSC computer for order processing

• the system was a big hit and was spread to 200 hospitals in a short time
Evolution of ASAP

- **1970s:** The system was named ASAP (analytic systems automated purchasing)
  - updated with new electronic equipment
  - allowed for modification of order quantities
- **1977:** ASAP 2: terminals connected customers to AHSC
  - could see prices, stocks
  - proposed substitutes for out of stock items
  - supported e-messages
Evolution of ASAP

- **1980 ASAP 3**
  - customers can use their own product codes
  - electronic files for repetitive ordering
  - bar code readers (later)

- **1983 ASAP 4**
  - linked customer computers to AHSC computers
  - automatic order file preparation
  - confirmation of order
  - updating delivery dates

- **1984 ASAP 5**
  - decision support tools for customers
Supply Chain Problems and Solutions

- Problems along the supply chain from two sources: Uncertainties and the need to coordinate several activities, internal units and business partners
- A major source of supply chain uncertainties is demand forecast. The actual demand may be influenced by several activities such as competition, prices, weather conditions, technological developments, customers’ general confidence, delivery times and more.
- Trust is a major issue
- Make-or-buy decisions
- Vendor selection
- Reverse logistics
Bullwhip Effect

Erratic shifts in orders up and down the supply chain. It is related to properly setting inventory levels in various parts of the supply chain.
Solutions to Supply Chain Problems

- Vertical integration: integrate with the upstream part of the supply chain, typically by purchasing up-stream suppliers, in order to ensure better coordination (before 1980s).
- Using inventories: The most common solution used by companies to solve supply chain problems is building inventories as an “insurance” against supply chain uncertainties (before 1990s).
Contemporary Solutions to SC Problems

- Information sharing: sharing information along the supply chain can improve demand forecasts. Such sharing can be facilitated by EDI, extranets, and groupware technologies, based on master data management.
- E-Business: Use of Internet, electronic marketplaces etc.
- Vendor-managed inventories (VMI): allowing suppliers to monitor the inventory levels of their products in the retailers’ stores and to replenish inventory when needed.
Contemporary Solutions to SC Problems

- Drop shipping: Supplier directly ships to end-consumer
- E-Procurement: Use of Internet technologies to purchase or provide goods or services
- Supply Chain Teams: Composed of people from different companies who work together
Discussion

- What effects might turn up in asymmetrical relationships (e.g. one customer for many small suppliers)?
Customer Relationship Management (CRM) is an enterprisewide effort to acquire and retain customers.

- Includes a one-to-one relationship between a customer and a seller.
- One simple idea “Treat different customers differently”.
- Helps keep profitable customers and maximizes lifetime revenue from them.
CRM Applications

- Customer-facing applications
  - areas where customers interact with company
- Customer-touching applications
  - customers interact directly with the application
- Customer-centric intelligence applications
  - analyze results of operations and improve CRM applications
- Online networking applications
  - methods that provide opportunity to build personal relationships with large numbers of people
Sales force automation (SFA) functions provide such data as sales prospect and contact information, product information, product configurations and sales quotes.

Marketing

- Cross-selling refers to the marketing of complementary products to customers.
- Up-selling is the marketing of higher-value products or services to new or existing customers.
- Bundling is a type of cross-selling in which a combination of products is sold together at a lower price than the combined costs of the individual products.
Customer service can take many forms and includes:

- Search and comparison
- Free products or services
- Technical and other information and services
- Customized products and services
- Tracking account or order status
- Personalized Web pages
- FAQs
- E-mail and automated response
- Call centers
Customer Relationship Management

- Discussion
  - Do universities employ some kind of CRM?
  - If not, how could they introduce this?