

# Managing Software Projects

Presented by  
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## Sharing Moment

- Does your company develop software projects?
- In the case study II-6 chocolate network, what does it take to run a fan page on LINE or Facebook?



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## The Need for Competitive Advantage



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## Existing Rivals

### Considerations:

- Numerous or equally balanced competitors--- mavericks are likely to make moves.
- Slow industry growth intensifies competition
- High fixed / storage costs--- cut more price to sell
- Lack of product differentiation / switching costs
- Capacity augmented in large increments
- Diverse competitors--- difficult to read competitors' intentions or reactions
- High strategic stake--- need to succeed in industry
- High exit barriers: specialized assets; fixed costs of exit; strategic interrelationships

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## Threat of New Entrants



### Considerations:

- Economies of scale
- Product differentiation
- Capital requirements
- Switching costs
- Access to distribution channels
- Cost advantages independent of scale:
  - Learning or experience curve
  - Government subsidies
  - Proprietary technology
  - Access to raw materials
- Government policy--- e.g., regulated industries

## Threat of Substitutes



### Considerations:

- Substitutions offer improved price/performance trade-off
- Substitutes produced by industries earning high profits--- substitutes often come rapidly into play if some development increases competition in these industries.
- Low switching costs to accept substitute
- Changing customer's needs and wants

## Power of Customers



### Considerations:

- Concentrated or large-volume purchases
- Product purchased is a component that is not significant to the final product's differentiation
- Products purchased are standard/undifferentiated.
- Low switching costs to buyer
- Buyer is very price conscious--- the purchased products represent a significant costs to buyers
- Buyer is likely to integrate backward
- Buyer has full information about demand, market prices, supplier costs, etc.

## Power of Suppliers



### Considerations:

- Concentration or domination of suppliers selling products to your industry
- Importance of supplied product for your business
- Your industry is not an important customer of the supplier group
- Availability of substitutes to use in your industry
- Switching costs and differentiation of supplier products
- Supplier is likely to integrate forward

## Industry Trends



<u>Trend</u>	<u>Examples</u>
Technology	ABCD; Internet
Regulatory	Deregulation: telephone & airline industries
Global markets	Manufacturing: pricing, branding
Economic	Recession: impact on disposable income
Demographic	Buying power: baby boomers, X-Y
Social values	Environmental and social issues: green, AIDS, ethics
Local laws	Non-smoking space

## Sources of Competitive Advantage

- Focused product lines \*\*\*
- Low cost product \*\*\*
- Product differentiation \*\*\*
- High quality product
- Product customization
- Product performance features
- Rapid new product introduction
- Process automation & integration
- Innovation & continual process improvement
- Quick & reliable delivery

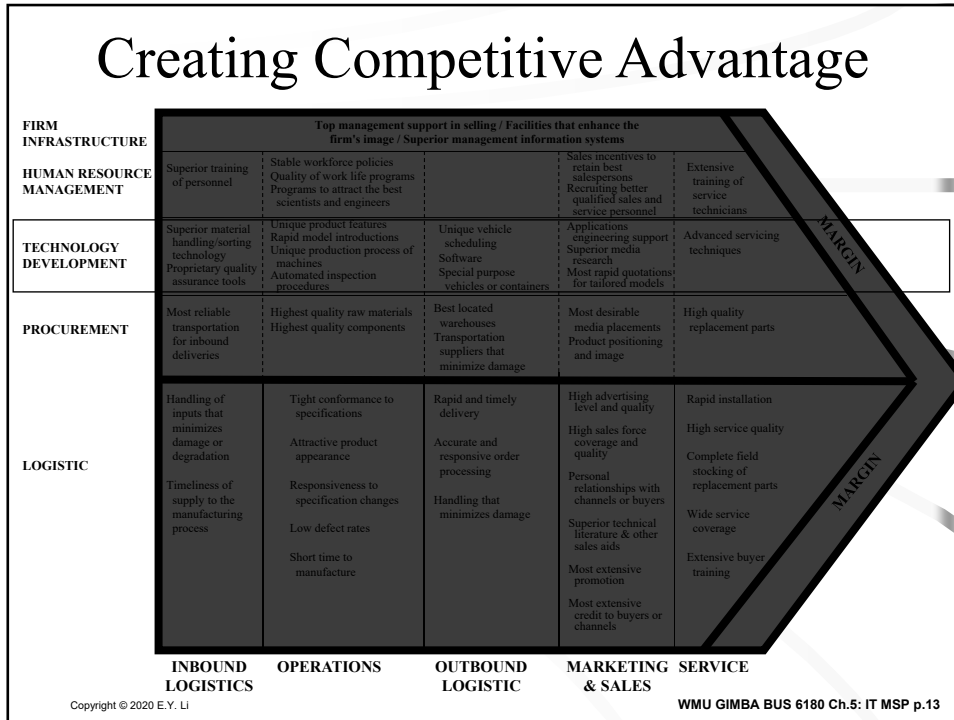
## Sources of Competitive Advantage

- Quick response to changes
- Flexibility in production rates
- Market/competitor intelligence
- Marketing research & analysis
- Leadership in technologies
- Communications within organization
- Integration of organization's subsystems--- ERP
- Computer networks with suppliers/customers--- IOS
- Integration of up/down stream business--- SCM
- Customer relationship management--- CRM
- Strategic alliance

## Sources of Competitive Advantage

- Dedicated employees
- Effective marketing mix & product mix
- Effective resources utilization
- Excellence in customer services
- Better distribution channel
- Quality of work life in the company
- Better company image
- Better political network
- Better public relation
- Better social network

# Creating Competitive Advantage



# IT Improves Processes

IT Capability	How IT Improves Business Processes
Transactional	Transform structured processes into routine transactions
Geographical	Transfer information quickly and easily across large distances, making processes indep. of geography
Automational	Reduce or replace human labor in a process
Analytical	Bring complex analytical methods to bear on a process
Informational	Bring large amounts of information into a process
Sequential	Allow multiple sequential tasks to work simultaneously
Knowledge	Allow the capture and dissemination of knowledge and expertise to improve a process
Tracking	Track the status, inputs, and outputs of a process
Disintermediation	Connect two parties directly within a process

# IT Creates Competitive Advantages

- **Lower Costs**
  - Use IT to substantially reduce the cost of business processes.
  - Use IT to lower the costs of customers or suppliers.
- **Differentiate**
  - Develop new IT features to differentiate products/services
  - Use IT to reduce the differentiate advantages of competitors
  - Use IT to focus products/services at selected market niches.
- **Innovate**
  - Create new products/services that include IT components
  - Make radical changes to business processes with IT
  - Use IT to develop unique new markets or market niches

# IT Creates Competitive Advantages

- **Promote Growth**
  - Use IT to manage regional and global business expansion
  - Use IT to diversify and integrate into other products/services
- **Develop Alliances**
  - Use IT to create virtual organizations of business partners
  - Develop IOS linked by the Internet or other networks that support strategic business relationships with customers, suppliers, subcontractors, and others
- **Improve Quality and Efficiency**
  - Use IT to improve the quality of product/services
  - Use IT to improve the efficiency of business processes
  - Use IT to shorten the time to develop, produce, and deliver



# IT Creates Competitive Advantages

- **Build an IT Platform**
  - Leverage investment in IS people, hardware, software, and networks from operational uses into strategic applications
  - Build a strategic information base of internal and external data collected and analyzed by using IT.
- **Other Strategies**
  - Use IOS to create switching costs that lock in customers and suppliers.
  - Use investment in IT to build barriers to new entrants
  - Use IT components to make substitution of competing products unattractive
  - Use IT to help create, share, and manage business knowledge

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Source: James A. O'Brien, *Introduction to Information Systems*, McGraw-Hill, 2000. WMU GIMBA BUS 6180 Ch.5: IT MSP p.17

## Level of IT Usage

### Level 5: Strategic

- IT is viewed as a competitive differentiator.
- Massive amounts of IT are supporting transaction processing, decision making, collaboration, and key business processes.
- Business processes are modified to reduce time and costs and improve quality and flexibility.

### Level 4: Offensive

- IT is viewed as a point of leverage rather than as a competitive differentiator.
- Networks of PCs and servers are proliferating in the organization.
- Organization is committed to capturing IT benefits.

### Level 3: Defensive

- IT growth is controlled to less than rate of business growth.
- IT investments follow general industry behavior.

### Level 2: Cost-Justified

- Tight control is maintained over IT.
- Technology platforms and applications are aging.
- ROI evaluations are done only at the project level.
- No overall technology deployment plan exists.

### Level 1: Controlled

- IT is viewed as expense.
- Management is unwilling to invest in computing.

Source: Richard Murray, "The Quest for World Class IT Capability," *Information Systems Management*, Summer 1991, p. 13.

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## Examples of Strategies

Strategy	Company	Business Solution	Business Benefit
<b>Cost leadership</b>	Levitz Furniture	Centralized buying	Cut purchasing costs
	Sony Corporation	Decentralized buying	Cut purchasing costs
	Metropolitan Life	Medical care monitoring	Cut medical costs
	Deere & Company	Machine tool control	Cut manufacturing costs
<b>Differentiation</b>	Navistar	Portable computer-based customer needs analysis	Increase in market share
	Setco Industries	Computer-aided job estimation	Increase in market share
	Consolidated Freightways	Customer online shipment tracking	Increase in market share
<b>Innovation</b>	Merrill Lynch	Customer cash management accounts	Market leadership
	Federal Express	Online package tracking and flight management	Market leadership
	McKesson Corp.	Customer order entry and merchandising	Market leadership

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## Examples of Strategies

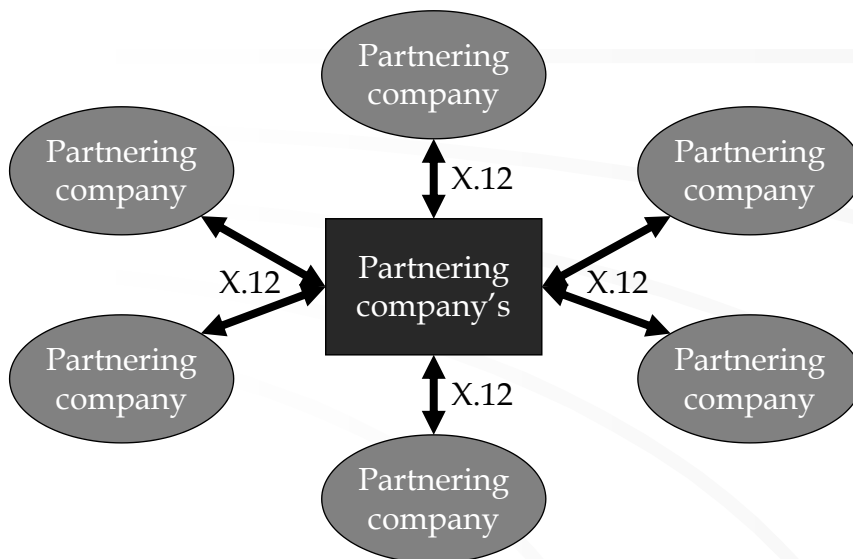
Strategy	Company	Business Solution	Business Benefit
<b>Growth</b>	Citicorp	Global telecommunications network	Increase in global market
	Wal-Mart	Merchandise ordering by satellite network	Market leadership
	Toys 'R' Us Inc.	POS inventory tracking	Market leadership
<b>Alliance</b>	Wal-Mart/ Procter & Gamble	Automatic inventory replenishment by supplier	Reduced inventory cost/ increased sales
	Levi Strauss/ Designs Inc.	Electronic data interchange	Just-in-time merchandise replenishment
	Airborne Express/ Rentrak Corp.	Online shipment tracking / inventory management	Increase in market share

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# Inter-Organizational Systems

## EDI Network (1980)



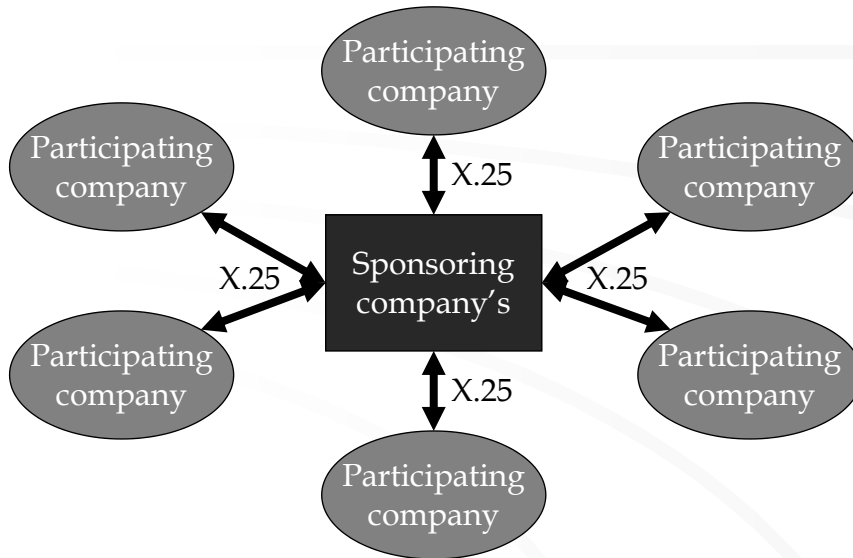
## EDI Standards

- **Electronic data interchange (EDI)**
  - ANSI X.12
  - first used 1975, standardized 1981
  - W3C's XML (Extensible Markup Language), 1998
- **Electronic data interchange for administration, commerce and transport (EDIFACT)**
  - ISO 9735
  - first edition 1988, amended 1990

## EDI Benefits

- **Reduces the delays caused by postal paper chains.**
- **Avoids the need to re-key data and therefore saves time and reduces errors.**
- **Avoids the cost of the creation, recording and storage of paper documents and records.**
- **Facilitates shorter lead times and reduced stock holdings which allow reductions in working capital requirements (i.e. just-in-time policies).**
- **Provides the opportunity to improve customer service.**
- **Provides the opportunity to reduce administrative costs.**

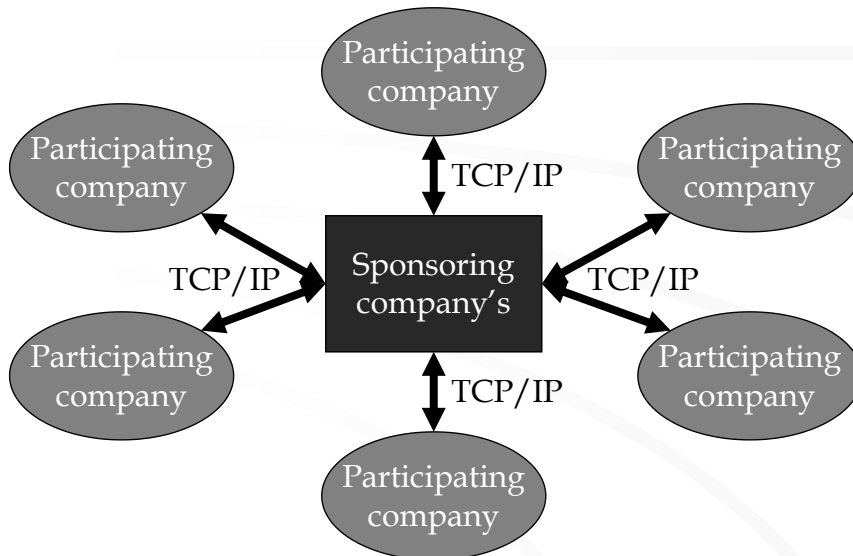
## Inter-organizational System (1990)



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## IOS via Extranet (1995)



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## Examples of IOS

- **Link to suppliers:**
  - General Motors, Sears Roebuck, etc.
- **Link to dealers or agents:**
  - AA's SABRE, TWA's PARS, UA's APOLLO, CIGNA and State Farm, Security Pacific Bank, Ford and Chevrolet, etc.
- **Link to customers:**
  - Inland Steel, Emery Air Freight, Federal Express, American President Lines installed order/freight-tracking systems for the customers to check on the progress of their orders.

## Examples of IOS

- **Link to customers:**
  - McKesson Drug's ECONOMOST began as a simple order-entry system, then expanded to include inventory management and pricing, now provides such functions as store design and layout, and preparation of income statements and balance sheets for retail customers.
  - Eastman Kodak allows small film developing labs to obtain advice on pricing and work schedules as well as order Kodak paper, chemicals, and other supplies.
  - American Hospital Supply's ASAP allows hospitals to place order electronically.

## Examples of IOS

- **Link to customers:**
  - CIGNA allows its casualty insurance customers to examine their own data stored on the insurer's computers in order to find ways of reducing their insurance bills.
  - Singer, General Electric, etc.
- **Link to customer's customers:**
  - First Boston Bank's SHELTERNET real estate loan system provides home buyers of qualified real estate brokerage with information on available loan products and initiates a mortgage application.

## Using IOS to Create Competitive Advantage

- **Comparative Efficiency**: allows an organization to produce its goods or services more cheaply than its competitors through internal efficiency and interorganizational efficiency.
  - **Improving internal efficiency:**
    - Lower inventory costs by allowing "JIT" delivery.
    - Encourage standardization of data representation, making data easier to manipulate and analyze internally.
    - Capture data more quickly, leading to faster analysis and shorter response time.

## Using IOS to Create Competitive Advantage

### – Improving interorganizational efficiency:

- "Export work" by getting customers or suppliers to do data entry and editing
- Allow customers to "shop" and check order status electronically, without tying up customer service representatives
- Provide benefits of vertical integration (more control, coordination, lower costs) without requiring actual ownership of the organizations
- Facilitate cross-selling or up-selling of additional or higher margin products

## Using IOS to Create Competitive Advantage

### – Improving interorganizational efficiency:

- Permit inexpensive, rapid electronic transmission of sales and service messages
- Increase sales of company products, due to ease and efficiency of ordering and to favorable display on order-entry screens
- Remove a level of the distribution chain by going direct to customer or user rather than through an intermediary
- Capture more precise, timely usage data allowing production, scheduling according to use rather than according to sale or shipment.



## Using IOS to Create Competitive Advantage

### – Improving interorganizational efficiency:

- Evaluate quickly and economically the effects of advertising, rebates, and other marketing programs
- Extend market reach to customers who could not be economically served by conventional field sales calls
- Relate sales message, including price and other terms, to buyer's previous experience with seller and with product
- Ship in more economical lots and be prepared to receive incoming goods by communicating with transportation companies

## Using IOS to Create Competitive Advantage

### – Improving interorganizational efficiency:

- Deliver products or services electronically, monitor compliance with policies related to customers, dealers, etc.
- Observe ordering pattern for and usage of, competitors' products
- **Bargaining Power**: allows a firm to resolve bargaining situations with its customers and suppliers to its own advantage through search-related costs, unique product features, and switching costs.

## Using IOS to Create Competitive Advantage

- **Bargaining Power:**

- **Lowering search-related costs:**

- Lower cost of "shopping" via links to suppliers; control, observe, or profit from shopping via links to customers.
    - Improve customers' ability to shop for a third-party product that generates fee income or additional sales of primary product.
    - Suggest alternative product specifications that reduce customers' costs of improve customers' performance
    - Get the best available prices on purchased materials.
    - Alert customer to opportunities to obtain volume discounts by altering order patterns slightly.

## Using IOS to Create Competitive Advantage

- **Bargaining Power:**

- **Improving unique product features:**

- Make product easier or less expensive to select, order, handle, use, or account for.
    - Enhance product image as state-of-the-art.
    - Improve customer service by identifying and reporting problems more quickly, allowing more accurate diagnosis and faster response.
    - Provide immediate feedback on product availability and price.
    - Lower required inventory levels.

## Using IOS to Create Competitive Advantage

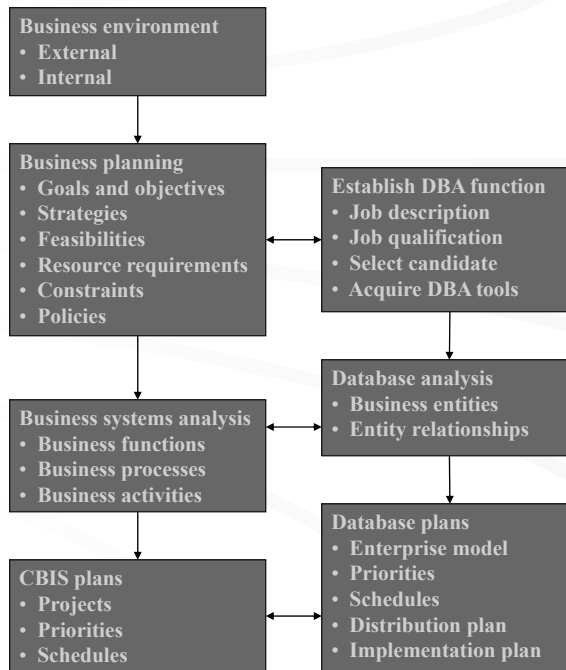
- **Bargaining Power:**
  - **Raising switching costs:**
    - Raise users' need to retrain personnel, to modify operating procedures, or to invest in new or additional hardware or software if they change to a different system.
    - Provide summary reports and other functions to users.
    - Threaten change in status of personnel if automated system is replaced by non-automated system.

## Internet Changes the Way You Compete (2000)

- **Extranet replaces VAN for IOS services.**
- **Switching costs related to retraining and hardware/software change are almost nil.**
- **Inter-organizational connection is low cost and easy using Internet.**
- **More free services can be provided to users to increase the switching cost.**
- **One to one marketing can prevail.**
- **User-personalized web front and push technology become the norm.**

# Business System Planning

## Two Milieus of BSP Process



## Enterprise Business Planning

- Where are we?
- Where do we want to go?
- When do we get there?
- How do we get there?
- Why do we get there?
- Which shall we do first?
- Who will do it?
- What do we need?
- How much will it cost?

## Strategic Business Planning

- Time frame: covering five years or longer
- Focus on: decision about the future direction
- Objective: adjusting the business over time according to the ever-changing conditions and requirements of the environment
- Task examples:
  - setting long-range objectives
  - establishing overall priorities
  - formulating the strategies (the approaches and methods) to be used to meet the objectives

## Tactical Business Planning

- Time frame: covering one to two years
- Focus on: the combined financial effects of the tactical decisions in the company
- Objective: to balance the demands for resources for the development of new projects and the demands for resources for ongoing services
- Task examples:
  - personnel planning
  - purchasing planning
  - production planning, etc.

## Tactical Business Planning

- Time frame: on a daily, weekly, or monthly basis
- Focus on: the planning and control of individual activities and tasks within the framework of given allocated resources
- Objective: to maintain satisfactory performance
- Task examples:
  - planning the work to be done next week
  - following up the work accomplished last week
  - detailed scheduling

# Developing a Business System

- Evaluate business environment
  - Identify market demand
  - Identify business models
  - Identify critical success factors (CSF's)
  - Set goals and objectives
  - Formulate bus. strategies
  - Identify info. needs
  - Develop business policies
  - Identify business functions
  - Identify business processes
- Develop a business model
  - Define business processes
  - Define business activities
  - Define resource needs & constraints
  - Establish a business organization
  - Identify organization attributes
  - Update policies & procedures
  - Operate the business

# Stage of MIS Planning

Stages of MIS planning	Description
Strategic MIS planning	Establishing the relationship between the overall organizational plan and the MIS plan.
Organizational information requirements analysis	Identifying broad, organizational information requirements to establish a strategic information architecture (enterprise model) that can be used to direct specific application system development projects.
Resource allocation	Allocation of both MIS application development resources and operational resources.
Project planning	Developing a plan that expresses schedules and resource requirements for specific information system projects.

## Typical CSF's of a Business

- Common CSF's: common in industry
  - customer satisfaction
  - quality
  - short lead time
- Unique CSF's: unique to a company itself

## Common Business Goals

- g1. Max. profit/benefit
- g2. Min. costs
- g3. Controlled growth



## Internal Business Strategies

- R & D
- Quality of work life
- Supplier relation
- Quality control
- Production & inventory mgt.
- Use of quantitative models
- Cost analysis
- Work simplification
- Product mix
- Training and education
- Sales analysis
- Automation
- Internal auditing
- Regular maintenance
- Effective management & control of functional areas.

## External Business Strategies

- Advertising & promotion
- Public relation
- Market research
- Sales analysis
- Environmental mgt. & control
- Quality management & control
- Sales training
- Customer services/satisfaction
- Pricing
- Product diversification
- Competitive analysis
- Distribution channel
- Supplier relation
- Customer relation
- Quality of work life
- R & D

## Factors of Prioritizing Strategies

- **Competitive advantages**
- **Critical success factors**
- **Impact upon the business**
- **Length of implementation**
- **Near-term and long-term costs and benefits**
- **Political climate**
- **Political overtones**
- **Prerequisites / feasibilities**
- **Regulatory requirements**
- **Resources available**
- **Risks**
- **Technical and organizational complexity**

## Common Business Objectives

- o1. increasing sales, customers, market share (g1,g2,g3)**
- o2. improving efficiency and effectiveness (g1,g2 )**
- o3. improving company image (g1 )**
- o4. improving the quality of products/services (g1,g2 )**
- o5. improving the ROI (g1,g2 )**
- o6. reducing errors (g1,g2 )**
- o7. reducing costs (g1,g2 )**
- o8. reducing waste (g1,g2 )**
- o9. developing new products/services (g3 )**

## Business Analysis Techniques

- break-even analysis
- cash flow analysis
- competitive analysis
- critical success factors
- ends-means (O-IP) analysis
- facilities layout analysis
- feasibility study (TELOS)
- market research
- resources needs analysis
- return-on-investment analysis
- risk assessment
- sales forecasting
- site analysis
- strategy set transformation
- value chain analysis
- zero-based budgeting
- strategic grid

## Definitions

- **Business Function:** A business function is a broad group of closely related activities and decisions that contribute to a product/service life cycle, or serve to manage resources, or serve to implement a strategy.
- **Business Process:** A business process is a decision-related activity that occurs within a function and often serve to manage a corporate resource.

Objectives	CSF's	Internal Strategies	External Strategies	Information Requirements	Sources of Information
Improved productivity	Productivity Customer satisfaction Q.C. Competitive pricing	Just in time production		Quality of data Actual labor hr Delivery schedule Production schedule Daily material requirements Inventory levels Materials on order Manpower requirement Manpower availability Product specs  Required test Test tools on hand	Quality assur. Finance Program mgt. Production Production dept  MRP/MIS dept Purchasing rec. Inventory rec.  Production dept  HR database Personnel rec. Customer/Gov. regulation Engineer'g dept Production dept

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Objectives	CSF's	Internal Strategies	External Strategies	Information Requirements	Sources of Information
Real time integration of information throughout business	Productivity Customer satisfaction Q.C. Bidding strat. Competitive pricing	IT project		All kinds of information	All departments involved
Obtain quality personnel	Productivity Response to cust. needs Q.C. Bidding strat. Competitive pricing	Training & development of human resource		Employee capabilities  Training and development	Personnel file/ job description / manpower tracking system Interview Personnel Production

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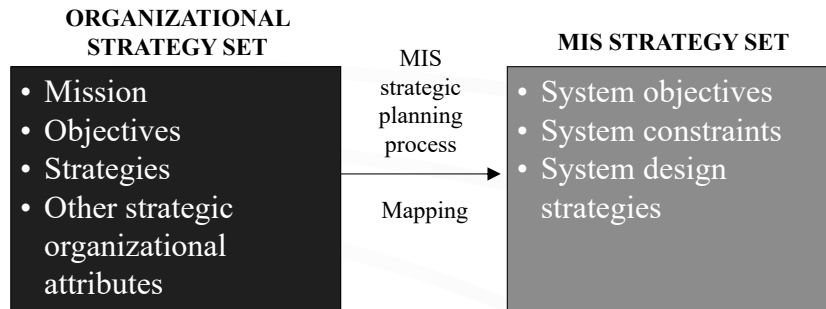
Objectives	CSF's	Internal Strategies	External Strategies	Information Requirements	Sources of Information
Increase ROI	Productivity Diversification of products & customers Bidding strat. Competitive pricing	Cost analysis		Manufacturing cost Sales forecast	Finance dept Marketing dept
Analyze market Select target markets	Diversification of products & customers Bidding strat. Competitive pricing		Market'g research	Market identif. Test market experiment	Marketing department

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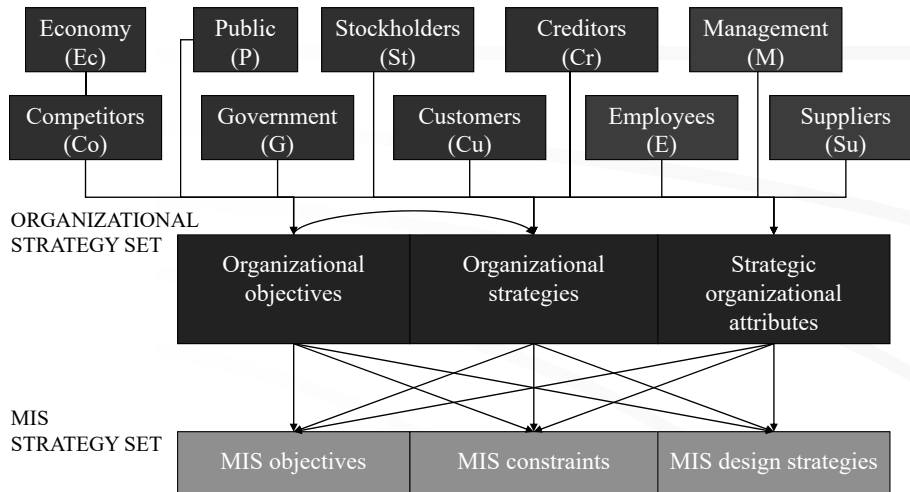
Objectives	CSF's	Internal Strategies	External Strategies	Information Requirements	Sources of Information
Effective marketing plan	Bidding strategies Competitive pricing		Analyzing competitors	Competitor's strategies, objectives, strengths & weaknesses, reaction patterns	Marketing department
Identify most attractive supplier	Q.C. Bidding strategies Competitive pricing		Analyzing suppliers	Sources of capital Raw material price Vendor reliability	Finance dept. Purchasing dept. QA dept
Contract win	Bidding strategies Competitive pricing		Pricing/ bidding decisions	Pricing objectives Sales forecast Estimated costs	Pricing policies Mktg. dept. Finance dept.

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# Strategic MIS Planning Process



# Strategic MIS Planning Process



# Strategic MIS Planning Process

<u>Organizational Objectives</u>	<u>Organizational Strategies</u>	<u>Strategic Organizational Attributes</u>
O <sub>1</sub> : To increase earnings by 10% per year (St, Cr, M)	S <sub>1</sub> : Diversification into new businesses (O <sub>1</sub> , O <sub>6</sub> )	A <sub>1</sub> : Highly sophisticated management (M)
O <sub>2</sub> : To improve cash flow (G, St, Cr)	S <sub>2</sub> : Improvements in credit practices (O <sub>1</sub> , O <sub>2</sub> , O <sub>3</sub> )	A <sub>2</sub> : Poor recent performance has fostered a recognition of the need for change (St, M)
O <sub>3</sub> : To maintain a high level of customer good will (Cu)	S <sub>3</sub> : Product redesign (O <sub>3</sub> , O <sub>4</sub> , O <sub>5</sub> )	A <sub>3</sub> : Most managers are experienced users of computer services (M)
O <sub>4</sub> : To be perceived as socially responsible (G, P)		A <sub>4</sub> : High degree of decentralization of management authority
O <sub>5</sub> : To produce high quality, safe products (Cu, G)		A <sub>5</sub> : Organization must be responsive to regulatory agencies
O <sub>6</sub> : To eliminate vulnerability to the business cycle (Ec, St, Cr)		

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# Strategic MIS Planning Process

<u>MIS Objectives</u>	<u>MIS Constraints</u>	<u>MIS Design Strategies</u>
MO <sub>1</sub> : To improve speed of billing (S <sub>2</sub> )	C <sub>1</sub> : Availability of funds for MIS development may be reduced (A <sub>2</sub> )	D <sub>1</sub> : Design on modular basis (C <sub>1</sub> )
MO <sub>2</sub> : To provide information on product failures (S <sub>3</sub> )	C <sub>2</sub> : System must incorporate best available decision models and management techniques (A <sub>1</sub> , A <sub>3</sub> )	D <sub>2</sub> : Modular design must produce viable system at each stage of completion (C <sub>1</sub> )
MO <sub>3</sub> : To provide information on new business opportunities (S <sub>1</sub> )	C <sub>3</sub> : System must incorporate environmental information as well as internal information (MO <sub>2</sub> , MO <sub>3</sub> , MO <sub>4</sub> )	D <sub>3</sub> : System must be oriented to differential usage by various classes of managers (A <sub>4</sub> , A <sub>5</sub> )
MO <sub>4</sub> : To provide information which will permit the assessment of the level of organizational objectives (O)	C <sub>4</sub> : System must provide for different reports involving various levels of aggregation (A <sub>4</sub> )	D <sub>4</sub> : System should have real time inquiry capability (MO <sub>7</sub> , O <sub>3</sub> ) use COBOL (A <sub>1</sub> , A <sub>3</sub> )
MO <sub>5</sub> : To provide timely and accurate information on recent performance (A <sub>2</sub> )	C <sub>5</sub> : System must be capable of producing information other than management information (MO <sub>6</sub> )	D <sub>5</sub> : System should be responsive to the perceived needs of its user-managers (A <sub>1</sub> , A <sub>3</sub> , A <sub>4</sub> )
MO <sub>6</sub> : To produce reports desired by regulatory agencies (A <sub>5</sub> )		
MO <sub>7</sub> : To produce information which will permit quick response to customer inquiries (O <sub>3</sub> )		

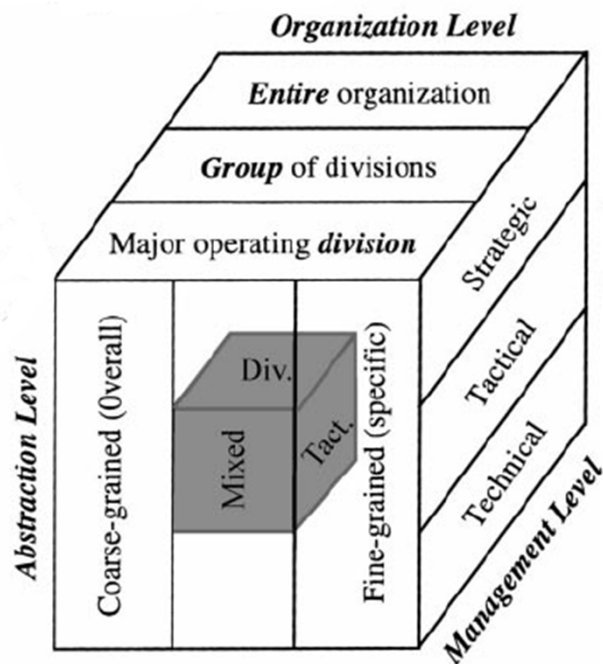
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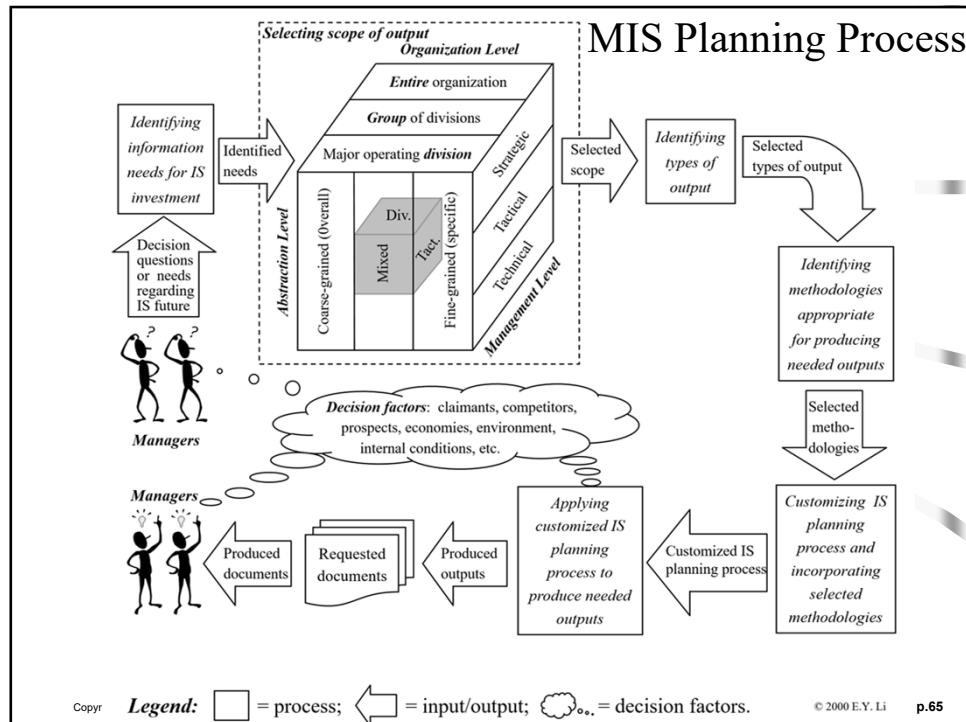
## Selecting MIS Planning Cube

- The levels of organization are:
  - entire organization, group of divisions, major operating division
- The levels of management include:
  - Strategic, tactical, technical
- The levels of abstraction include :
  - coarse-grained, mixed-grained, fine-grained

## MIS Planning Cube







## A Case Study of MIS Planning

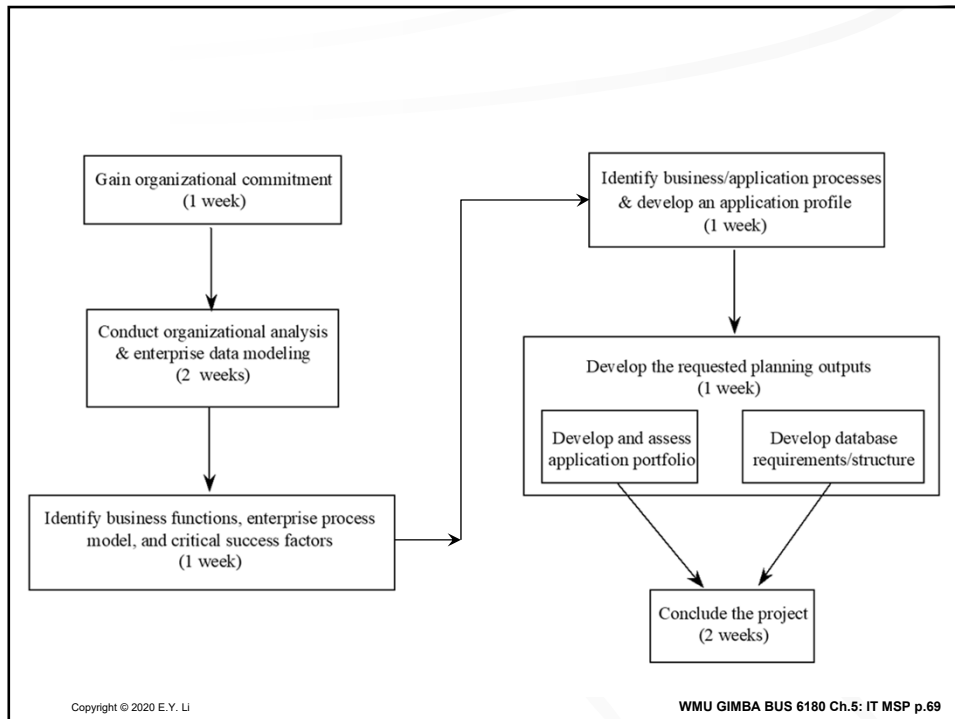
- Background – The ABC Bank
- Customizing the IS planning process for the ABC Bank
- Implementing the planning process
  - Step 1: Gain organizational commitment
  - Step 2: Conduct organizational analysis and enterprise data modeling
  - Step 3: Identify Business functions, enterprise process model, and CSFs
  - Step 4: Identify Business/Application processes and develop an application profile
  - Step 5: Develop the requested planning outputs
  - Step 6: Conclude the project

## Background – The ABC Bank

- Open in the early 1990s ◦
- \$50 million assets ◦
- President Peter ◦
- VP John also responsible for the bank's IS function ◦
- The scope of the project was the development of an IS plan that would be consistent with the bank's strategic direction ◦

## Customizing the IS planning process for the ABC Bank

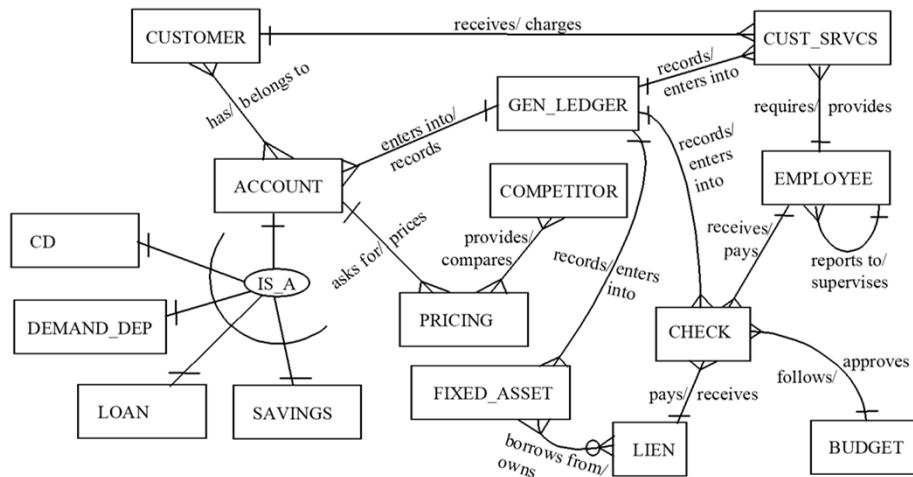
- The Customer want to answer:
  - Where are we? Where do we want to go? What should we do next?
- The scope of output
  - entire organization, strategic, mixed-grained.
- Output:
  - the required business processes and their corresponding IS applications.
  - a risk assessment of each potential application project.
  - the required database files and the business processes they support.
  - the structures of the required database files.



## Implementing the planning process

- Step 1 : Gain organizational commitment
  - Memorandum announce 、 executive assistant 、 senior author 、 progress report ◦
- Step 2 : Conduct organizational analysis and enterprise data modeling
  - Goal : Developing an enterprise data model and identify the organizational strategy set ◦
  - Objective : Understanding the bank's infrastructure, operations , and competitive environment ◦
  - Action : interview and observation ◦

## Step 2-1 Enterprise data model



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## Stage 2-2 Organizational strategy set

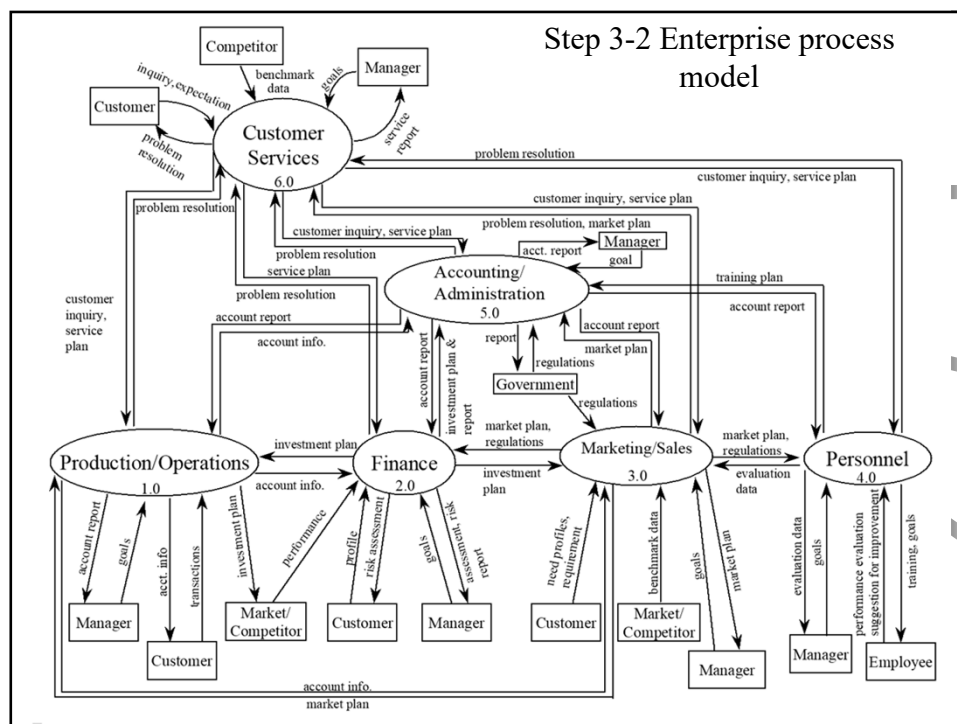
- Five goals :
  - maximizing profit 、 minimizing costs 、 steady growth 、 maintaining employee satisfaction 、 excellence in customer relations ◦
- Strategic IS plan
  - free of technical jargon and details, and provide a rough idea of potential applications and database files ◦

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## Step 3-1: Identify business functions 、 enterprise process model and CSFs

- Production/Operations
  - maintain a profitable net interest margin
- Finance
  - Board of Directors, assign appropriate interest rate requirements for different levels of investment risk
- Marketing/Sales
  - attract and retain depositors and qualified borrowers
- Personnel
  - Personnel management 、 all positions be occupied by qualified employees
- Accounting/Administration
  - accounting information be quickly relayed to top management
- Customer services
  - Satisfied customers, CRM



## Step 4: Identify Business/Application processes and develop an application profile

Function	Business/Application process	
Production/Operations	Deposit account management	Demand deposits (O) Savings (O) Certificates of deposit (O)
	Loan management	Commercial account management (O) Consumer account management (O) Real estate account management (M) Loan processing (M) Bond portfolio (M) Money market portfolio (M) Federal funds portfolio (M)
	Investment management	
Finance	Asset/liability management	Rate sensitivity analysis (C) Interest margin analysis (M) Key performance ratio (M)
	Reserve management (M)	
Marketing/Sales	Account setup (M) Account analysis (X) Competitor analysis (M) Pricing (M) Forecasting deposits (M)	

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## Step 4: Identify Business/Application processes and develop an application profile (cont.)

Personnel	Recruitment (M)
	Scheduling (M)
	Manpower planning (M)
	Compensation policy (M)
	Performance appraisal (M)
Accounting/Administration	General ledger maintenance (O)
	Payroll (C)
	Check reconciliation/monthly statement (O)
	Government reporting (C)
	Audit confirmation & reporting (O)
	Office supplies management (M)
	Fixed assets management (M)
	Accounts payable (M)
Budget planning (M)	
Board-of-Directors report (M)	
Customer services	Safe deposit (M)
	A/R discounting (X)
	Trust management (X)
	Contract collections (X)
	Bank by phone service (X)

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## Step 5: Develop the requested planning outputs

Potential system project	Size	Experience	Structure	Total
<i>Production/Operations</i>				
Real estate loan account management	2	0	1	3 <sup>a</sup>
Loan processing	2	0	1	3
Bond portfolio	2	1	2	5
Money market portfolio	2	1	2	5
Federal funds portfolio	2	1	2	5
<i>Accounting/Administration</i>				
Fixed assets management	1	1	1	3
Accounts payable	2	0	1	3
Budget planning	2	0	2	4
Board-of-Directors report	3	0	3	6
<i>Customer services</i>				
Safe deposit	1	0	1	2
A/R discounting	2	1	1	4
Trust management	3	1	3	7
Contract collections	2	1	1	4
Bank-by-phone service	3	1	1	5

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## Mapping the Bank's Processes Against the Database Files

Database Files:	A	C	D	E	L	S	C	G	E	F	L	P	C	B	C	
Database Files:	C	C	D	D	O	A	N	S	A	V	I	N	O	M	E	
Database Files:	O	U	N	T	D	E	P	S	T	O	M	E	R	V	G	
Database Files:	E	R	C	S	E	R	D	E	E	T	A	S	S	E	T	
Database Files:	R	I	C	I	N	G	T	O	R							
Database Files:	C	H	E	C	K											
<i>Business/ Application Processes:</i>																
P Demand deposit account management	r		C				u	u				r			r	
R Savings account management	r			C			u	u				r				
O CD account management	r		C				u	u				r				
D Commercial loan acct. management	r				u		u	u				r				
/ Consumer loan account management	r				u		u	u				r				
O Real estate loan acct. management	r				u		u	u				r				
P Loan processing	u			C			u					r				
E Bond portfolio management	r							r							r	
R Money market portfolio management	r							r							r	
A Federal funds management	r							r							r	
F Rate sensitivity analysis	r				r										r	
I Interest margin analysis	r														r	
N Key performance ratio analysis	r														r	
A Reserve management	r														r	
M Account setup	C	C	C	C	C	C										
K Account analysis	r	r	r	r	r	r	r									
T Competitor analysis	r	r	r	r	r	r	r	r					C		r	
/ Pricing	r	r	r	r	r	r	r					C			r	
S Forecasting deposits	r	r	r		r			r				r			r	
P Recruitment									r						r	
E Scheduling									r						r	
R Manpower planning									r						r	
S Compensation policy									r						r	
O Performance appraisal								r							r	
A General ledger	r	r	r	r					C	u					r	
C Payroll									u	C					C	
C Check reconciliation			r												r	
T Government reporting	r							r				r				
/ Audit confirmation & reporting	r	r	r	r	r	r	r		r	r	r					
A Office supplies management									u						r	
D Fixed assets management									u	C	r				r	
M Accounts payable	r								u	r	r				r	
I Budget planning	r	r	r	r					r	r	r	r	r	r	C	
N Board-of-directors report	r	r	r	r					r	r	r	r	r	r	r	
Customer services (safe deposit)		u			u	C	u	r				r				

Legend: C = create/read/update/delete; u = update only; r = read only.

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# Database Structure

Database file	Fields
Account	<i>Account_no</i> Account_name
CD	<i>Account_no</i> Starting_date Length_of_term Interest_rate Principle
Demand_dep	<i>Account_no</i> <i>Date_n_time</i> Check_no Debit Credit Balance
FA_LIEN <sup>b</sup>	<i>Asset_no</i> <i>Lien_no</i>

## Step 6: Conclude the project

- 1. Introduction
  - Answer to : Where are we? Where do we want to go? Why do we go there? Who are in the planning task force?
  - Identify the scope of the planning document ◦
- 2. The planning process
  - Answer to : How do we get there?
  - Propose a process of IS planning and explain the process steps based on Fig. 2
- 3. Time table
  - Answer to : When do we get there?
  - Use a Gantt chart to show overlapping activities and a flowchart as shown in Fig. 2 to show the overall process flow.



## Step 6: Conclude the project (Cont.)

- 4. Actions & outputs
  - Describe the actions taken and the progression of these actions ◦
  - Identify and explain the outputs of these actions at each planning step ◦
- 5. Conclusion & recommendations
  - answer to : How much will it cost? How much could we spend?  
What should we spend on first?
  - Recommend the future actions ◦
- 6. Comments & feedback
  - Discuss the problems to be avoided and the issues to be pursued in the next planning cycle ◦

## Conclusion and Recommendation

- For a small company, the planning document must be concise, easy to change, and independent of any particular information technology.
- The demand-centric output-driven adaptive approach described herein works best.
- The planning document delivered by this project provided the bank's management with some guidelines for selecting critical applications for implementation.
- The planning process should be repeated every three years or when necessary--- agile process but stable vision.

# Total Quality Management for Software Projects

## TQM Definition

- Total quality management (TQM) "is a management approach to long-term success through customer satisfaction. TQM is based on the participation of all members of an organization to improving processes, products, services, and the culture they work in. TQM benefits all organization members and society. The methods for implementing this approach are found in the teachings of such quality leaders as Philip B. Crosby, W. Edwards Deming, Armand V. Feigenbaum, Kaoru Ishikawa, and J.M. Juran." [American Society for Quality Control (ASQC), 1992]

## TQM Definition

- TQM is both a philosophy and a set of guiding principles that represent the foundation for a continuously improving organization. TQM is the application of quantitative methods and human resources to improve the material and services supplied to an organization, and the degree to which the needs of the customers are met, now and in the future. TQM integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach focused on continuous improvement.” [U.S. Department of Defense, 1991]

## The Teachings of Quality

Years	Teacher	Concept and Method
1920's	Walter Shewhart	Statistical controls
1950's	W. Edwards Deming	Organization-wide quality control
	Joseph Juran	Total quality control
	Armand Feigenbaum	Quality control circles
1960's	Kaoru Ishikawa	Total quality control
1970's	Philip Crosby	Zero defect
1980's	Genichi Taguchi	Design experiments

## Two Views of Quality

Traditional View	TQM View
<b>Productivity and quality are conflicting goals.</b>	<b>Productivity and quality are not conflicting goals.</b>
<b>Quality is defined as conformance to specifications or standards.</b>	<b>Quality is correctly defined requirements that satisfy users needs.</b>
<b>Quality is measured by degree of non-conformance.</b>	<b>Quality is measured by user satisfaction as well as by continuous process/ product improvement.</b>
<b>Quality is achieved through intense product inspection.</b>	<b>Quality is achieved by effective product design and process controls.</b>

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## Two Views of Quality

Traditional View	TQM View
<b>Some defects are allowed if a product meets minimum quality standards.</b>	<b>Defects are prevented through process-control techniques.</b>
<b>Quality is a separate function that focuses on evaluating production.</b>	<b>Quality is a part of every function in all phases of the product life cycle.</b>
<b>Workers are blamed for poor quality.</b>	<b>Management is responsible for quality.</b>
<b>Supplier relationships are short-term and cost-oriented.</b>	<b>Supplier relationships are long-term and quality-oriented.</b>

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## Differences in Goals

Traditional Culture	TQM Culture
<ul style="list-style-type: none"> <li>• maximizing profit or benefit</li> <li>• minimizing costs</li> <li>• achieving controlled growth</li> </ul>	<ul style="list-style-type: none"> <li>• improving customer satisfaction</li> <li>• improving quality</li> <li>• reducing schedule</li> </ul>

## Principles of Implementation

Principle	Concept and Method
<ul style="list-style-type: none"> <li>• <b>Quality is everyone's business.</b></li> </ul>	<ul style="list-style-type: none"> <li>• empowerment</li> <li>• sense of belonging</li> <li>• pride in the quality of work</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Customer Emphasis.</b></li> </ul>	<ul style="list-style-type: none"> <li>• everyone has a customer</li> <li>• satisfying internal and external needs, requirements, and expectations</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Quality must be built into the product.</b></li> </ul>	<ul style="list-style-type: none"> <li>• quality is a component of a product</li> <li>• quality cannot be added afterward</li> </ul>

## Principles of Implementation

Principle	Concept and Method
<ul style="list-style-type: none"> <li>• <b>TQM requires management commitment &amp; involvement.</b></li> </ul>	<ul style="list-style-type: none"> <li>• management provides leadership to implement</li> <li>• management and the systems are responsible for quality</li> </ul>
<ul style="list-style-type: none"> <li>• <b>TQM accomplishment involves continual training.</b></li> </ul>	<ul style="list-style-type: none"> <li>• train employee in TQM principles and implementation tools.</li> <li>• recognize training credential for performance evaluation.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Leadership is the substitute for slogans and exhortations.</b></li> </ul>	<ul style="list-style-type: none"> <li>• slogan like “Quality is job one” means nothing.</li> <li>• use kanbans for charts, not slogans.</li> </ul>

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## Principles of Implementation

Principle	Concept and Method
<ul style="list-style-type: none"> <li>• <b>Long-term emphasis.</b></li> </ul>	<ul style="list-style-type: none"> <li>• make processes measurable</li> <li>• use metrics to chart progress</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Know the current process before improvement begins.</b></li> </ul>	<ul style="list-style-type: none"> <li>• know not only your product but also your process</li> <li>• measure process improvements</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Cross-functional orientation and teamwork.</b></li> </ul>	<ul style="list-style-type: none"> <li>• developing a product is not just the designer's concern. Anybody involved must take part in.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Effective use of statistical methods and QC tools.</b></li> </ul>	<ul style="list-style-type: none"> <li>• identify special causes of variation</li> <li>• identify pattern with the limits.</li> <li>• use Q7 and M7 tools</li> </ul>

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## Principles of Implementation

Principle	Concept and Method
<ul style="list-style-type: none"> <li>• <b>Constant process, product/service improvement.</b></li> </ul>	<ul style="list-style-type: none"> <li>• empower all employees to influence an organizational process that can improve quality</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Incentivize TQM involvement.</b></li> </ul>	<ul style="list-style-type: none"> <li>• establish reward and recognition program</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Information sharing.</b></li> </ul>	<ul style="list-style-type: none"> <li>• share profit, budget, schedule, progress, errors; non-private info.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Eliminate communication barriers.</b></li> </ul>	<ul style="list-style-type: none"> <li>• management must make themselves available to and easily accessible by the workers.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>Suppliers must have a TQM philosophy.</b></li> </ul>	<ul style="list-style-type: none"> <li>• establish long-term business commitments with a few TQM certified suppliers.</li> </ul>

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## TQM Tools

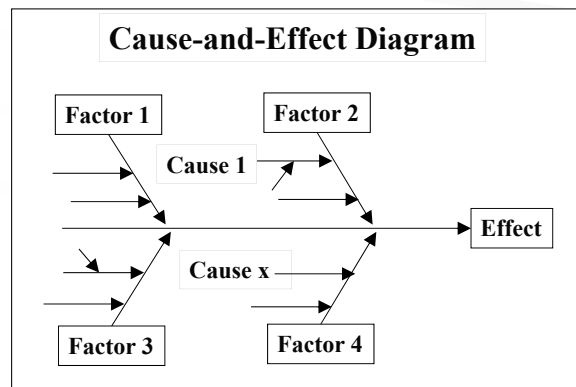
- **Quality Seven (Q7) Tools:** used to analyze historical data for solving a particular problem *when all data needed for decision making are readily available.* (Use M7 tools if data are limited.)
- **Management Seven (M7) Tools:** useful in areas such as product quality improvement, cost reduction, new-product development, and policy deployment, etc.; used when the problem calls for collaborative decision among different functional areas.

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## Q7: Cause-and-Effect Diagram

- **Cause-and-effect diagram.** This diagram is also called "fishbone diagram" or "Ishikawa diagram." It identifies, explores, and displays all possible causes or contributing factors of a problem or event.

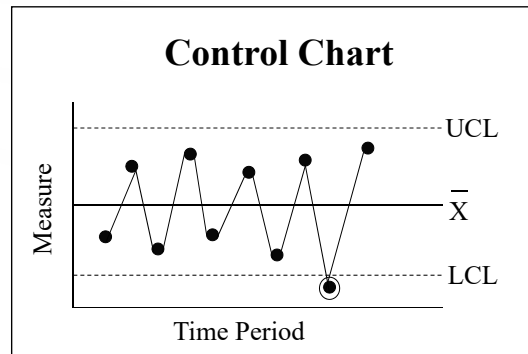


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## Q7: Control Chart

- **Control chart.** This chart serves to detect special causes of variation. The chart has control limit lines at the center, top, and bottom levels. Sample data are plotted in dots on the chart to evaluate process situations and trends.



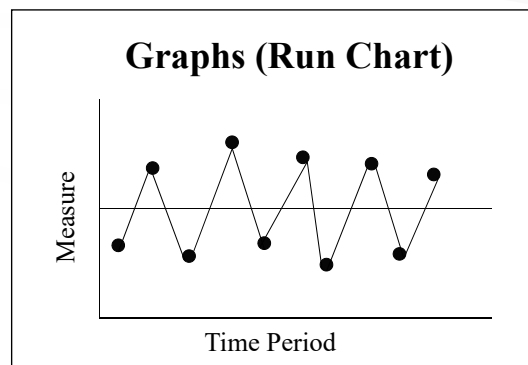
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## Q7: Graphs

- **Graphs.** There are many types of graphs that are useful to evaluators. Line graphs, also called run charts, are used to illustrate variations over a period of time. Bar graphs compare categorical values via parallel bars. Circle graphs, or pie charts, indicate the categorical breakdown of values relative to the total value. Radar charts assist in analyzing previously evaluated items each may have its own axis of measurement..



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## Q7: Checksheet

- **Checksheet.** This document is designed to tabulate the results through routine checking of the situations. It is passed between major checkpoints during the production process and acts as a safeguard from defects.

**Checksheet**

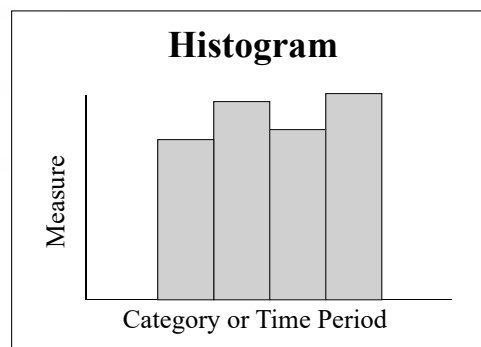
ITEM	PERIOD				Row
	1	2	3	4	Total
Error-1		///			8
Error-2					4
Error-3			///		10
Column Total	5	5	8	4	22

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## Q7: Histogram

- **Histogram.** This diagram graphically displays a set of frequency data in bar graphs and enables evaluators to determine problems by checking the dispersion shapes, center values, and the nature of dispersion.

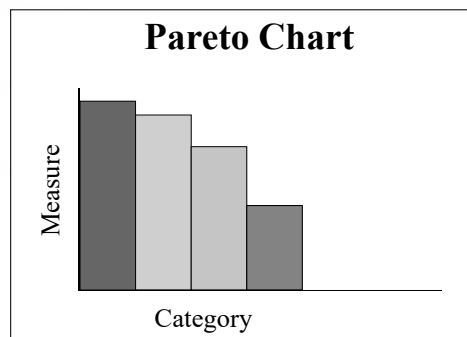


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## Q7: Pareto Chart

- **Pareto chart.** This chart classifies problems according to cause and phenomenon. It makes use of bar graphs sorted in a prescribed order to display the relative importance of problems by selected categories.

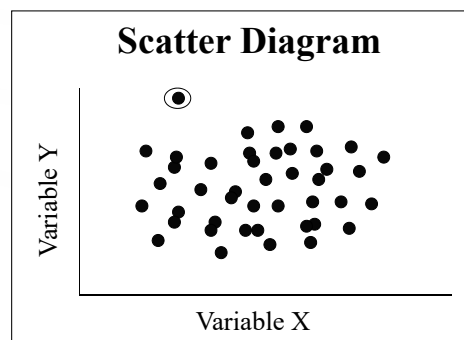


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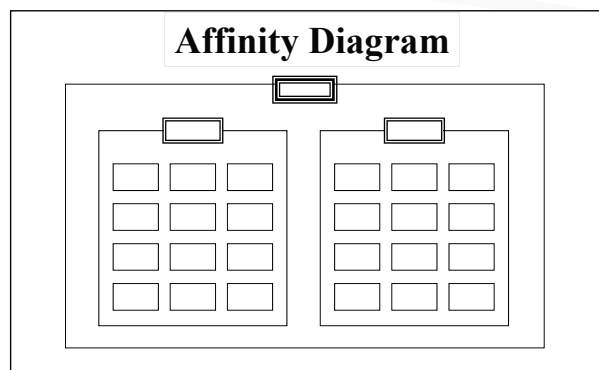
## Q7: Scatter Diagram

- **Scatter diagram.** This diagram is also known as X-Y chart. It displays what happens to one variable when another variable changes in order to test a theory or make forecasts.



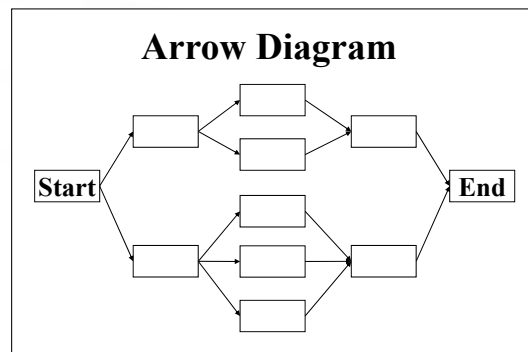
## M7: Affinity Diagram

- **Affinity diagram.** This is essentially a brain storming output. It is based on group work in which every participant writes down his ideas and the ideas are then grouped and realigned by subject matter.



## M7: Arrow Diagram

- **Arrow diagram.** This diagram is also called "flow chart." It is often used in PERT (Program Evaluation and Review Techniques) and CPM (Critical Path Method). It uses a network representation to show the steps necessary to implement a plan or to complete a process.

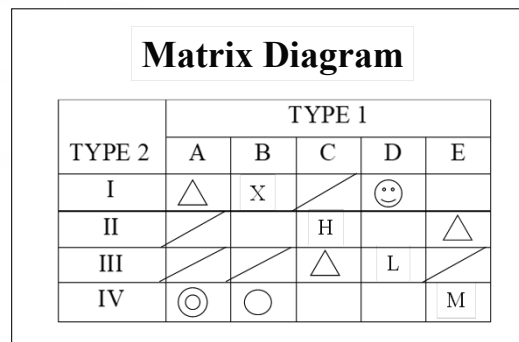


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## M7: Matrix Diagram

- **Matrix diagram.** This diagram is used to clarify the relations between two different factors. It is often used in deploying quality requirements into counterpart (engineering) characteristics and then into production requirements.

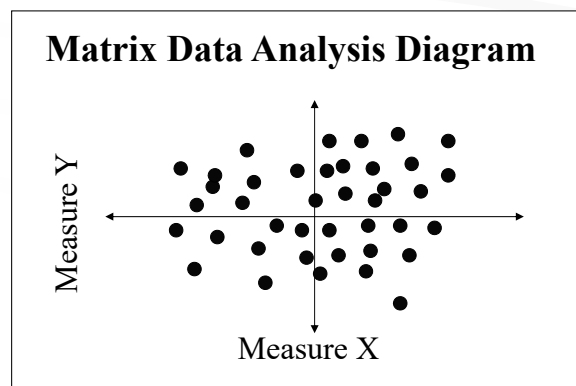


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## M7: Matrix Data Analysis Diagram

- **Matrix data analysis diagram.** This diagram is used when the matrix diagram does not provide sufficiently detailed information. It is the only M7 tool that is based on data analysis and gives numerical results.

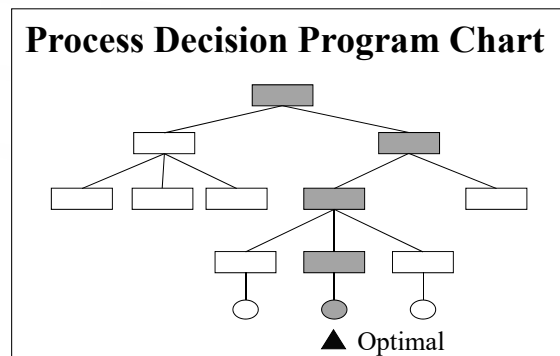


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## M7: Process Decision Program Chart

- **Process Decision Program Chart (PDPC).** This diagram is commonly used in operations research community. It is a hierarchical chart that displays how an optimal alternative is arrived. It is similar to a decision tree diagram.

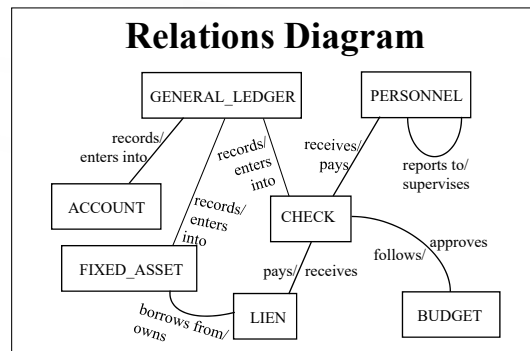


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## M7: Relations Diagram

- **Relations diagram.** This diagram is also known as causal model diagram. It clarifies the interrelations in a complex situation involving many interrelated factors and serves to clarify the cause-and-effect relationships among factors.

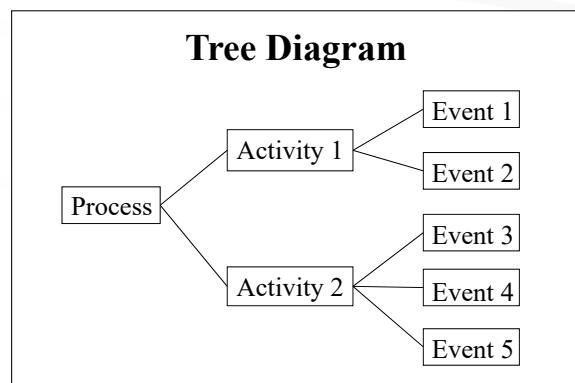


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## M7: Tree Diagram

- **Tree diagram.** This diagram is similar to a functional decomposition chart. It is applied to show the interrelations among goals and measures and among processes and activities.



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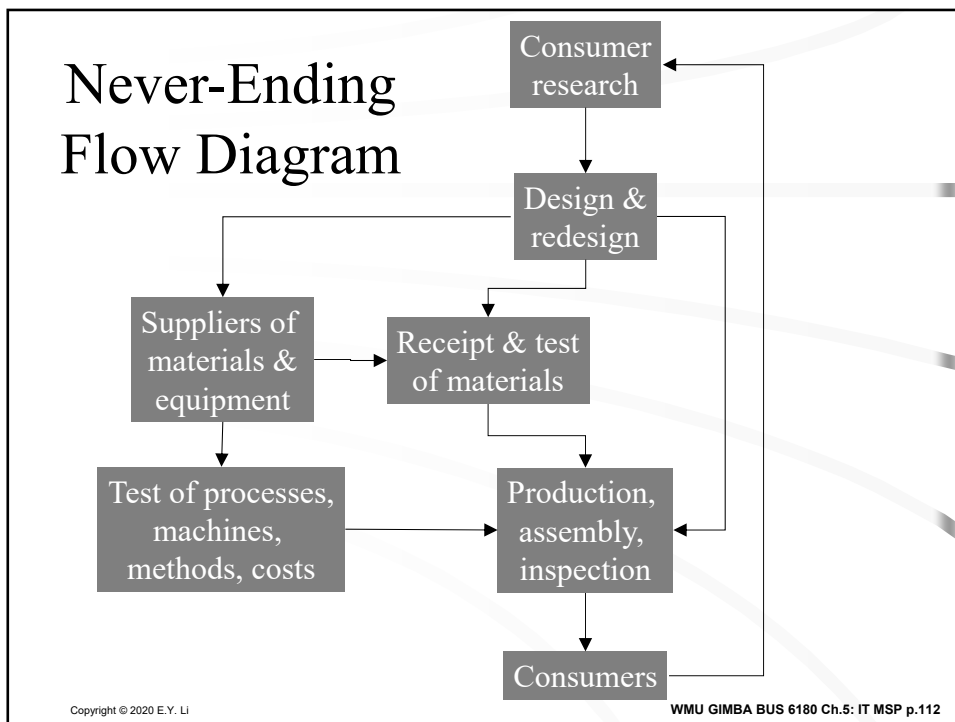
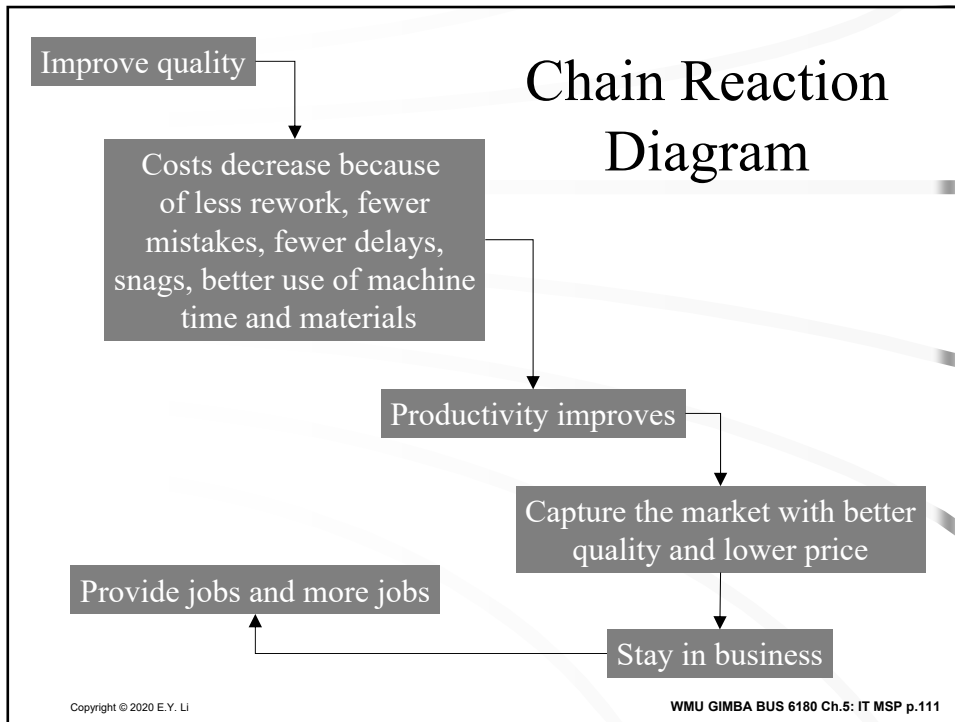
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## W. Edward Deming's 14 Points

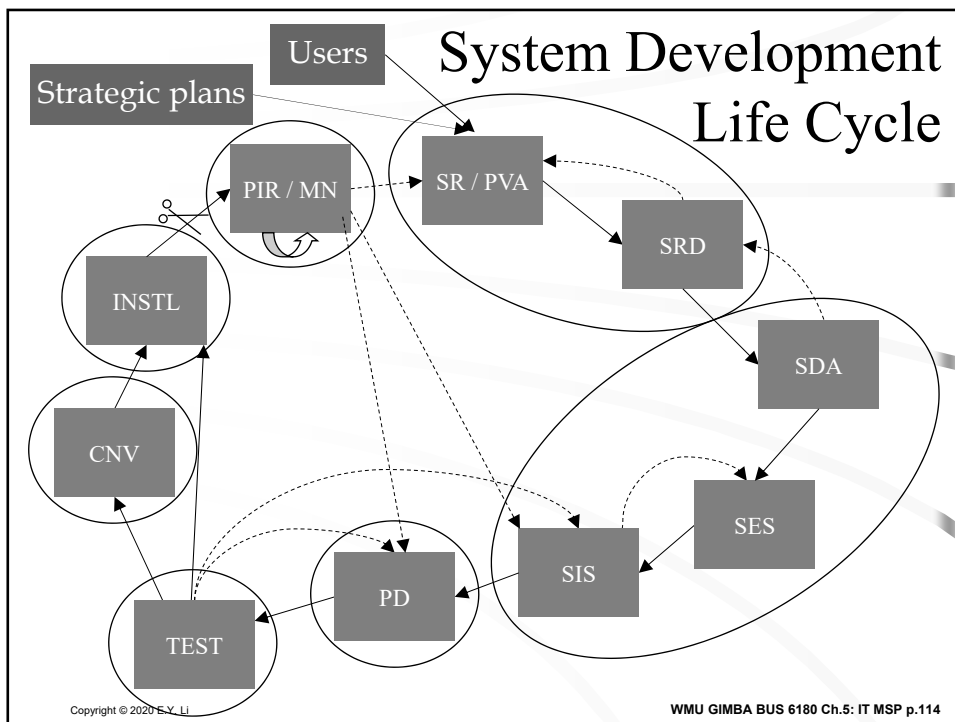
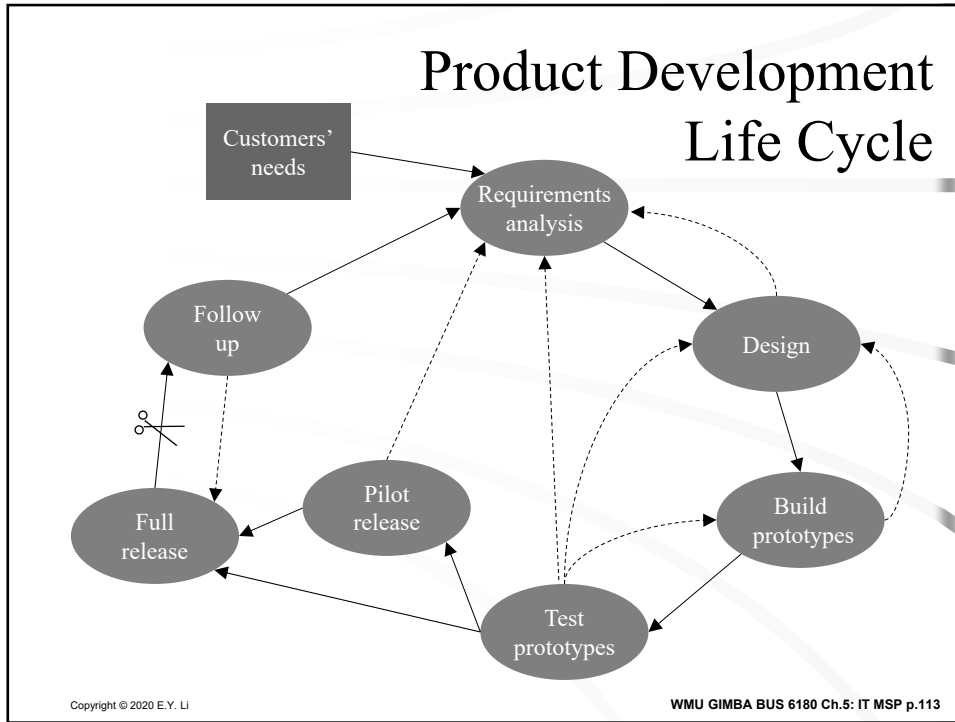
1. Create constancy of purpose for improvement of product and service.
2. Adopt the new philosophy of total quality.
3. Cease dependence on mass inspection to achieve quality.
4. End the practice of awarding business based on price tag alone.
5. Improve constantly and forever the system of production and service.
6. Institute training on the job.
7. Institute leadership.

## W. Edward Deming's 14 Points

8. Drive out fear of job insecurity.
9. Break down barriers between departments or staff areas.
10. Eliminate slogans, exhortations, and targets for the workforce.
11. Eliminate numerical quotas, goals, and work standards.
12. Remove barriers to pride of workmanship.
13. Institute a vigorous program of education and retraining for everyone.
14. Put everyone to work to accomplish the transformation.







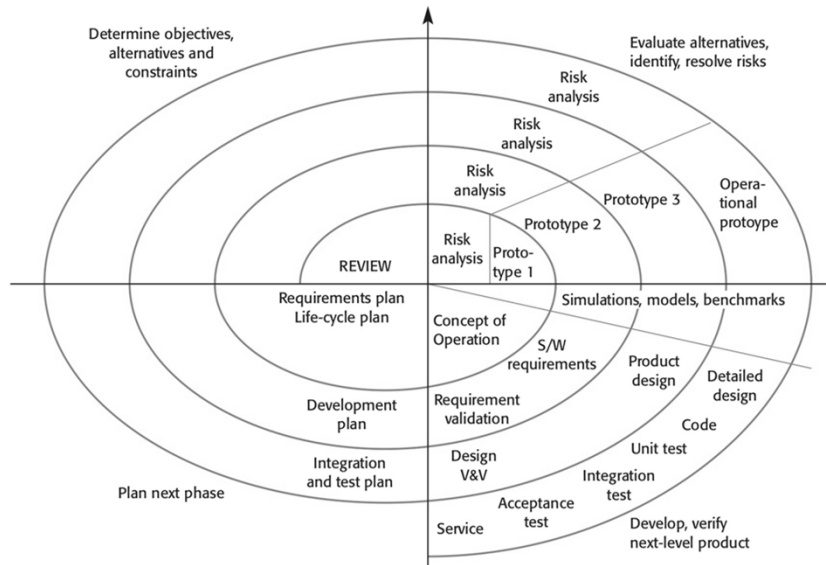
# System Development Life Cycle

PDLC Phases	SDLC Phases	Phase Objectives
<b>Requirements Analysis</b>	Service Request/Project Viability Assessment	To initiate a project and conduct cost/benefit analysis as well as feasibility study.
	System Requirements Definition	To define project scope, analyze the existing system, and define information requirements, data attributes, and system objectives.
<b>Design</b>	System Design Alternatives	To identify and evaluate alternate system designs and prepare initial project schedules.
	System External Specifications	To specify data flow, user/system interface, system controls, and manual supporting procedures.
	System Internal Specifications	To specify processing logic, file structure, module interfaces, and system architecture.

# System Development Life Cycle

PDLC Phases	SDLC Phases	Phase Objectives
<b>Build Prototypes</b>	Program Development	To transform programs' internal specifications into program code using a computer language.
<b>Test Prototypes</b>	Testing	To verify and validate the system being developed throughout the system development life cycle.
<b>Pilot/Full Release</b>	Conversion	To convert the data formats and procedures for the new system.
	Installation	To install the hardware and software for the new system, and cutover the system into production.
<b>Follow Up</b>	Post Implementation Review/Maintenance	To monitor and maintain the quality and performance of the new system.

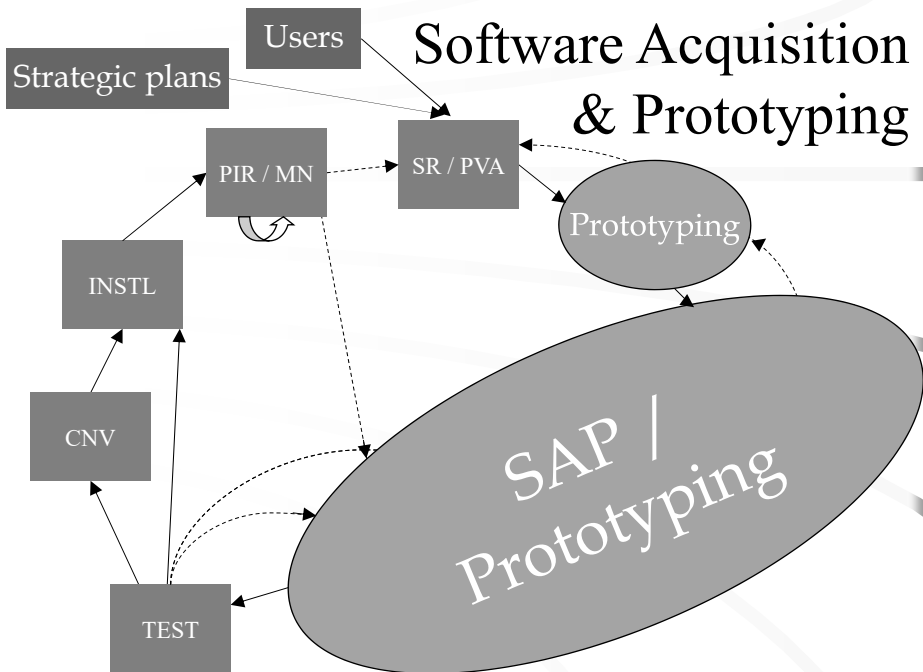
# Barry Boehm's Spiral Model



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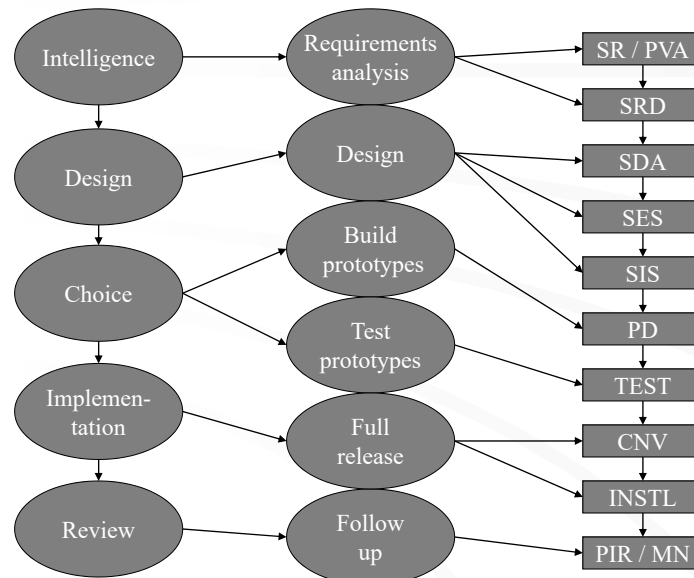
# Software Acquisition & Prototyping



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# A Process for All



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## 14 Points in Software Process

### 1. Create constancy of purpose for improvement of product and service.

- Software development team’s quality responsibility continues into production stage.
- Management must:
  - Establish operational definitions for each step in the software development process.
  - Define what is meant by “service to the customer.”
  - Define standards of development, maintenance, and service for the next year and five years ahead.
  - Define the internal and external customer.
  - Develop ways to provide better systems and services in less time, using fewer resources.
  - Invest in tools and techniques for better software development.

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## 14 Points in Software Process

### **2. Adopt the new philosophy of total quality.**

- Quality comes first and everyone must join in.
- All Corporate management must embrace TQM and clearly communicate their support of this concept to all members in the software development team.

### **3. Cease dependence on mass inspection to achieve quality.**

- Quality is built in, not added on.
- Management must install job training and incentive programs to continually improve software development processes.

## 14 Points in Software Process

### **4. End the practice of awarding business based on price tag alone.**

- Do not award a software contract based on price tag.
- It is better to create long-term relationship with a few loyal and trustworthy outsourcing contractors who can produce quality code for your system.

### **5. Improve constantly and forever the systems of production and service.**

- Introduce new and working methodology, paradigm, standards, practices, techniques, tools, policies, and procedures into software development process.
- Update or expand project member's skill set.

## 14 Points in Software Process

### **6. Institute training on the job.**

- Management must assess the skill level of an employee before he or she is assigned to a software project.
- All project members must know what their jobs entail and how to do their work.

### **7. Institute leadership.**

- Management must lead, not punish.
- It is manager's job to help MIS staff do a better job and create a better system.
- Focus on the member whose performance is out of statistical control

## 14 Points in Software Process

### **8. Drive out fear of job insecurity.**

- Employees must feel secure before they are willing to ask questions, make suggestions, or even expose their weaknesses by asking for help.
- Establish long-term employment policy.

### **9. Break down barriers between departments or staff areas.**

- Open communication among functional areas and general knowledge across disciplines are necessary for a successful system implementation.
- Provide appropriate education and training for team members to change their behavior and improve their knowledge.

## 14 Points in Software Process

### **10. Eliminate slogans, exhortations, and targets for the workforce.**

- MIS management should post their progress in responding to suggestions and in helping the staff improve quality. Let the employees put up their own signs and slogans

### **11. Eliminate numerical quotas, goals, and work standards.**

- Let the project members put up their own goals. Managers should concentrate on helping people do a better job by reducing rework, errors, and waste. Everyone must work toward constant improvement, not some arbitrary, short-term goals

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## 14 Points in Software Process

### **12. Remove barriers to pride of workmanship.**

- A good workmanship relies on good materials, good tools, good methods, and good timing.
- Let the software development team put its group identity or team members' names on its software product.

### **13. Institute a vigorous program of education and retraining for everyone.**

- Management must set aside enough budgets to execute a generous education and retraining program for everyone to improve oneself.

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## 14 Points in Software Process

### **14. Put everyone to work to accomplish the transformation.**

- Put employees to work. All of us must identify our customers in order to determine precisely what our jobs are. Everyone belongs to a team, to work in the Plan-Do-Check-Act cycle, to address one or more specific issues, to find special causes detected by statistical signals.
- Put management to work. Only management can change the culture and environment that dominate any individual's performance. They must explain to a critical mass of people in the organization why change is necessary and that the change will involve everybody.

## Recommendations

- All employees regardless of their ranks must fully understand (or be trained with) and internalize the TQM concept and tools. Education programs are required.
- Start from the top management and unfold it downward to lower-level management and workers with a goal to benefit the critical mass of employees, not the management.
- The game has no no finish line for all employees and management. Continuous improvement is a must.

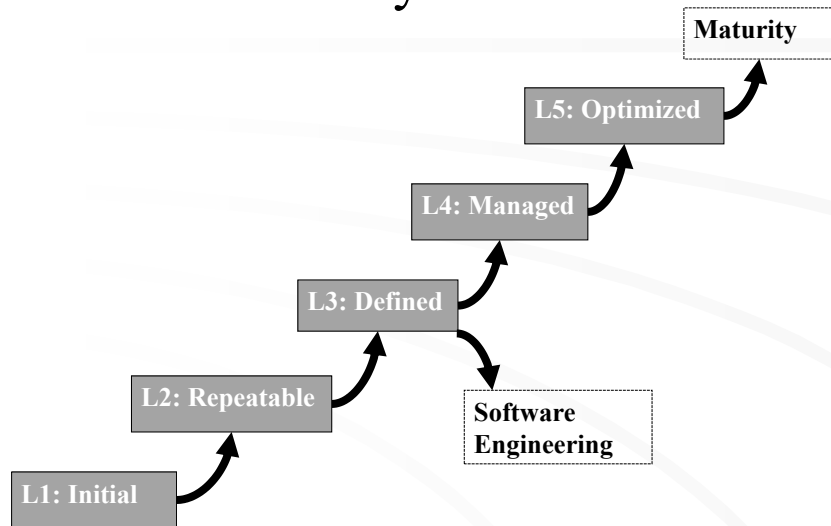


## Recommendations

- Everyone related to the value chain of the product are significant and must use one's mind constantly to play his or her own role well, otherwise, the chain will be broken, and the TQM process will soon fall apart. Incentive program is the key.
- Break down large organization into smaller manageable groups of 30 persons per group for TQM implementation. Software development team typically has a size that lend itself to TQM implementation.

## Software Process Capability Maturity Model

# Software Process Capability Maturity Model



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## Capability Maturity Model (CMM)

- CMM is framework of transforming software engineering from an ad hoc and error-prone process to a discipline that is well managed and supported by technology.
- The 5-Stage model:
  - Level I: Initial stage
  - Level II: Repeatable stage
  - Level III: Defined stage
  - Level IV: Managed stage
  - Level V: Optimizing stage

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# The CMM Levels

CMM Level	Characteristics	Key process areas	Key challenges
L1. Initial	(Ad hoc) Project chaotic	<ul style="list-style-type: none"> <li>Ad hoc processes</li> </ul>	<ul style="list-style-type: none"> <li>Project management</li> <li>Project planning</li> <li>Configuration management</li> <li>Software quality assurance</li> </ul>
L2. Repeatable	(Intuitive) Process dependent on individuals	<ul style="list-style-type: none"> <li>Requirements management</li> <li>Software subcontract management</li> <li>Software project tracking &amp; oversight</li> <li>Software project planning</li> <li>Software quality assurance</li> <li>Software configuration management</li> </ul>	<ul style="list-style-type: none"> <li>Training</li> <li>Technical practices</li> <li>Process focus</li> </ul>
L3. Defined	(Qualitative) Process defined and institutionalized	<ul style="list-style-type: none"> <li>Peer reviews</li> <li>Intergroup coordination</li> <li>Software product engineering</li> <li>Integrated software management</li> <li>Training program</li> <li>Organization process definition</li> <li>Organization process focus</li> </ul>	<ul style="list-style-type: none"> <li>Process measurement</li> <li>Process analysis</li> <li>Quantitative quality plans</li> </ul>
L4. Managed	(Quantitative) Measured process	<ul style="list-style-type: none"> <li>Software quality management</li> <li>Quantitative process management</li> </ul>	<ul style="list-style-type: none"> <li>Changing technology</li> <li>Problem analysis</li> <li>Problem prevention</li> </ul>
L5. Optimizing	Improvement fed back into process	<ul style="list-style-type: none"> <li>Process change management</li> <li>Technology change management</li> <li>Defect prevention</li> </ul>	<ul style="list-style-type: none"> <li>Still human intensive process</li> <li>Maintain organization at optimizing level</li> </ul>

Source: Adapted from Humphrey, Snyder, and Willis [1991].

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## Most and Least Performed Key Practices

\* This practice was not in the previous list.

Level	Question I.D. and Description	1996 (N=138)	2000 (N=102)	This Study (N=93)	Difference
<b>Most implemented practices</b>					
3 @	Q1.2.1. Does each software developer have a private computer-supported workstation/terminal?	92.3%	90.1%	79.57%	-10.53%
2 @	Q1.1.2. Does the project software manager report directly to the project (or project development) manager?	63.8%	51.5%	65.59%	14.11%
2	Q1.1.1. For each project involving software development, is there a designated software manager?	63.8%	52.5%	59.14%	6.66%
3 @	Q2.1.1. Does the software organization use a standardized and documented software development process on each project?	72.3%	77.2%	54.84%	-22.39%
3	Q2.1.6. Are standards used for the content of software development files/folders?	63.1%	63.4%	53.76%*	-9.60%
<b>Least implemented practices:</b>					
2	Q2.2.2.m. Are profiles of software metrics (size or complexity) maintained over time for each software configuration item?	16.2%	24.8%	25.81%*	1.05%
4	Q2.2.5. Are design errors projected and compared to actuals?	23.8%	38.6%	26.88%*	-11.73%
4	Q2.3.8. Is review efficiency analyzed for each project?	17.7%	17.8%	26.88%	9.06%
4	Q2.2.6.1s. Are code errors projected and compared to actuals?	19.2%	34.7%	27.96%*	-6.70%
4	Q2.3.9. Is software productivity analyzed for major process steps?	17.7%	30.7%	29.03%*	-1.66%

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## Key Points

- Software projects create competitive advantage.
- Business system planning should be top-down.
- MIS strategy set must map with organizational strategy set.
- TQM and CMM should be applied together to manage software development process.

# Q & A

## Case Study II-3 business intelligence



## Current IT infrastructure

1. ERP software
2. AccessNS BI software
3. Data warehouse.

**TABLE 1** Track 2012 Strategies and BI Applications

Track 2012 Strategy	Department	Application
Service	e-Commerce	accessNS: See description and screenshots above.
	Intermodal	Intermodal Operational Dashboard: A real-time (updated every 15 minutes) exception-based dashboard that communicates operational information about Intermodal service.
Managing Fuel Use	Industrial Engineering	Ad hoc: An ad-hoc application was developed after Hurricane Katrina to ensure that fuel was delivered to the right places at the right times in an emergency situation
Managing Asset Turns	Modalgistics	Multilevel: This application optimizes the movement of special multilevel cars.
	Car Distribution	Empty: This application reduces the number of empty cars that travel on the track network.
Workforce Productivity	Crew Call	Crew Call: This application optimizes crew scheduling to ensure crews are at the right train at the right time. The result is \$2.8 million annual savings for reducing the cost of trains held for crews.
	Human Resources	Workforce Planning: This application predicts future staffing needs. The HR planning staff proactively examines the employees within each department and explores historical trends for retirement ages and years of service. Armed with this data, they forecast out retirement attrition for the next five to ten years and help put strategies in place to meet hiring needs.

## Case Analysis Tasks

1. Identify the most important or the most critical issue that leads to the problem in the minicase;
2. Analyze this most important or most critical issue; then, provide your suggestions about what should be done;
3. Identify any additional issues;
4. Analyze these additional issues; then, provide your suggestions about what should be done and set the priority for each of them.

