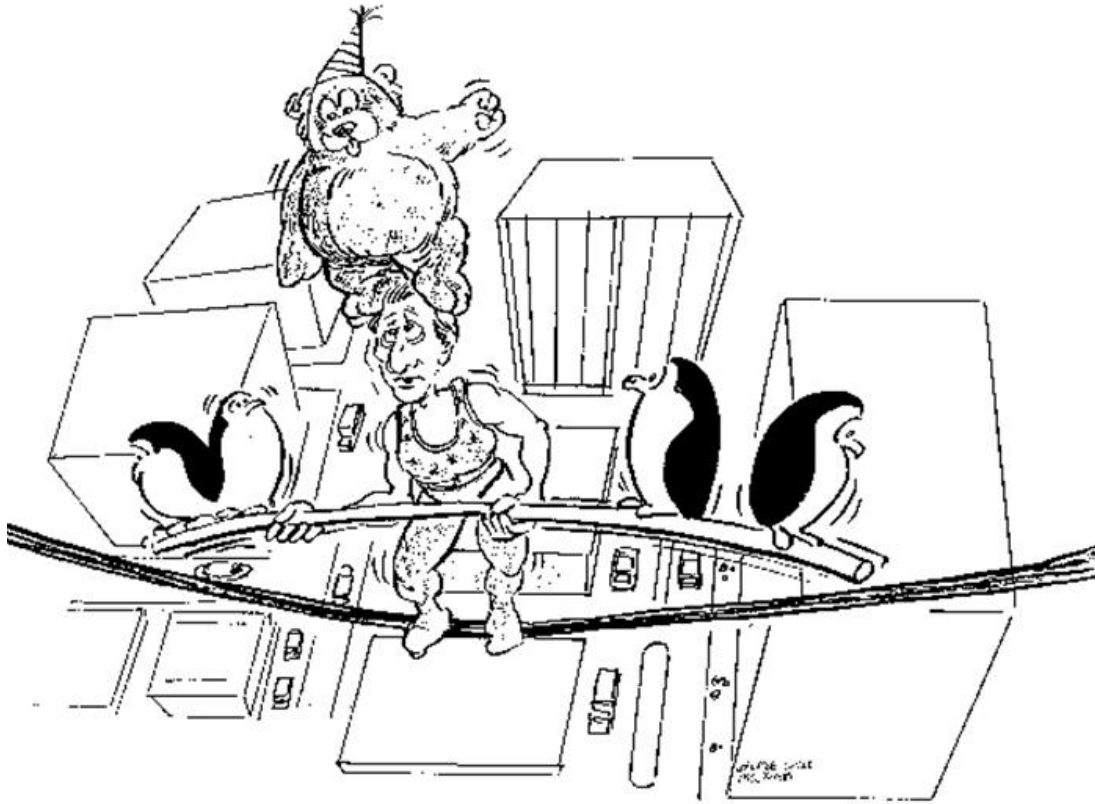


# MODULE 0: Introductory Concepts



## INTRODUCTORY CONCEPTS Balancing the Art & Science of Management Systems Engineering



# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

## Introductions

- Name
- Major
- Interesting thing you did this summer
- What career / field are you interested in pursuing after graduation?



# MODULE 0: Introductory Concepts

## Tools & Support

- All materials are organized by module on e-learning.
- Readings
- Assignments
- Slides & Podcasts
- Text is in pdf format. If you would like a copy, ASEM will sell you one for \$50. **DO NOT PRINT LARGE JOBS AT CAE!**

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview



# MODULE 0: Introductory Concepts

## Assignments

- Exercises
- In-class (group)
- Individual
- Case study (group)
- In-class exercises
- Final Exam

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview



# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

## What a '5' looks like

Question: What type of personnel management methodology does the manager use with the employee in the case study?

Answer: Coaching

Coaching is technically correct, but a good answer is in a complete sentence, is spelled correctly and provides some insight and reason.



# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

## What a '10' looks like

Question: What type of personnel management methodology does the manager use with the employee in the case study?

Answer: The manager in the case study uses the management methodology of 'coaching' with the employee. The use of specific improvement items such as 'focusing on details' by the manager in a one to one setting provide evidence that 'coaching' was employed as the management methodology.

Correct answer, but also with complete sentences and example from the case.



# MODULE 0: Introductory Concepts

## Course Objectives

1. Define, build, and scope a domain of responsibility.
2. Identify performance criteria for the domain and identify data and information needs.
3. Design relevant information portrayals.
4. Conduct an ABC Audit and time log.
5. Develop Data Flow Diagrams for the domain.
6. Build and use a management tool.

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview



# MODULE 0: Introductory Concepts

## Art and Systems

- Art-science distinction
- Is management an art or a science?
- Artists use many systems concepts, mathematics, geometry, symbolism.
- Art communicates meaning via extremely rich information.
- Systems are analogous.

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview





# MODULE 0: Introductory Concepts

## Bending Space / Time (Dali)



Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview



# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

## Bending Time & Space (Dali)

- Envisioning process
- Surrealism
- Time-space relationships
- Time management-can't be done
- Time-based management



# MODULE 0: Introductory Concepts

## 21<sup>st</sup> Century Management

Class Introductions

Course Overview

Art & Science of MSE

21st Century Management

MSE Overview

Balance

Class Module Overview

<b>CHARACTERISTIC</b>	<b>20TH CENTURY</b>	<b>21ST CENTURY</b>
<b>ORGANIZATION</b>	The Pyramid	Web/Network
<b>FOCUS</b>	Internal	External
<b>STYLE</b>	Structured	Flexible
<b>SOURCE OF STRENGTH</b>	Stability	Change
<b>STRUCTURE</b>	Self-sufficiency	Interdependencies
<b>RESOURCES</b>	Atoms physical assets	Bits information

*Source: Business Week 8/21/2000*



# MODULE 0: Introductory Concepts

## 21<sup>st</sup> Century Management

Class Introductions

Course Overview

Art & Science of MSE

21st Century Management

MSE Overview

Balance

Class Module Overview

### CHARACTERISTIC

### 20TH CENTURY

### 21ST CENTURY

OPERATIONS

Vertical integr.

Virtual integration

REACH

Domestic

Global

FINANCIALS

Quarterly

Real-time

INVENTORIES

Months

Hours

STRATEGY

Top-down

Bottom-up

PRODUCTS

Mass

Mass

Production

Customization

*Source: Business Week 8/21/2000*



# MODULE 0: Introductory Concepts

## 21<sup>st</sup> Century Management

Class Introductions

Course Overview

Art & Science of MSE

21st Century Management

MSE Overview

Balance

Class Module Overview

### CHARACTERISTIC

### 20TH CENTURY

### 21ST CENTURY

LEADERSHIP

Dogmatic

Inspirational

WORKERS

Employees

Employees and  
free agents

JOB EXPECTATIONS

Security

Personal growth

MOTIVATION

To compete

To build

IMPROVEMENTS

Incremental

Revolutionary

QUALITY

Affordable best

No compromise

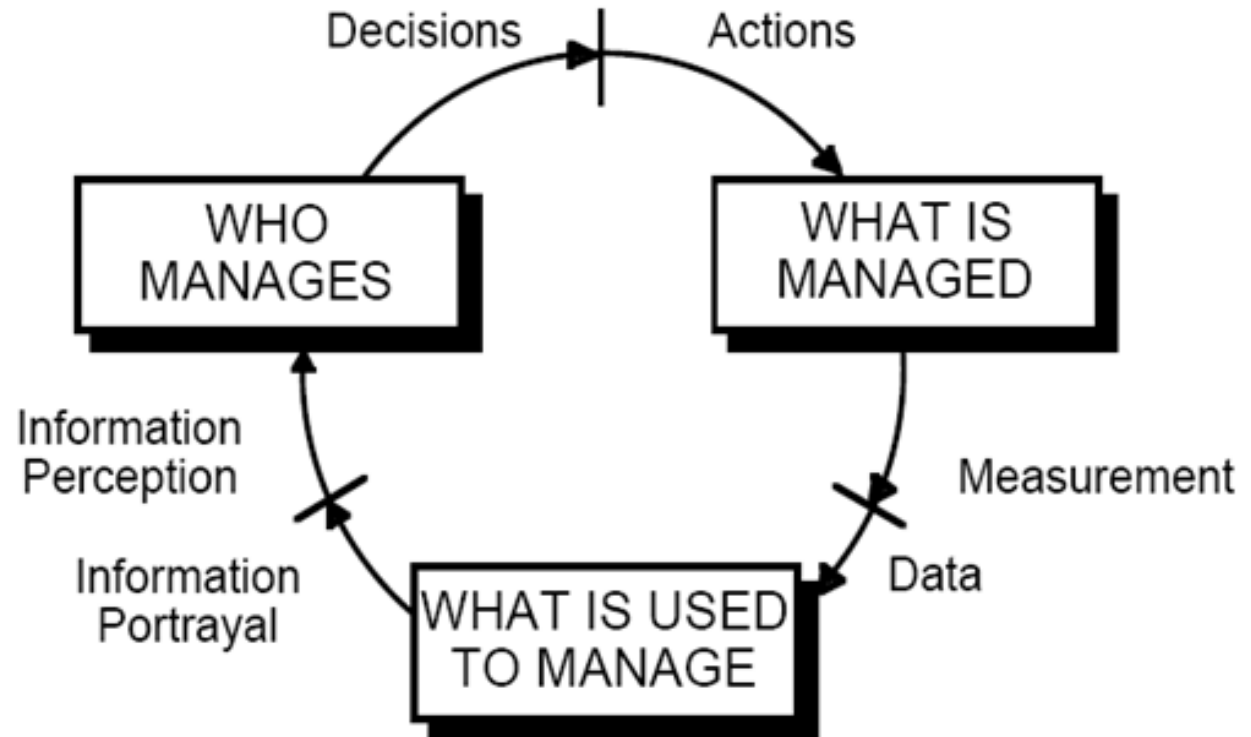
*Source: Business Week 8/21/2000*



# MODULE 0: Introductory Concepts

## Management Systems Engineering Overview

### MSM: Management System Model



Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview



# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

## Closed Loop Process

- Sequential functions
- Associated tools and techniques
- PDSA
- The Swimming Hole



# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

## Key Systems Concepts

- Human is central in group interactions and organizations.
- Trust is essential.
- Empowerment and trust require exposure.
- Systems and processes are different.
- Processes include a series of functions, with tools and techniques.





# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

## In MSE we Recognize the Emotional Part of Organizational Effectiveness

- Culture
- Motivation
- Trust
- Teamwork
  
- ...Important for stability and synergy in the organization.



# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

---

***“There is no science without fancy  
and no art without facts.”***

---

**Vladimir Nobokov**



# MODULE 0: Introductory Concepts

## The Management System Engineer Meets Needs

Class Introductions

Course Overview

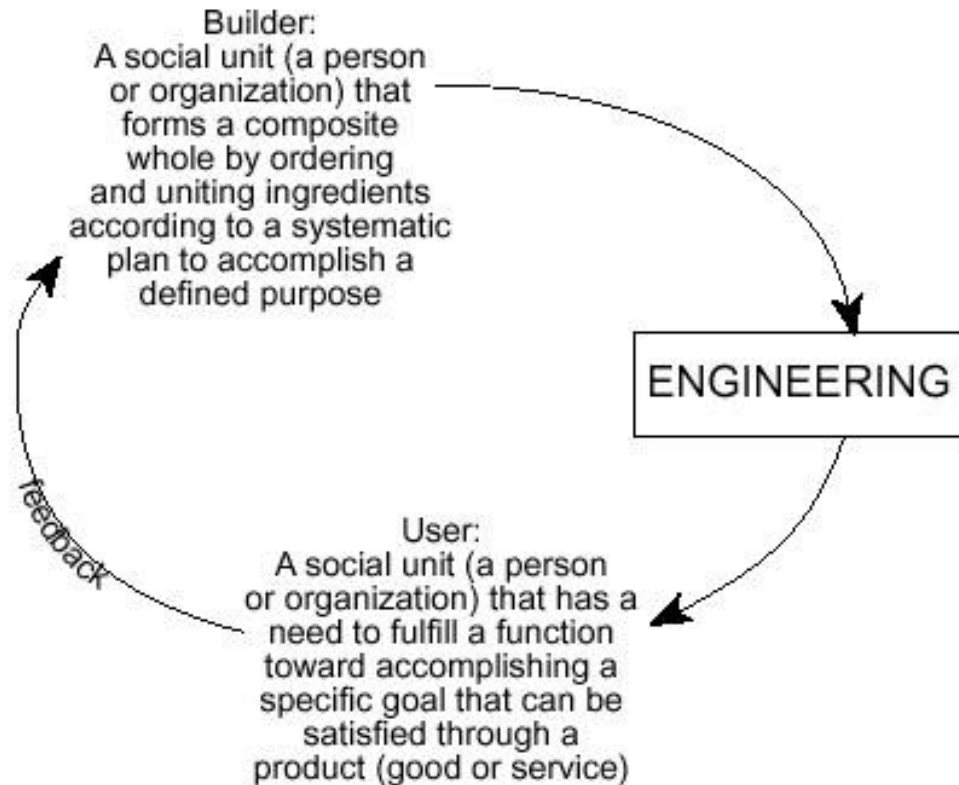
Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview



# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

---

*“Color is perspective.”*

---

Paul Cezanne



# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

## Color and Definitions

- No two persons will experience color exactly the same way.
- No two persons will define management exactly the same way.
- Write down your definition of management.
- Compare to others.
- Hard to change your definition.



# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

## What is the problem?

- System failure=f(management failure)
- Apply engineering fundamentals to management.
- Engineering vs. engineering process
- Engineering: connects builder to user
- Eng process: process of building something
- MSE applies engineering fundamentals to meet the needs of the manager.



# MODULE 0: Introductory Concepts

Class Introductions

Course Overview

Art & Science of MSE

21<sup>st</sup> Century Management

MSE Overview

Balance

Class Module Overview

## Balance is the Key to Management

- Art vs. science
- Management vs. labor
- Speed vs. quality
- Quantitative vs. Qualitative



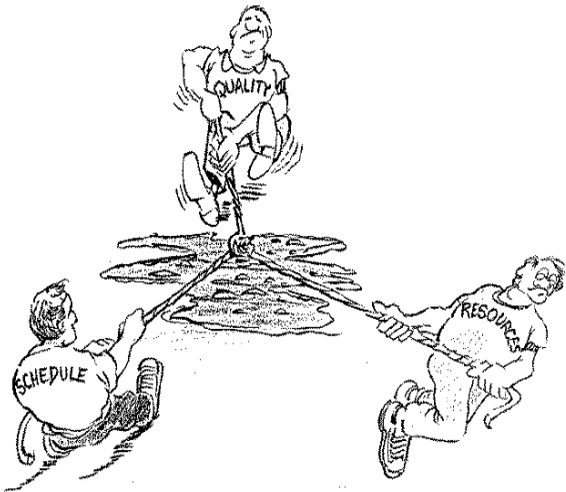
# MODULE 0: Introductory Concepts



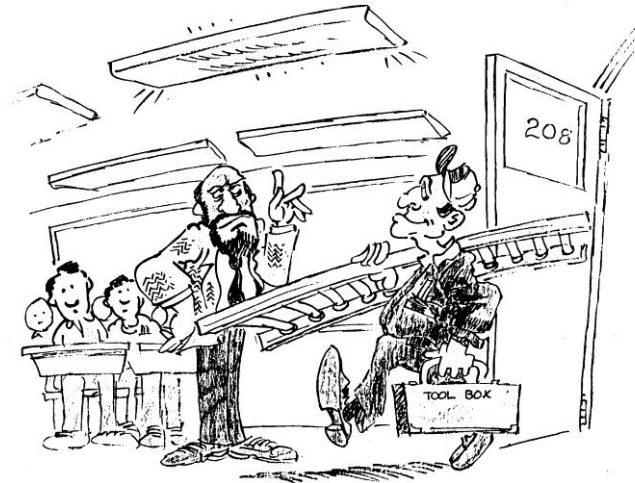
Module 0: Balance



Module 1: Domains of Responsibility



Module 2: Performance Criteria

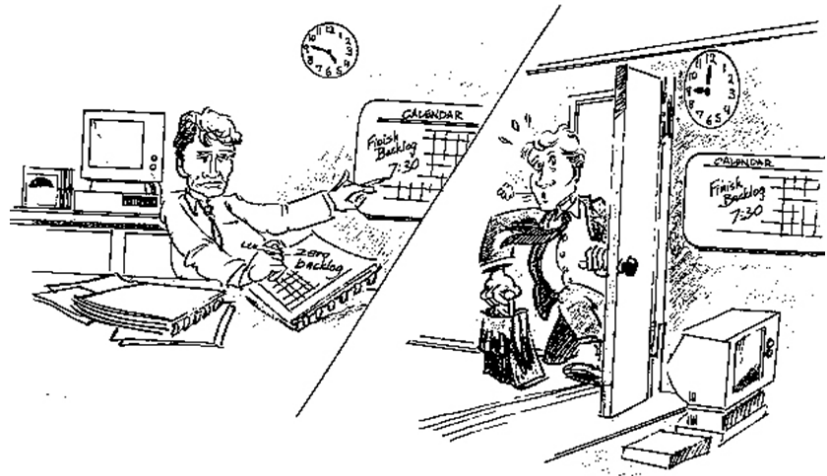


Module 3: Data -> Information

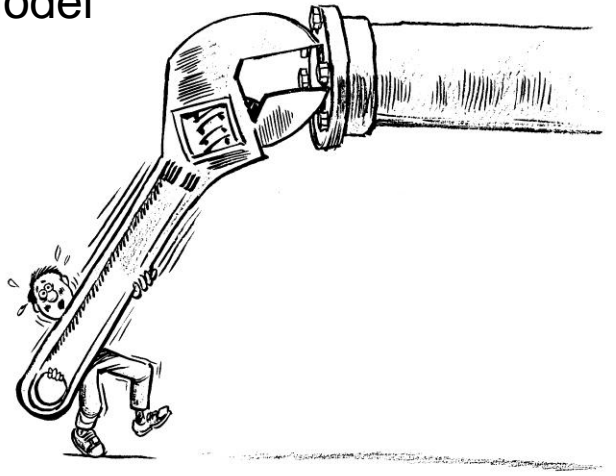
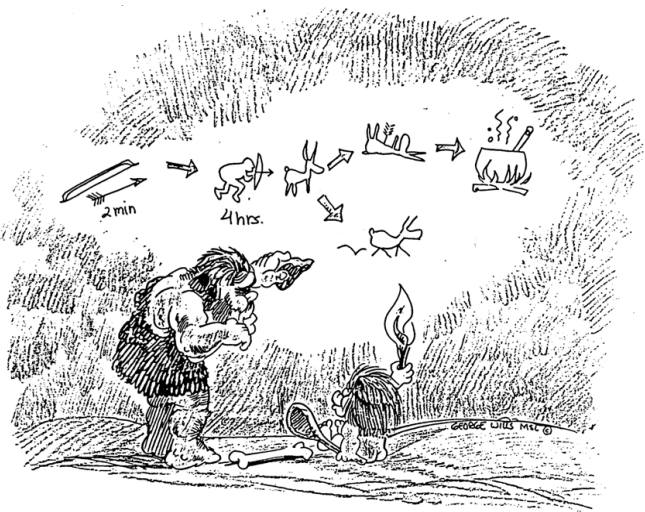




# MODULE 0: Introductory Concepts



## Module 4: The ABC Model



## Module 5: Data Flow Diagrams

## Module 6: Building Management Tools



# MODULE 1: Defining the Domain of Responsibility



**Defining the Domain of Responsibility:**  
*What is managed and by Whom?*



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Define Management Systems Engineering

- Mixture of Art and Science
- The harmonious, robust blend of:
  - the systems approach
  - the engineering process
  - the management process.
- People who practice MSE aren't necessarily engineers or managers.



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Leonardo Da Vinci

- Picsearch.com
  - Last Supper
  - Mona Lisa
  - Human body
- Epitome of the engineer
  - Imagine and envision
  - Connect imagination to reality
  - Geometric, structured approach



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Define ‘Management System’

“Any person or group of people making decisions about and taking action on a set of responsibilities, the work process for meeting those responsibilities, and the management tools for converting data from measurements of the work process into information for decision making.”



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

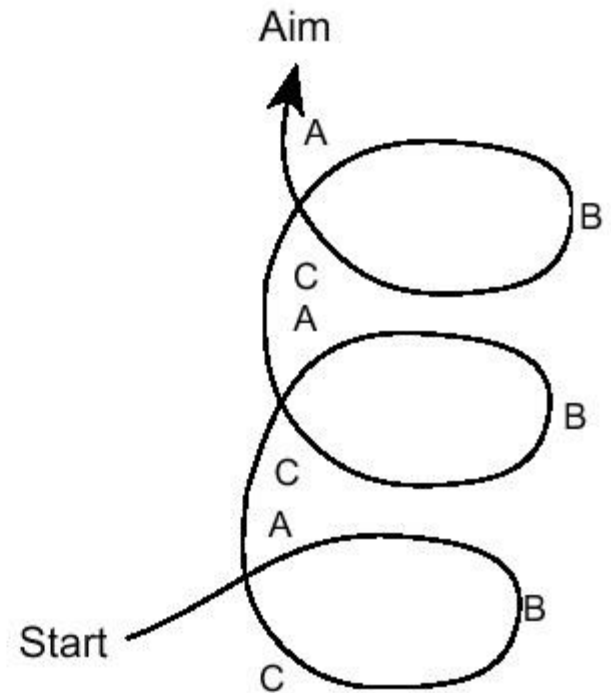
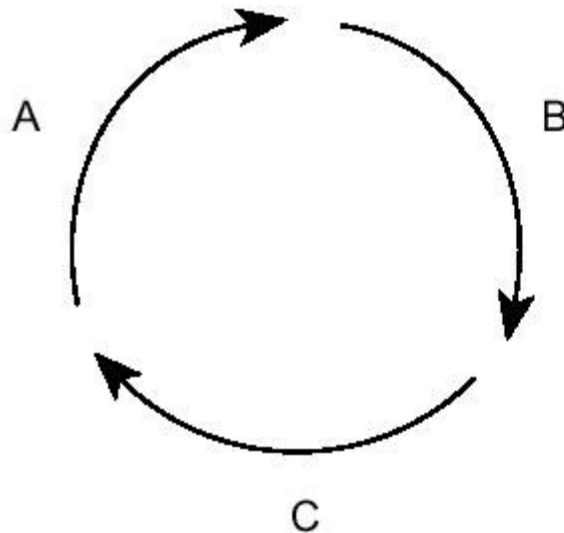
Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Processes for Learning Tend to be Cyclical Toward an Aim



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

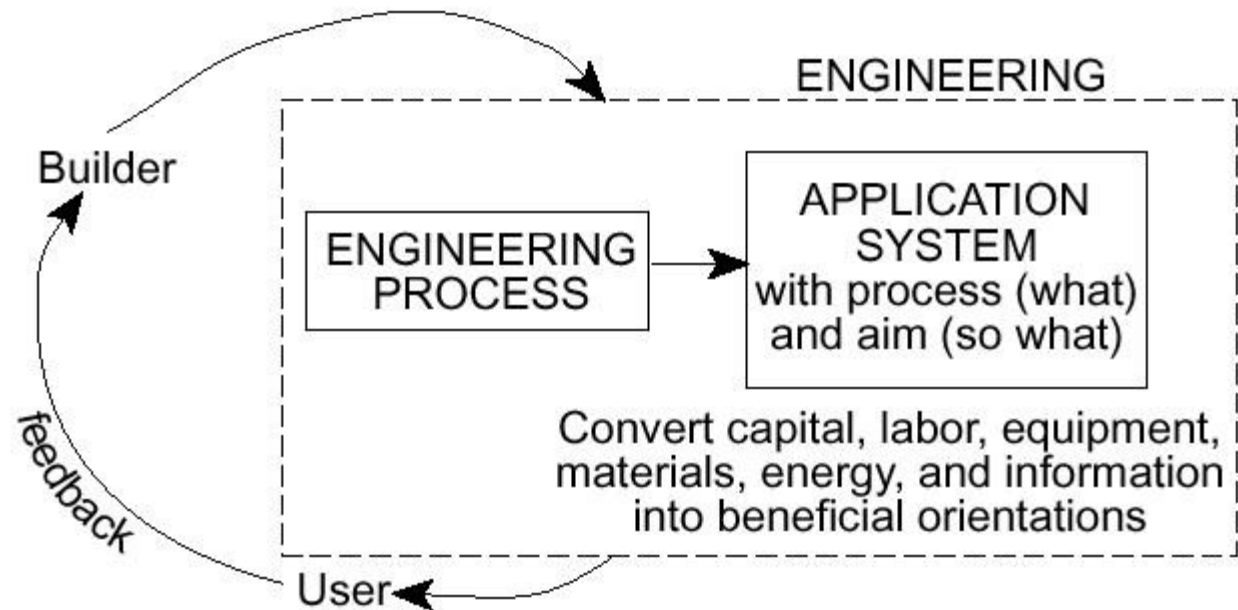
Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## What's Unique about MSE?

- Interventions
- Organization
- Performance



# MODULE 1: Defining the Domain of Responsibility

## How does MSE Impact Performance?

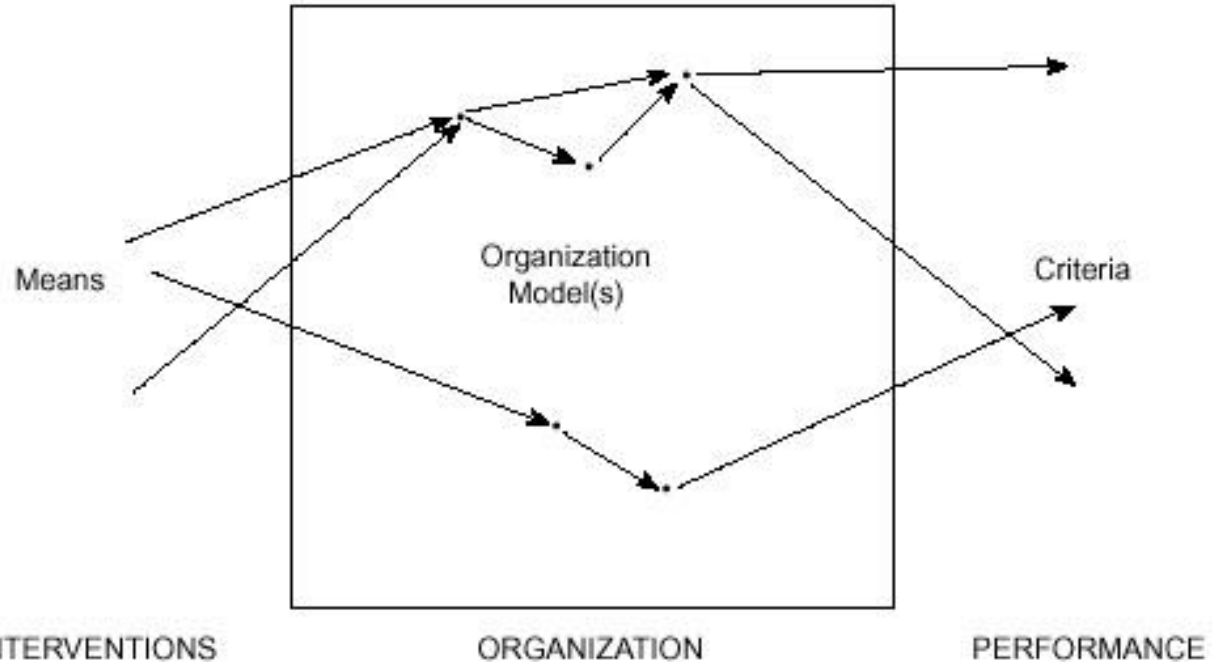
MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review





# MODULE 1: Defining the Domain of Responsibility

## Forrester's Systems Model

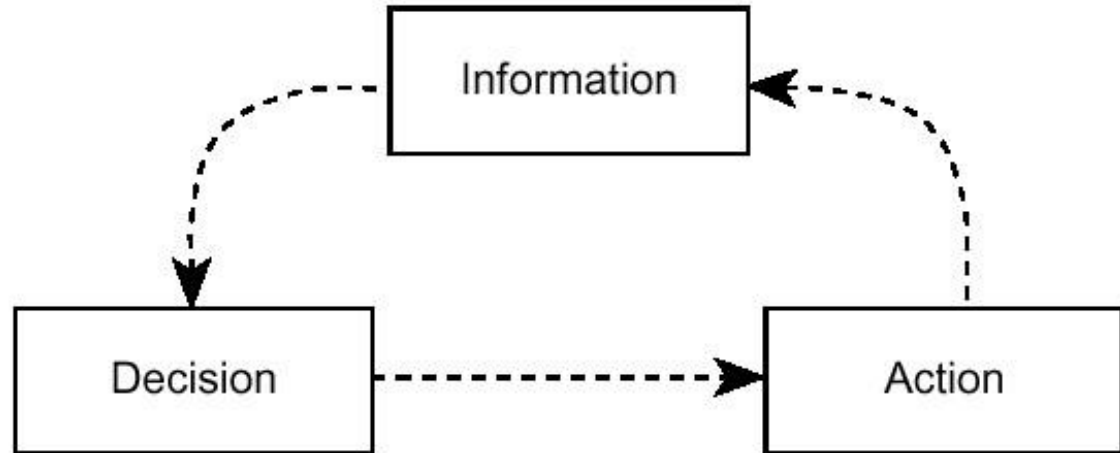
MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

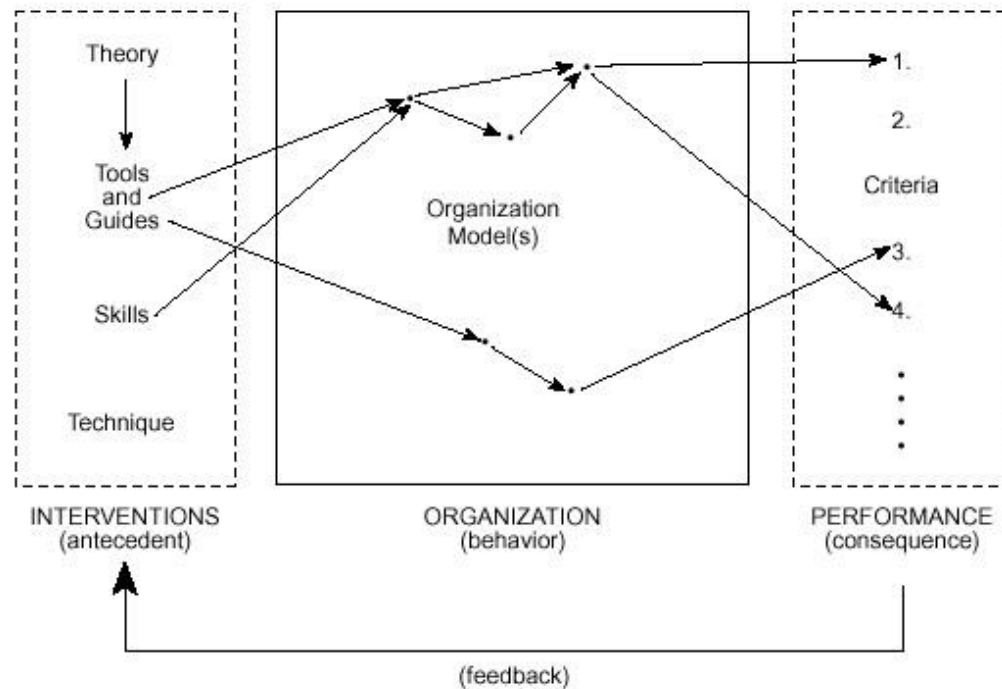
Concept Review



# MODULE 1: Defining the Domain of Responsibility

## Define Management

“Decision making [is] synonymous with managing.”  
(Herbert A. Simon, *The New Science of Management Decision*)

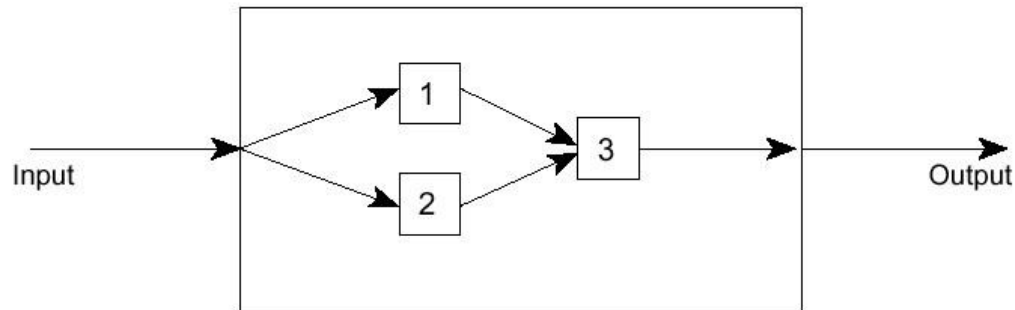


# MODULE 1: Defining the Domain of Responsibility

## Define 'System'

The organization is a system involving one or more processes for changing input into output, resulting in throughput, with all components working toward a common aim and with performance measures to determine progress toward the aim.

A System converts Input(s) into Output(s)



MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Exercise: Input / Output

Construct an input/output diagram for an academic program, such as UEM.

- What are the inputs?
- What are the outputs?
- What are the transformation processes?
- What interactions with the environment?
- What measures can be derived from this diagram?



# MODULE 1: Defining the Domain of Responsibility

## Define 'Engineering'

Engineering is a profession involving people who profess the engineering process for analyzing, designing, implementing, and following-up applications for the benefit of people based on natural laws and structured procedures for collecting, converting, and conserving energy.

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

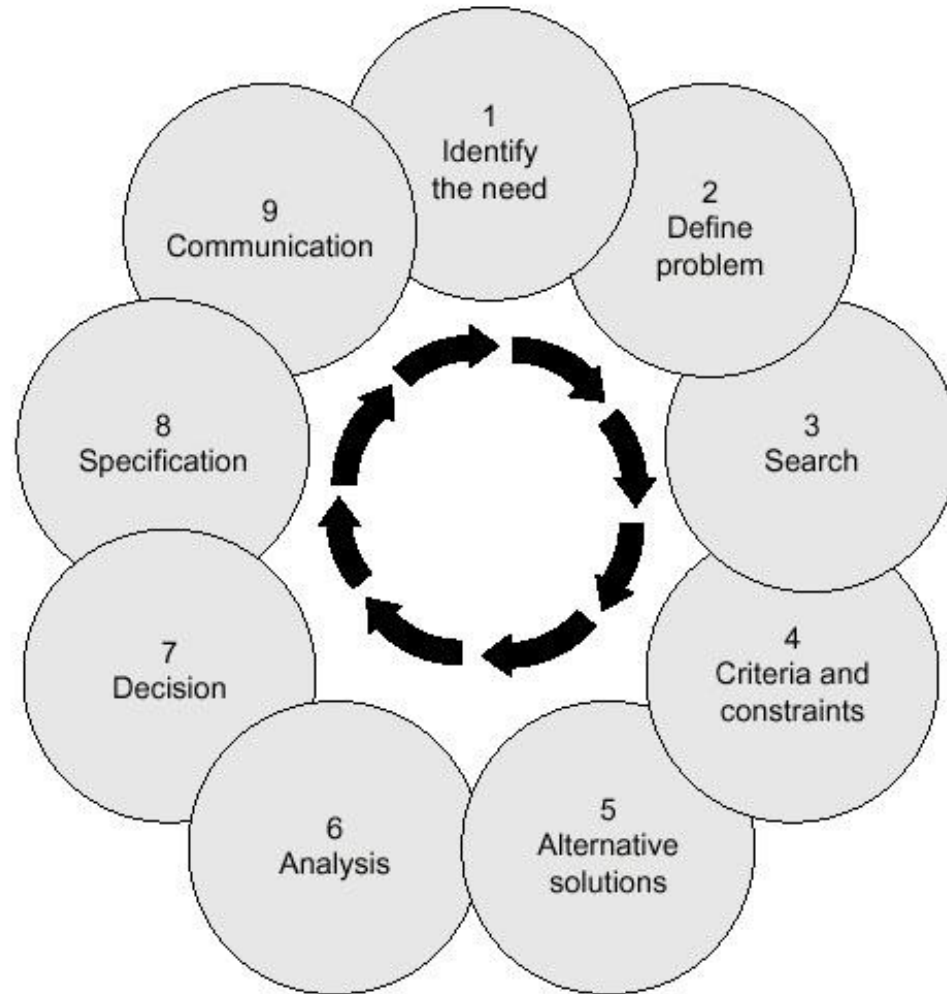
Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

## Engineer's Design Process



MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

## Fundamentals of the Engineering Process

- Language for communication (write dn/up)
- Problem-solving and scientific method
- Drawing and understanding cxns
- Systems approach as a way of thinking
- Walking the workplace
- System life cycle
- Envisioning and imagination

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

## Fundamentals of the Engineering Process

- Collecting, converting, and conservation of energy
- Knowledge of the lessons of the past
- Philosophy
- Teamwork, professionalism, empowerment
- Lifelong learning

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

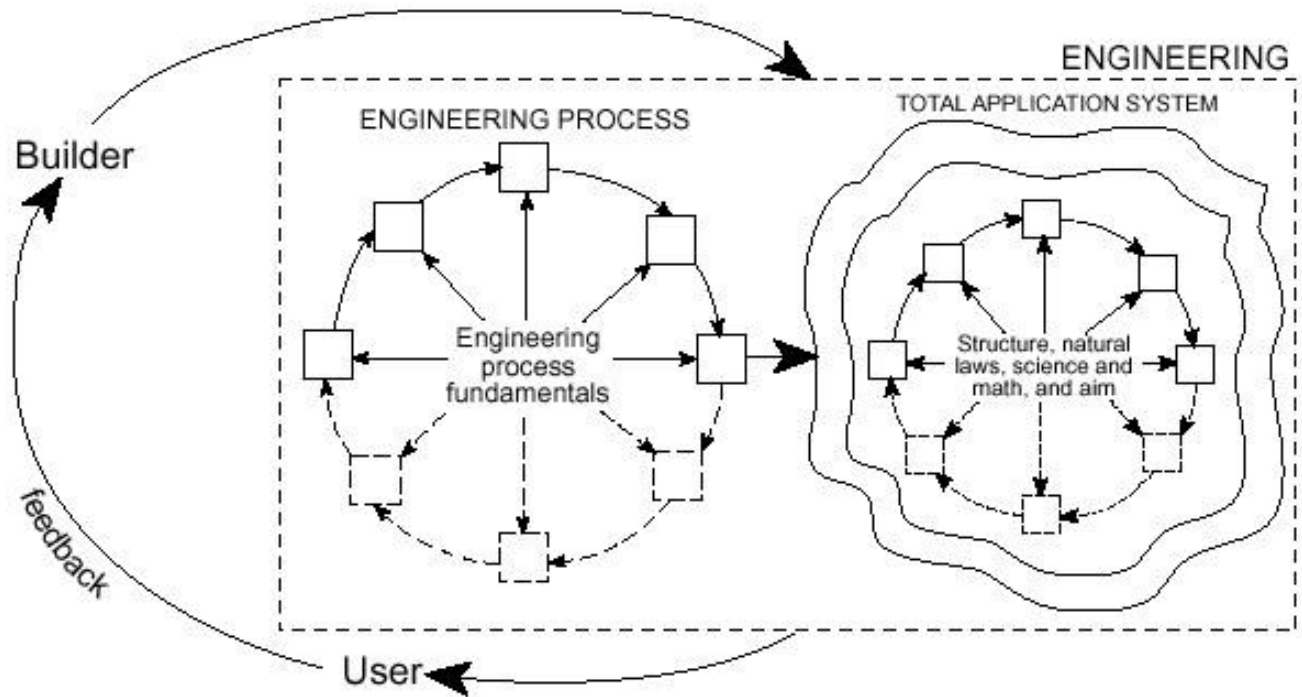
Concept Review





# MODULE 1: Defining the Domain of Responsibility

## Function of the Engineering Process



MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

You Never Finish the Engineering Process,  
You Just Abandon it

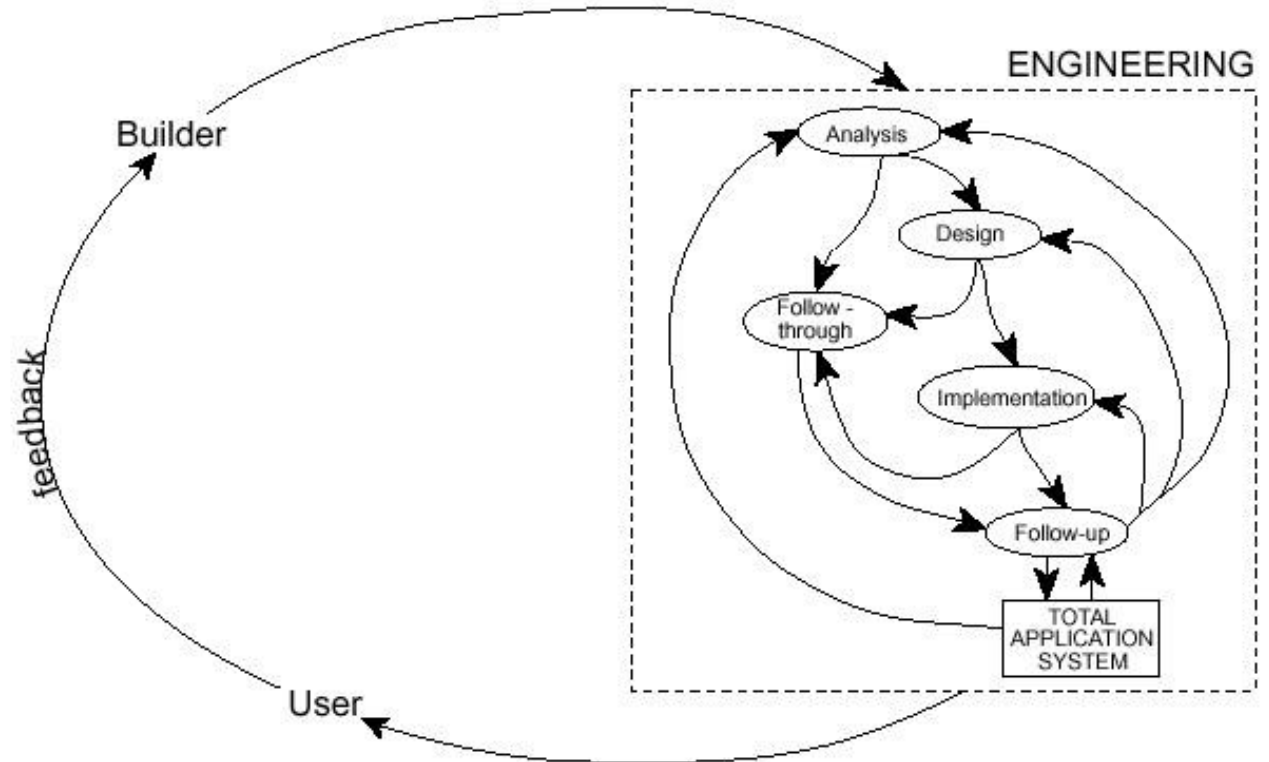
MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

## Responsibility

Responsibility is a unique concept: It can only reside and inhere in a single individual. You may share it with others, but your portion is not diminished. You may delegate it, but it is still with you. You may disclaim it, but you cannot divest yourself of it. Even if you do not recognize it or admit its presence, you cannot escape it. If responsibility is rightfully yours, no evasion or ignorance or passing the blame can shift the burden to someone else. Unless you can point your finger at the man who is responsible when something goes wrong, then you have never had anyone really responsible.

**H.G. Rickover**

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

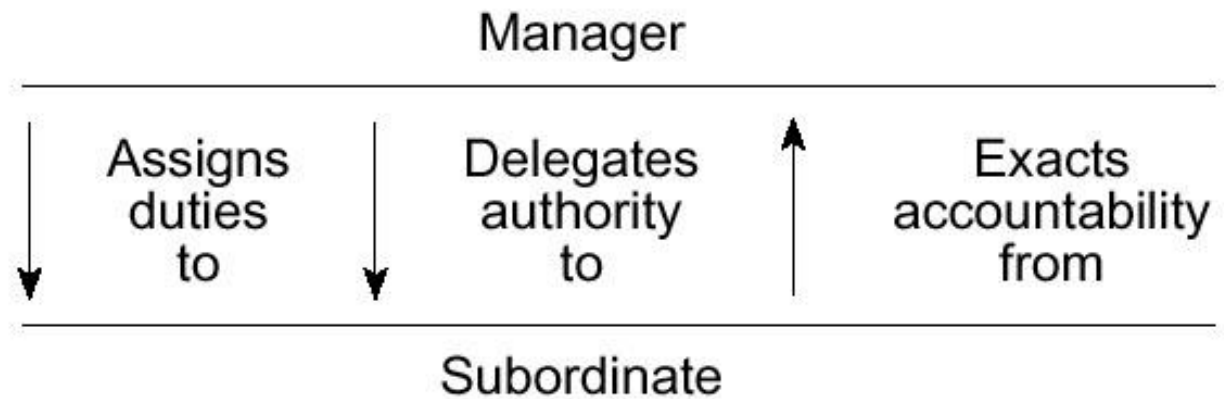
Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

## Delegation, Authority, Accountability



MSE Introduction

Management & Responsibility

Foundation Concepts I & II

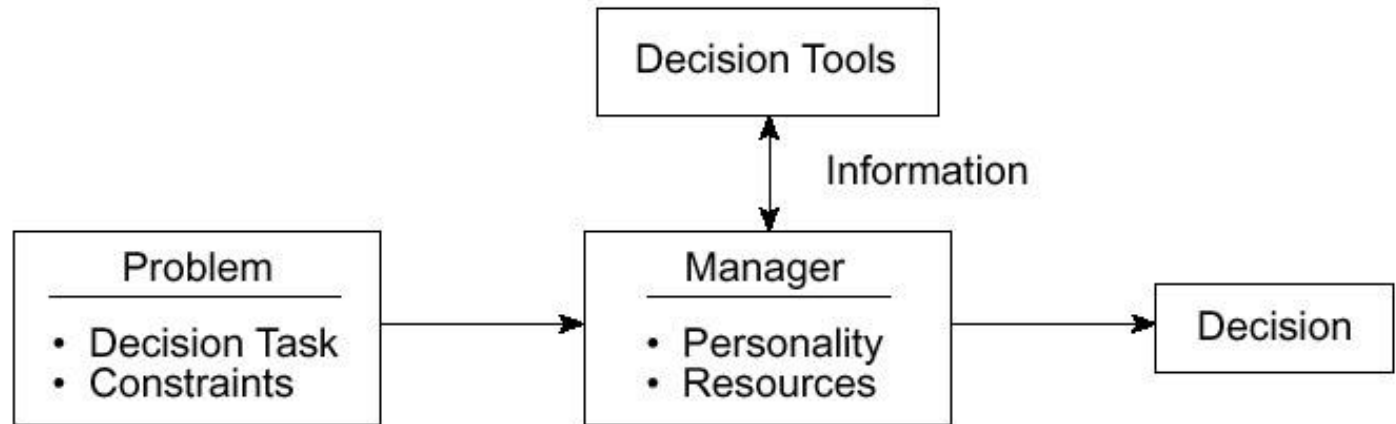
Management System Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

## Decision Making Model



MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Purpose of the Course

- Describe and evaluate systems.
- Determine which tools will work.
- Build or get the right tool.
- Describe how to use the tool.
- Predict performance from using the tool.
- Practice skills and techniques.



# MODULE 1: Defining the Domain of Responsibility

## Some General Concepts

- Semiotics
- Domain
- Responsibility, authority, accountability, delegation
- Manager and management, leader

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

## Operational Definition

- “Puts communicable meaning into a concept”
- “One that people can do business with”
- Allows for measurement

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review





# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Define Domain of Responsibility

- Limits and scope; connected to other domains
- One person accountable for responsibilities
- A connected, identifiable object of authority
- Make decisions, take action on what
- What=domain



# MODULE 1: Defining the Domain of Responsibility

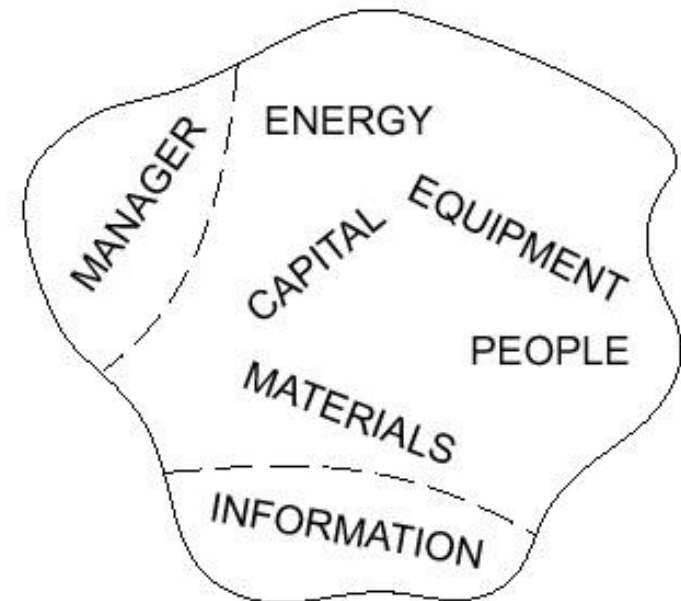
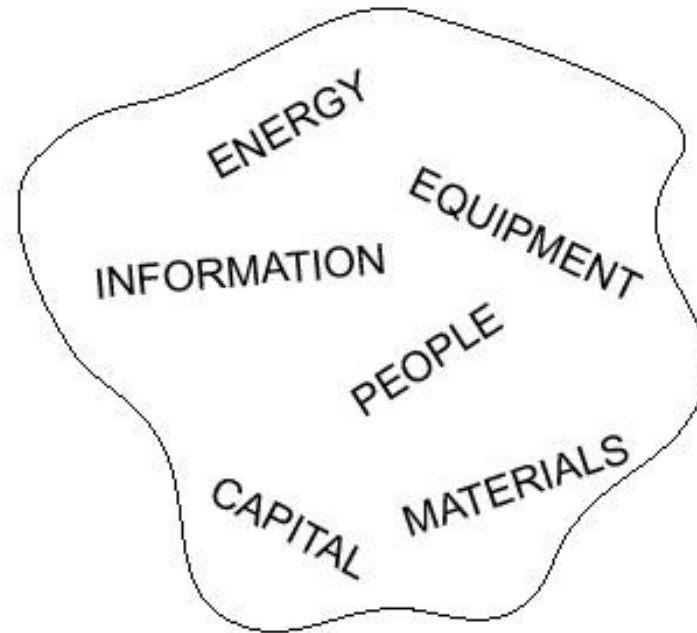
MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

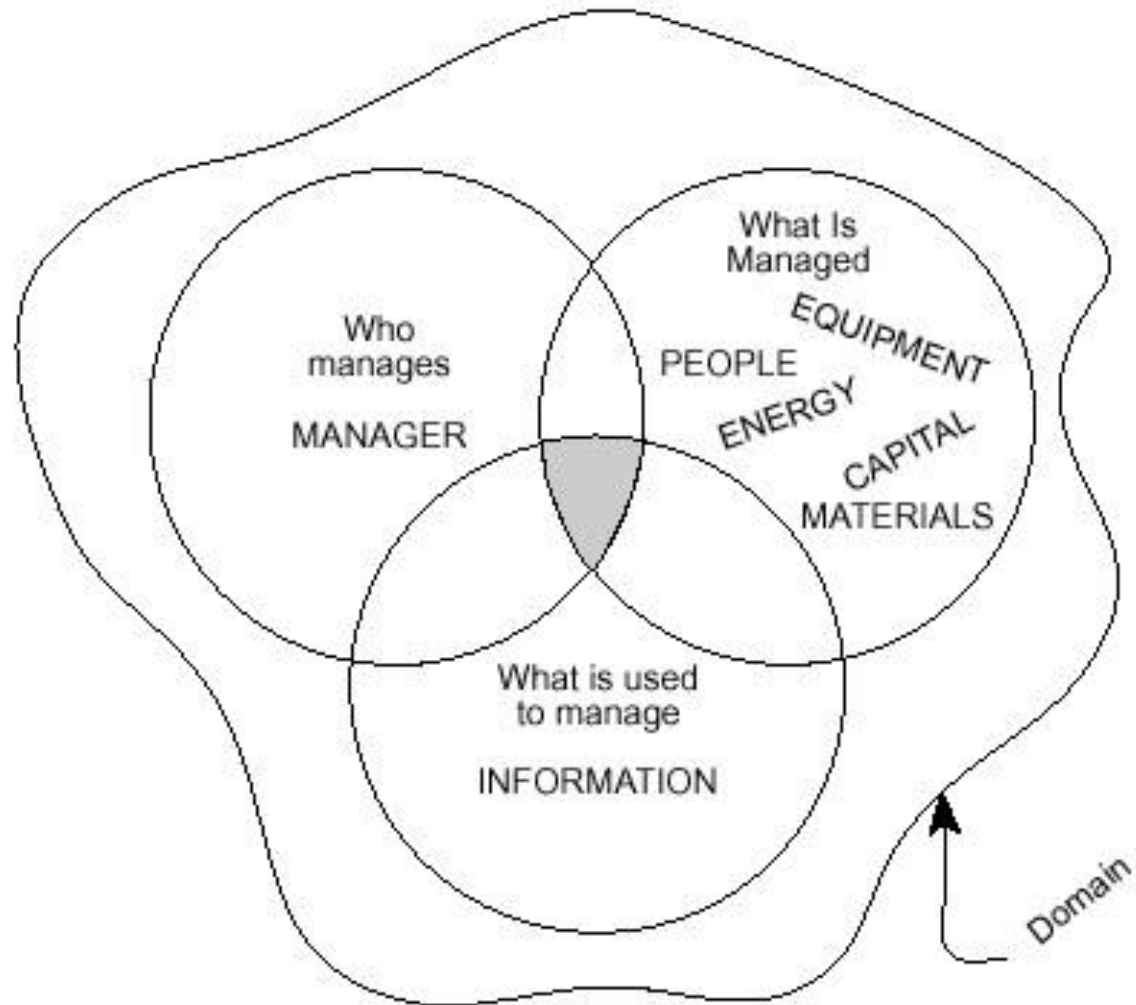
MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

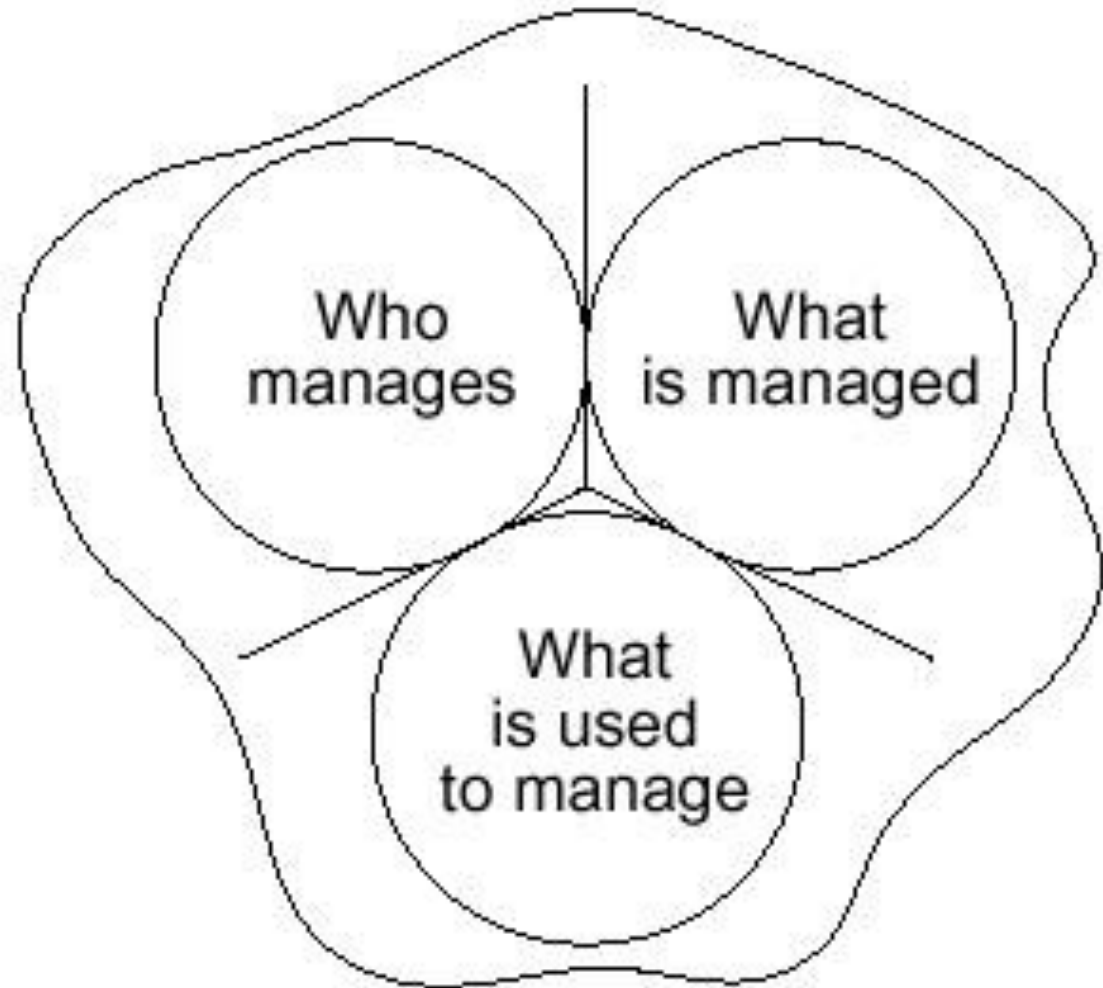
MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

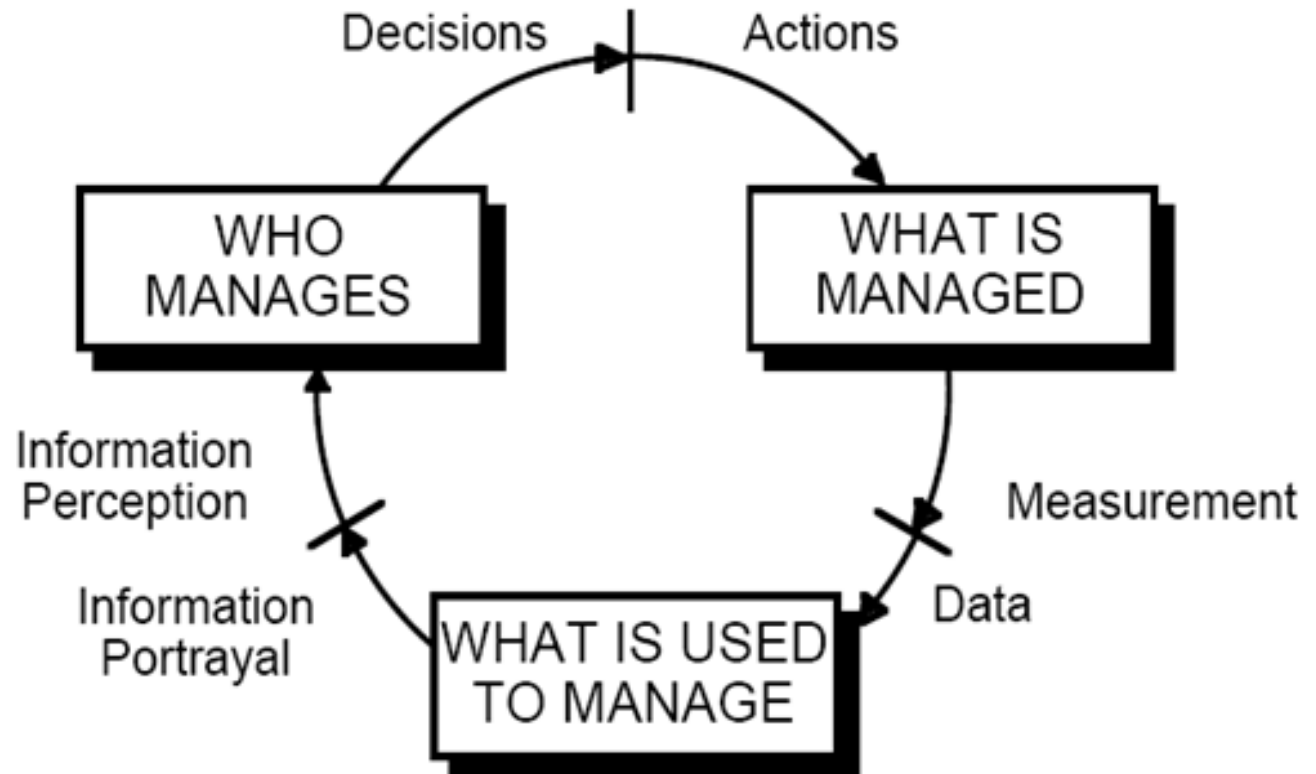
Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## MSM: Management System Model



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Define a Management System

- **System:**
  - converts inputs to outputs
  - defined objective (common aim)
  - transformation processes
  - measures of performance
  
- **Management system: domain of responsibility**
  - decision, actions



# MODULE 1: Defining the Domain of Responsibility

## More General Concepts

- Analysis & synthesis
- Synergy
- Balance
- Function

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

## Deming

- The important things in an organization are unknown and unknowable.

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review





# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Review Lessons from Foundation Concepts I

- To be a successful management systems engineer, you must understand and internalize the systems approach.
- The system perspective highlights the necessity of each system component and its importance to achieving the system's aim.



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Review Lessons from Foundation Concepts I

- Systems show internal movement, always changing; and a balanced system has both motion and stability
- Good models include what we know in our heart and gut as well as in our mind
- (etc. see p. 140, mod 1.1.15)



# MODULE 1: Defining the Domain of Responsibility

## Define the Systems Approach

- Systems approach vs. system
  - system is a thing
  - approach is way of viewing the world
- Extensive/intensive qualities (choc. Bar)
- System, holistic, generalist perspectives

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Static and Dynamic Systems

- Statics--for balance and strength of components
- Dynamics--change and influence of the environment in causing change
- Organizations have life cycles
- Time constant=f(business environment, leadership, staff)



# MODULE 1: Defining the Domain of Responsibility

## Closed and Open Systems

- Closed system does not interact significantly with its environment.
- Open system allows information, energy, and matter to cross its boundaries.
- Entropy--all man-made systems consume entropy, going from unordered to a more ordered state

MSE Introduction

Management & Responsibility

Foundation Concepts I & II

Management System Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## Process

- “A collection of well-defined, repeatedly-used functions and rules carried out under an overarching approach.”



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

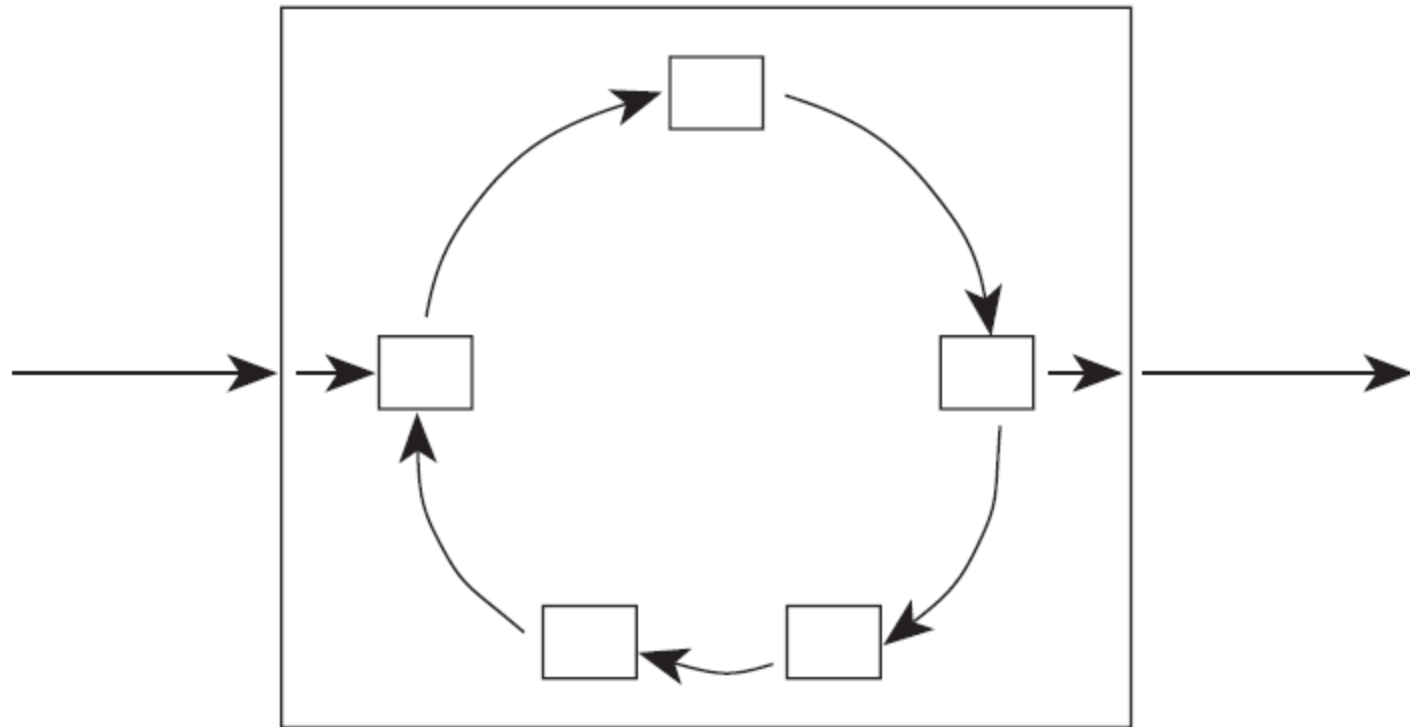
Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## A Cylindrical Process is Associated with a System



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

## System Perspective

- Components, attributes, relationships
- The importance/necessity of each component
- Touch a system anywhere, we touch it everywhere (tightly coupled)





# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

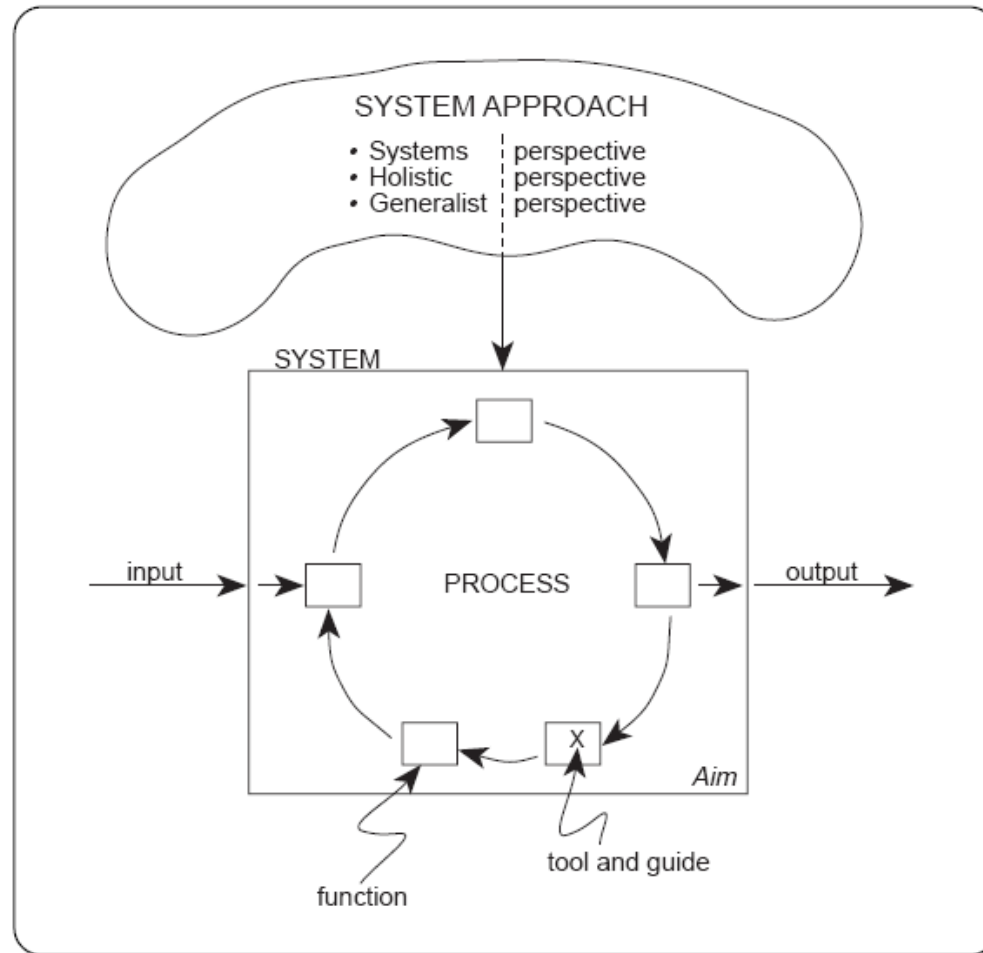
## Tools & Guides

- Tool: Means to an end
- Guide: list of instructions you can keep in your head
- Each tool needs a guide
- Management tool: convert data to information



# MODULE 1: Defining the Domain of Responsibility

## Systems Oriented Concepts



MSE Introduction

Management & Responsibility

Foundation Concepts I & II

Management System Model Introduction

Concept Review



# MODULE 1: Defining the Domain of Responsibility

MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review

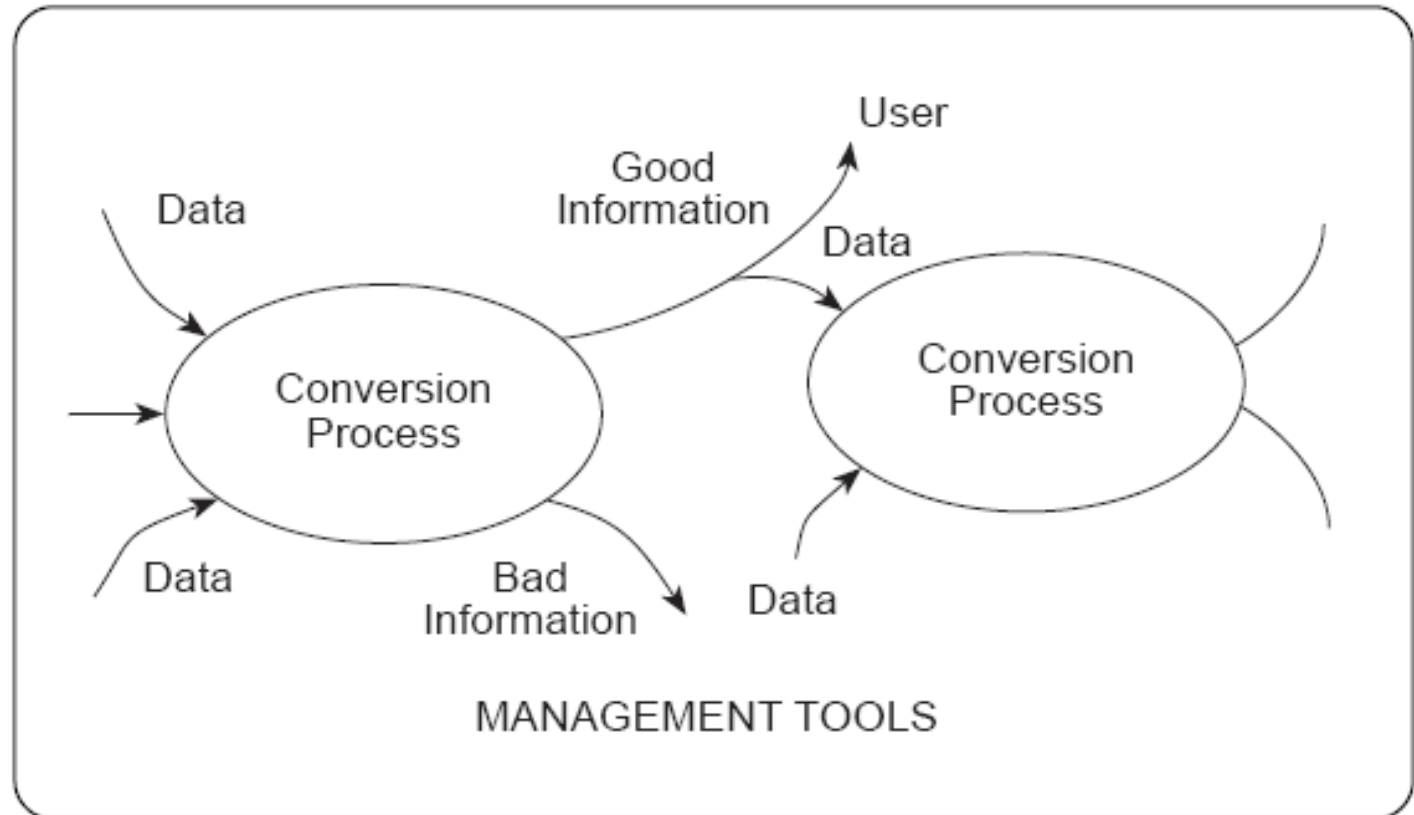
## Data for Information

- DRIP problems
- Today's manager is like Inspector Poirot.
- Two data types make information.
- Data-to-information chain



# MODULE 1: Defining the Domain of Responsibility

## All Information is Biased



MSE Introduction

Management &  
Responsibility

Foundation Concepts I & II

Management System  
Model Introduction

Concept Review



# MODULE 2: Performance Criteria



## Performance Criteria Managing and Measuring within Constraints



# MODULE 2: Performance Criteria

Management System  
Model

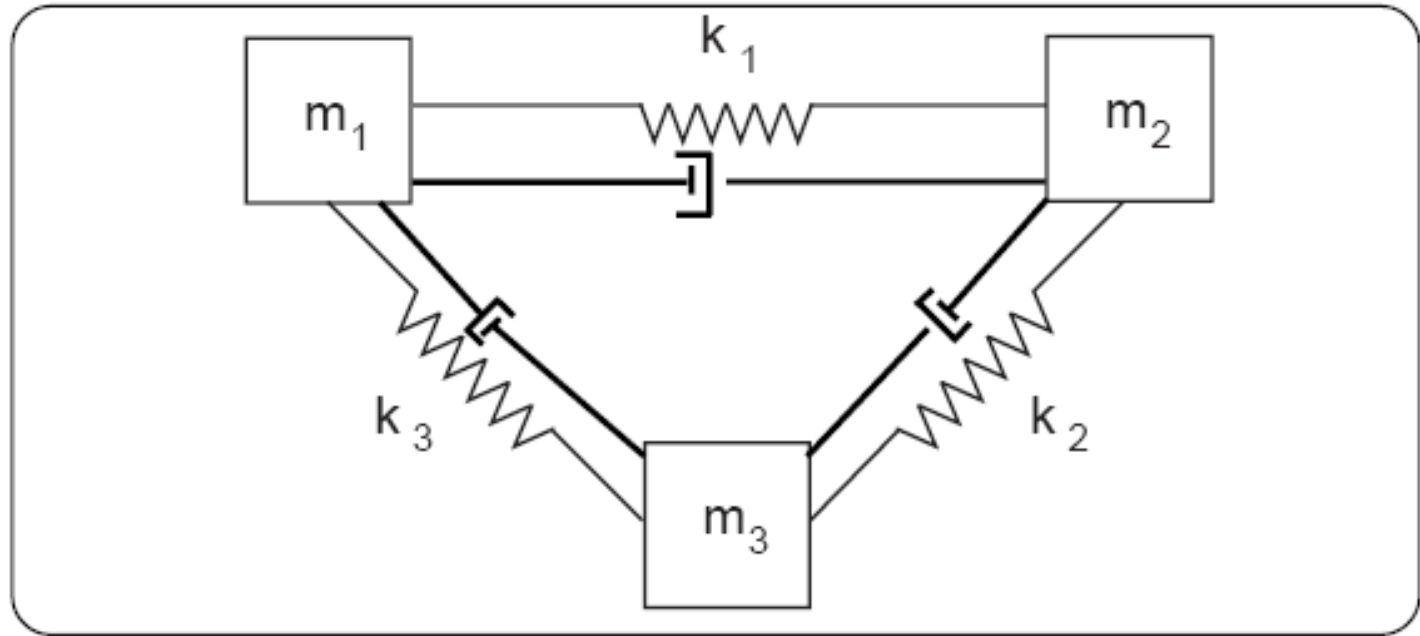
Performance Criteria

Controlling

Foundation Concepts III

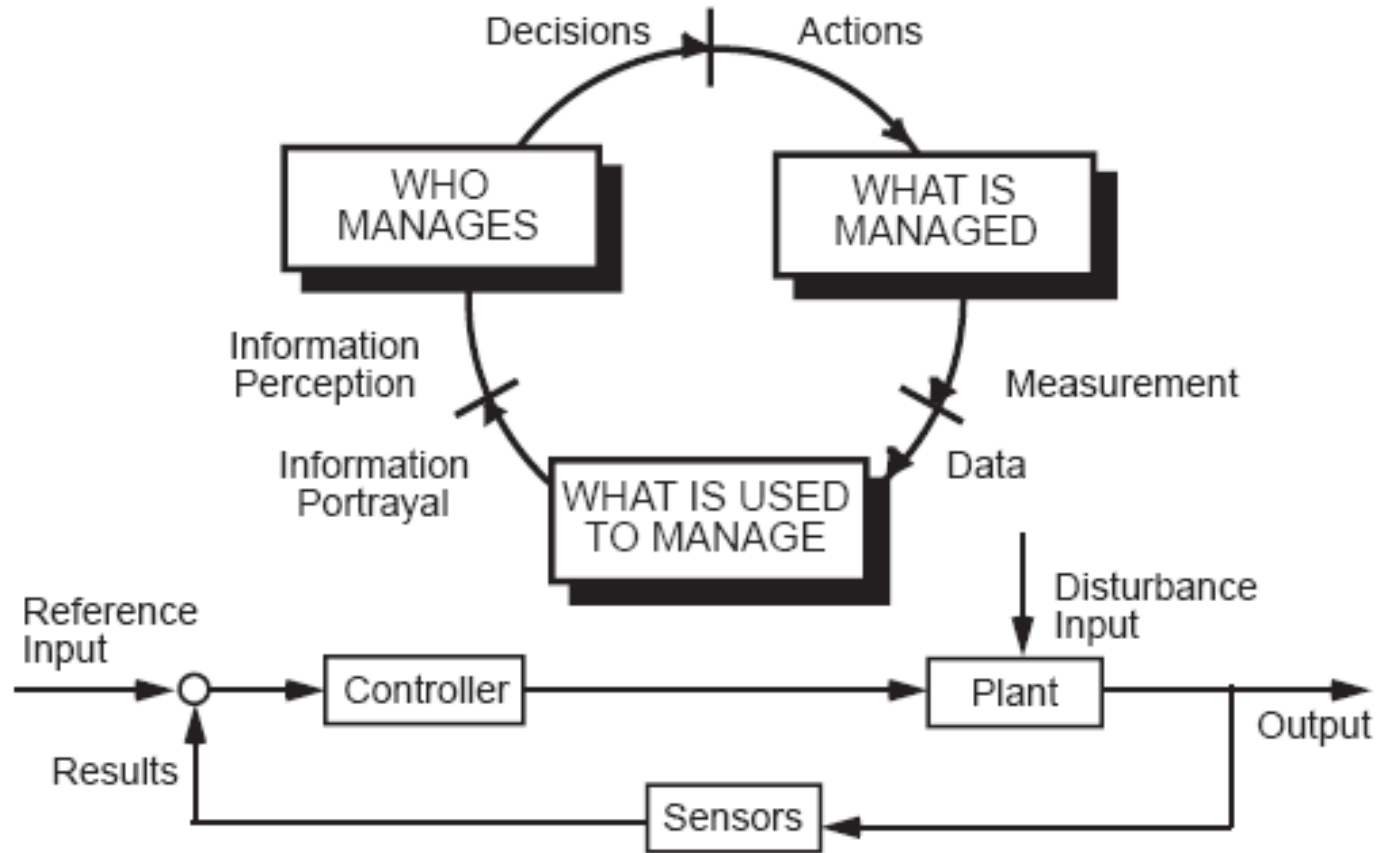
## Balance the MSM?

Perturb the System, what happens?



# MODULE 2: Performance Criteria

## The Control Loop Makes the MSM Predictive



Management System Model

Performance Criteria

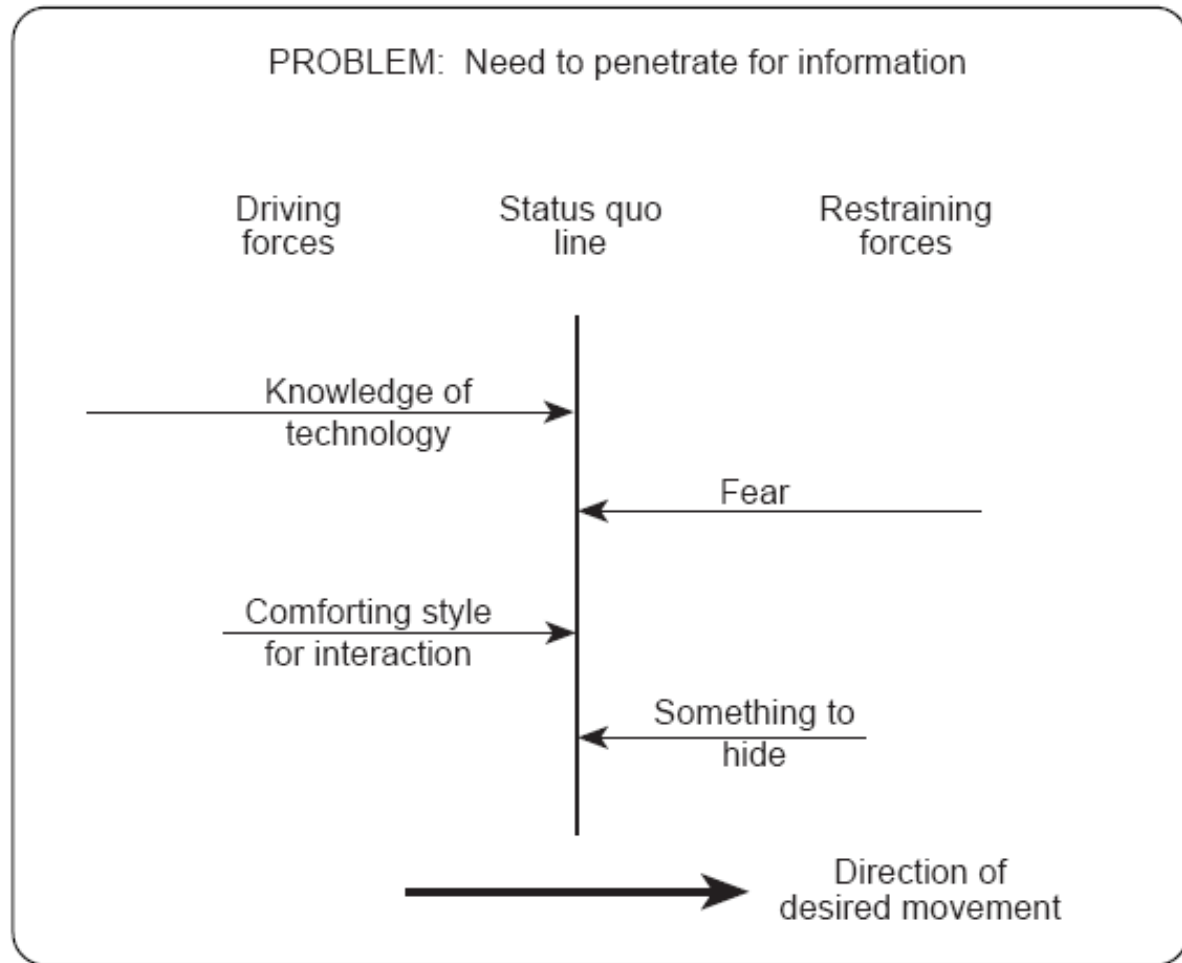
Controlling

Foundation Concepts III



# MODULE 2: Performance Criteria

## Forces, Friction & Energy in the Workplace



Management System Model

Performance Criteria

Controlling

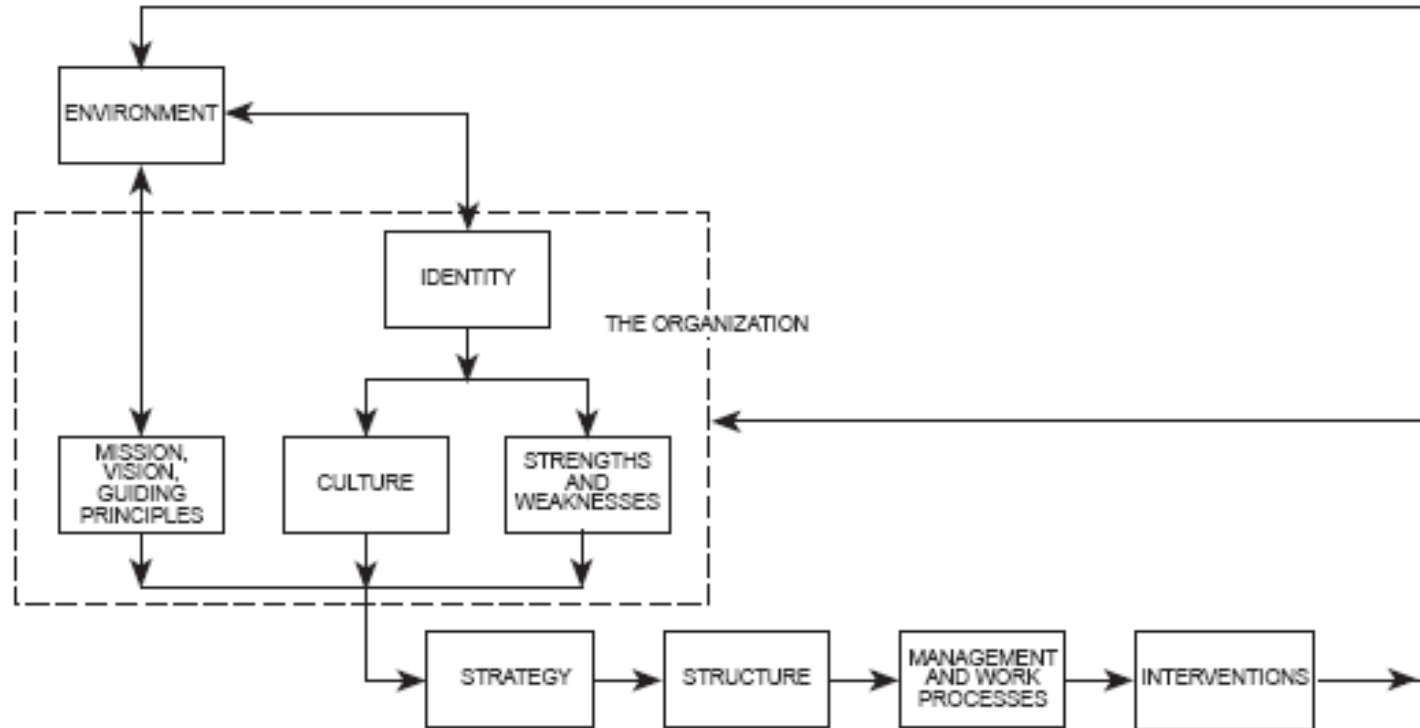
Foundation Concepts III





# MODULE 2: Performance Criteria

## Structure responds to Strategy



Management System Model

Performance Criteria

Controlling

Foundation Concepts III



# MODULE 2: Performance Criteria

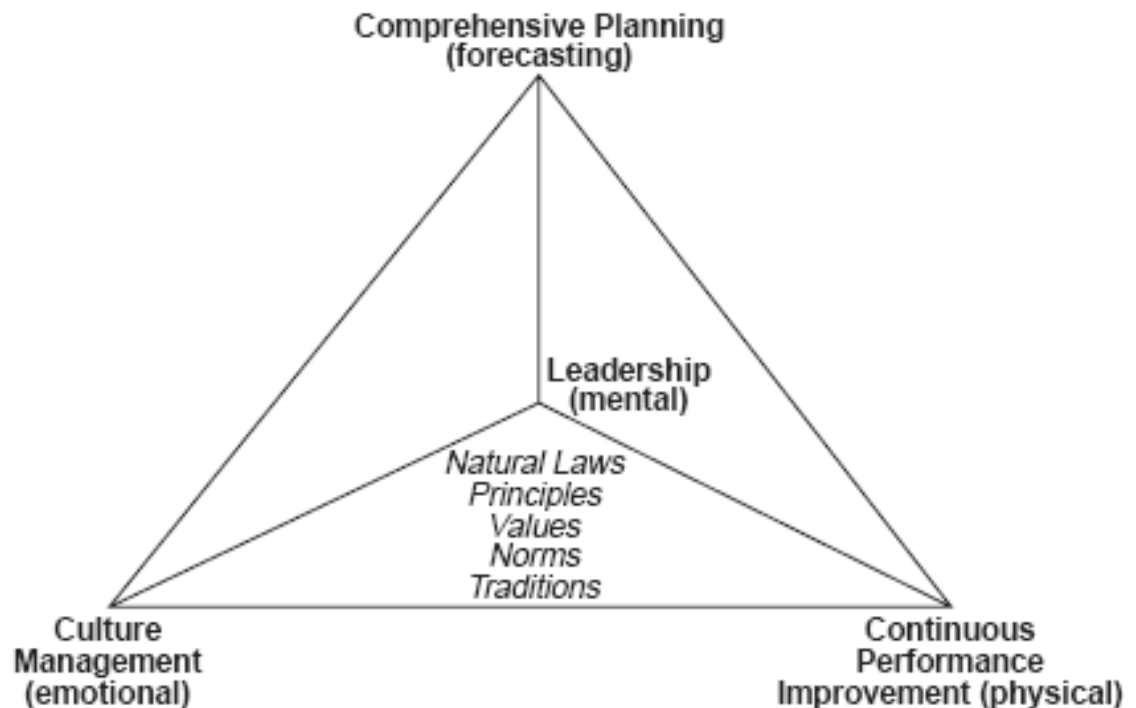
Management System Model

Performance Criteria

Controlling

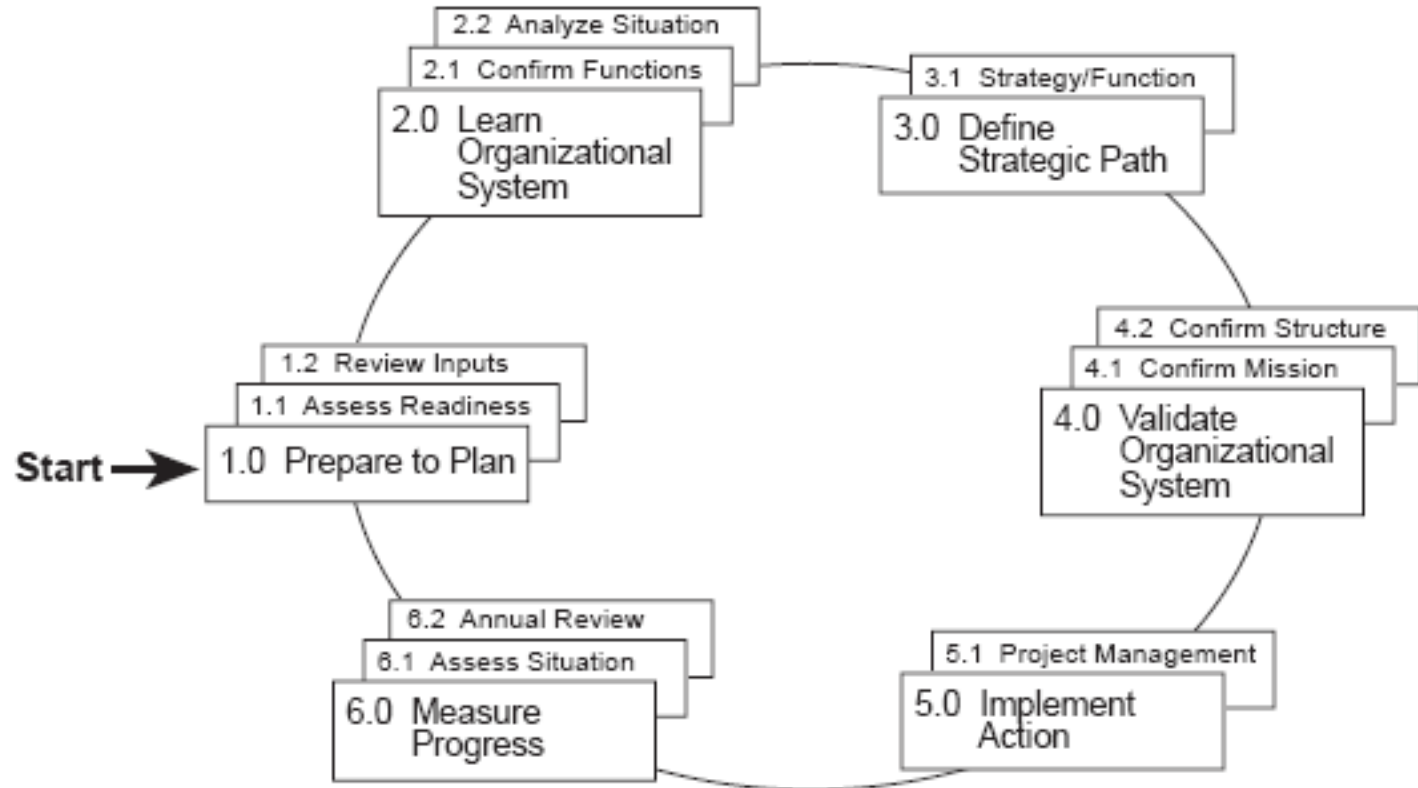
Foundation Concepts III

The OE Pyramid shows the strength, durability, balance, and interconnectedness inherent in balancing the activities for meeting a set of responsibilities.



# MODULE 2: Performance Criteria

## The Strategic Planning Framework



# MODULE 2: Performance Criteria

Management System Model

Performance Criteria

Controlling

Foundation Concepts III

## More Ways to Look at Organizational Change

- Kilmann's Five Tracks
- Sink's Seven Fronts
- McKinsey's Seven S's



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

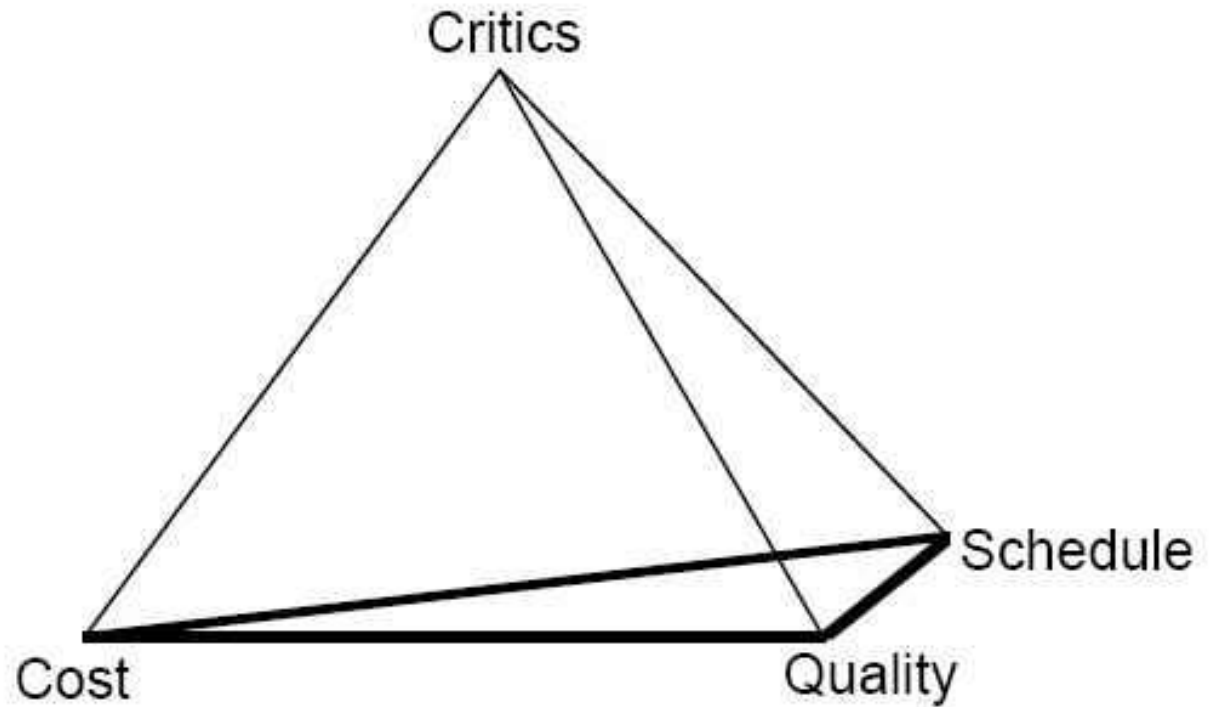
## Sink's Performance Criteria

- Effectiveness
- Efficiency
- Quality
- Profitability
- Productivity
- Quality of Work Life
- Innovation



# MODULE 2: Performance Criteria

## Project Management Pyramid



Management System Model

Performance Criteria

Controlling

Foundation Concepts III



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

## Goldratt's Criteria

- How to measure goal of making money?
  - Increase throughput
  - Reduce inventories
  - Reduce operating expenses



# MODULE 2: Performance Criteria

## What is a Control?

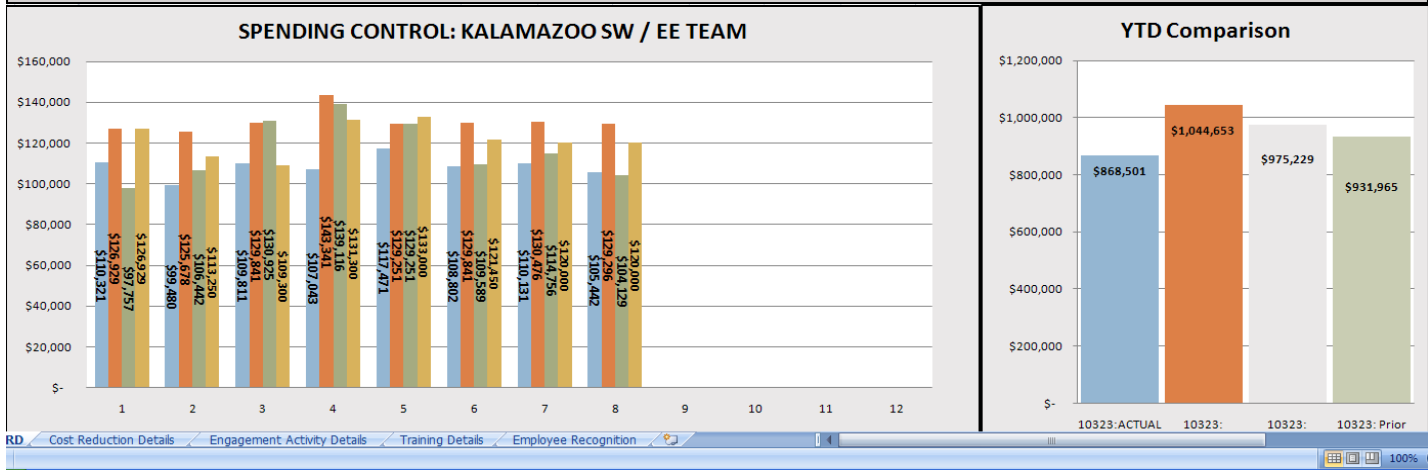
Management System Model

Performance Criteria

Controlling

Foundation Concepts III

[Software / EE / ATD] Balanced Scorecard															
Scorecard Measures		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD	
Financial	(EE / SW / ATD Expense) / Shipment \$	0.363%	0.357%	0.357%	0.438%	0.442%	0.344%	0.369%	0.328%						
	EE / SW / ATD Budget (+/-)	\$ 16,608	\$ 26,198	\$ 20,030	\$ 36,298	\$ 11,780	\$ 21,039	\$ 20,345	\$ 23,854					\$ 176,152	
	10323:ACTUAL	\$ 110,321	\$ 99,480	\$ 109,811	\$ 107,043	\$ 117,471	\$ 108,802	\$ 110,131	\$ 105,442					\$ 868,501	
	10323: BUDGET	\$ 126,929	\$ 125,678	\$ 129,841	\$ 143,341	\$ 129,251	\$ 129,841	\$ 130,476	\$ 129,296					\$1,044,653	
	10323: Projection	\$ 126,929	\$ 113,250	\$ 109,300	\$ 131,300	\$ 133,000	\$ 121,450	\$ 120,000	\$ 120,000					\$ 975,229	
	10323: Prior Year Actual	\$ 97,757	\$ 106,442	\$ 130,925	\$ 139,116	\$ 129,251	\$ 109,589	\$ 114,756	\$ 104,129					\$ 931,965	
	10323: EE / SW / ATD % GROWTH	11.4%	-7.0%	-19.2%	-30.0%	-10.0%	-0.7%	-4.2%	1.2%						
	Cost Savings from EE / SW / ATD Projects (350k)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -						
	(EE / SW / ATD Hds / Division Hds) <= 1.5%	1.10%	1.12%	1.20%	1.20%	1.20%	1.20%	1.12%	1.12%						
	EE Heads:	8	8	8	8	8	8	8	8						
SW / ATD Heads:	5	5	6	6	6	6	5	5							
EE / SW / ATD Total Heads:	13	13	14	14	14	14	13	13							
Kzoo total heads:	1,178	1,165	1,165	1,165	1,165	1,165	1,165	1,165							
DHF Audit Findings	0	0	0	0	0	0	0	0							
Customers	Open EE/SW/ATD PEPRs <=25	23	19	25	21	21	18	20	14						
	Oldest EE/SW/ATD PEPRs < 300 days	319	244	272	298	331	364	378	363						
People	1 Innovation / Training event for EE / SW / ATD per month	0	1	1	1	1	1	1	0						
	1 Employee of the Month / Meeting Winners from [EE / SW / ATD]	0	0	0	1	1	1	1	1						
	1 'Special' Engagement event conducted per month	0	1	1	2	2	1	2	1						
Technical Execution	TBD														
	TBD														
	TBD														
	TBD														





# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

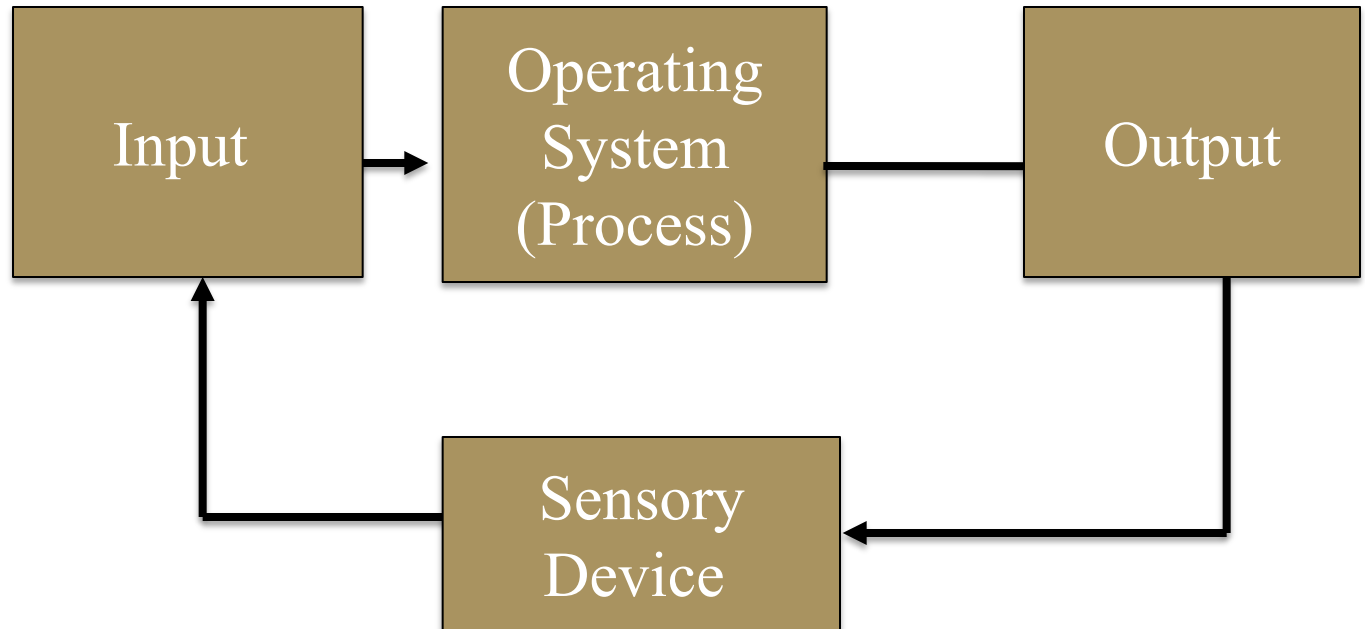
Foundation Concepts III

“You can’t manage it if you  
can’t measure it...  
You can’t measure it if you  
can’t define it.”



# MODULE 2: Performance Criteria

## Control Loop



Management System Model

Performance Criteria

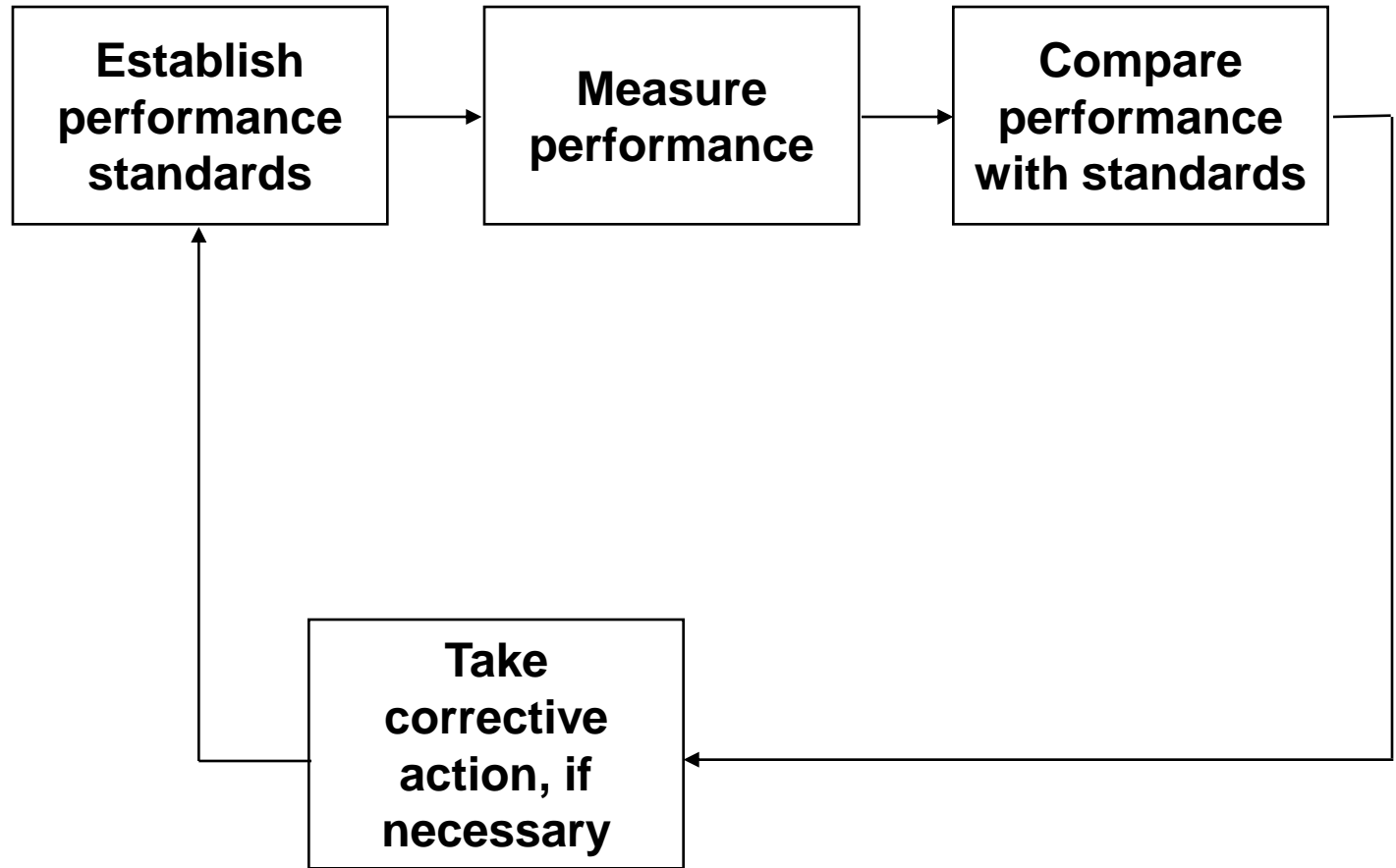
Controlling

Foundation Concepts III



# MODULE 2: Performance Criteria

## Process of Control



Management System Model

Performance Criteria

Controlling

Foundation Concepts III



# MODULE 2: Performance Criteria

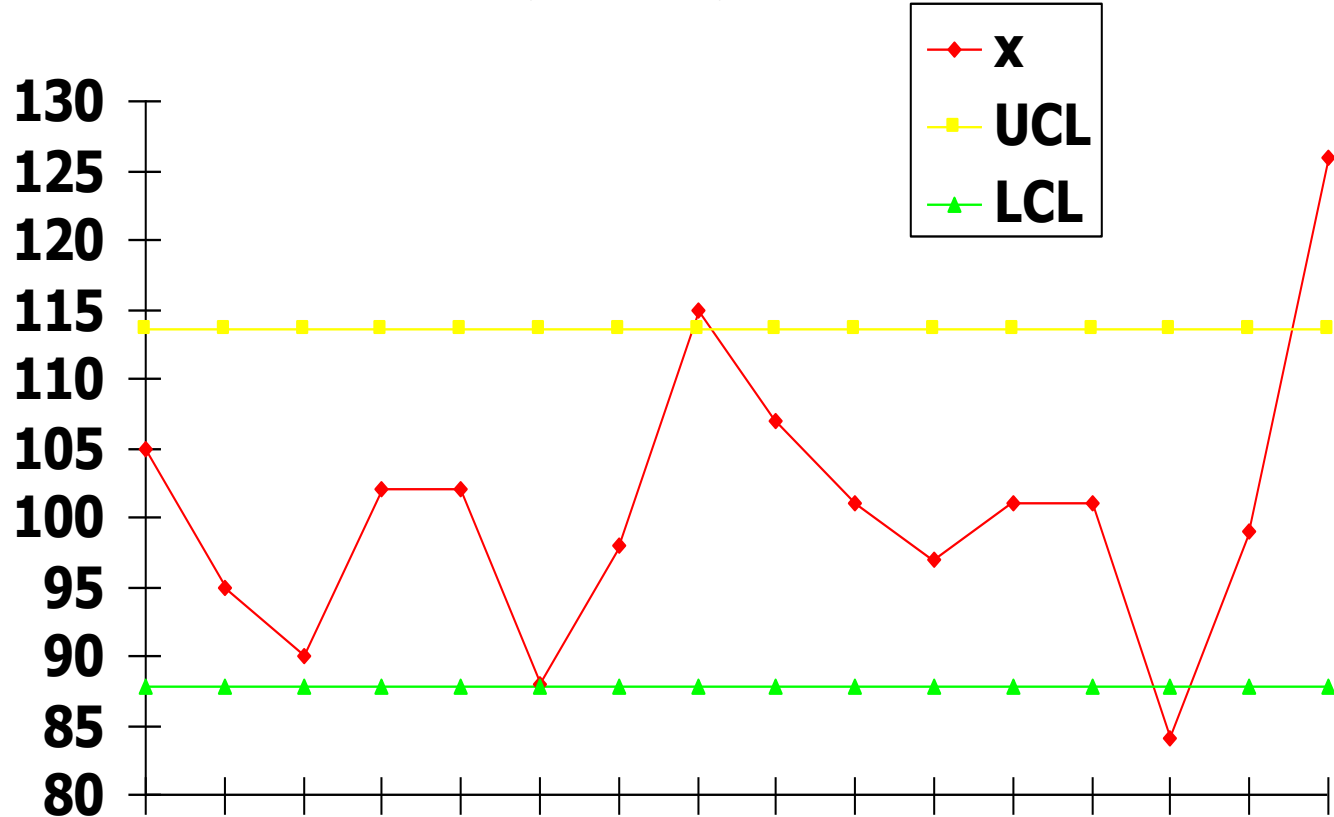
Management System Model

Performance Criteria

Controlling

Foundation Concepts III

## Control Chart



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

## Information vs. Data

- **Datum:** uninterrupted raw statement of fact
- **Information:** interpreted data; data compared against a standard
- Example: Thermostat



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

## Types of Standards

- Numerical
- Time-related
- Physical
- Monetary
- Intangible



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

## Control Using these Performance Measures

- Effectiveness
- Efficiency
- Quality
- Productivity
- Quality of Work Life
- Innovation
- Profitability/Budgetability



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

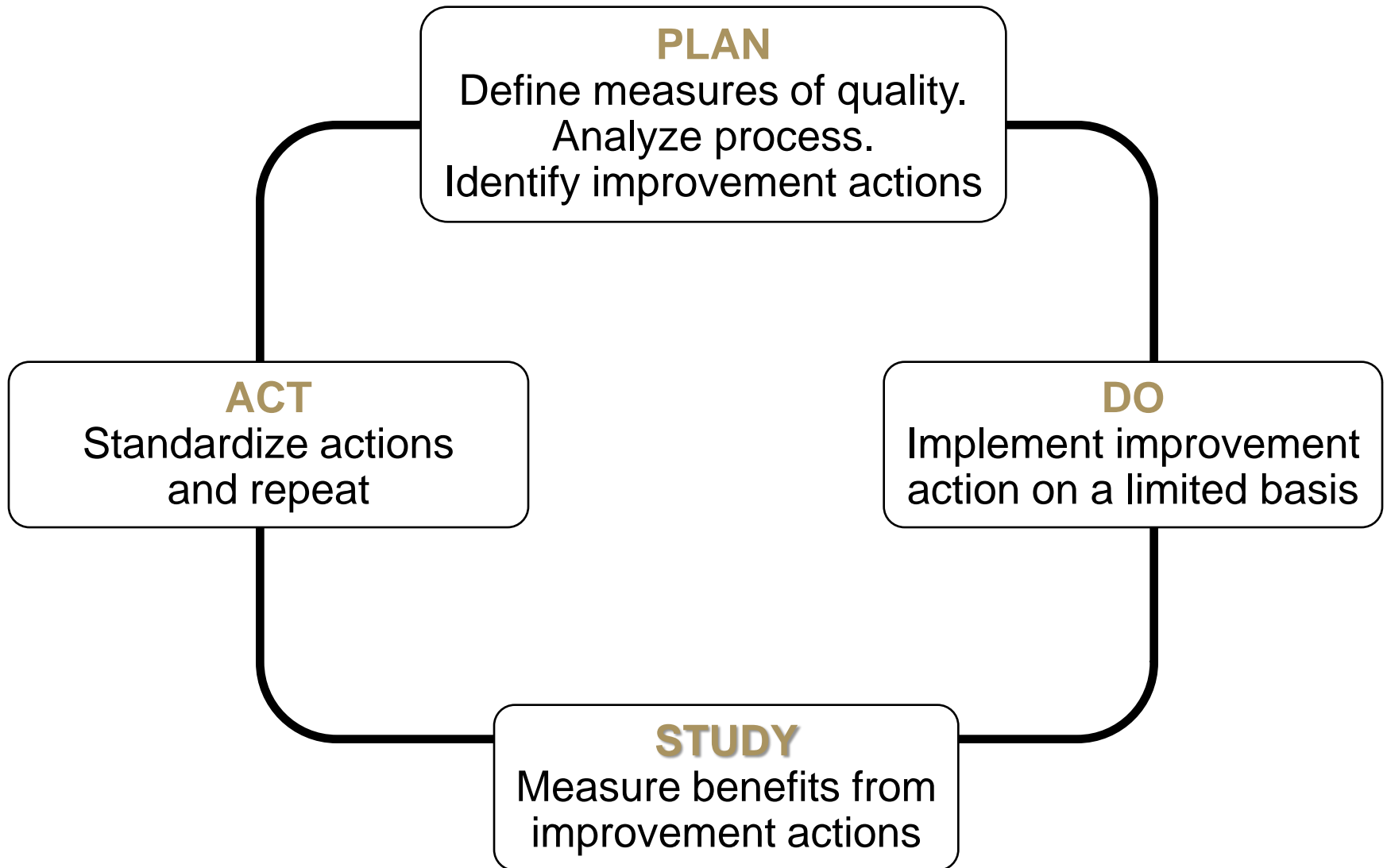
## Quality should be Measured Throughout the System

- Q1 Upstream systems
- Q2 Incoming quality assurance
- Q3 In-process quality assurance
- Q4 Outgoing quality assurance
- Q5 Total quality management





# MODULE 2: Performance Criteria



# MODULE 2: Performance Criteria

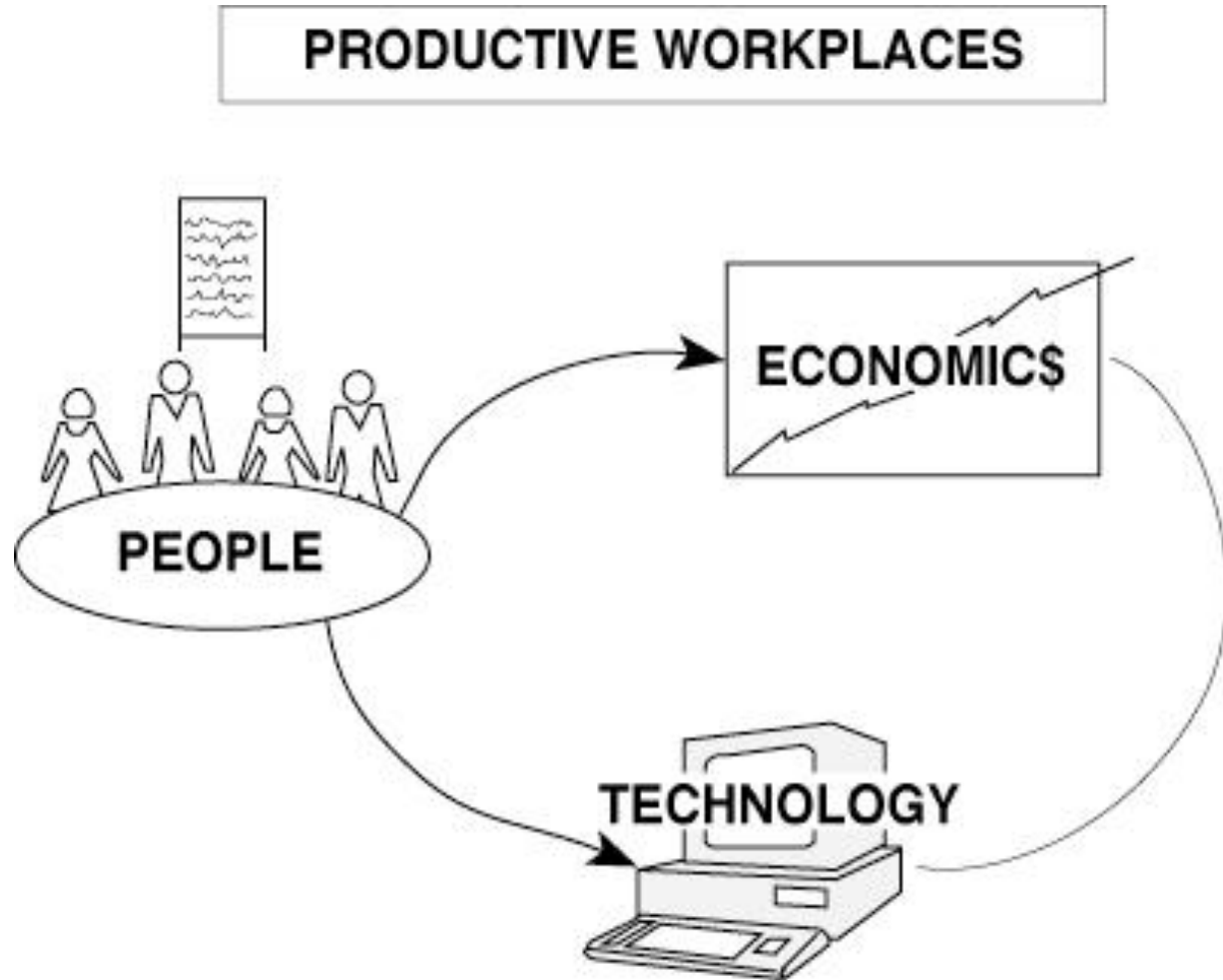
Management System Model

Performance Criteria

Controlling

Foundation Concepts III

## Essence of Weisbord



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

## Fundamental Concepts

- Integrator role
- Holistic perspective
- Acceptability/desirability (Fig. 1.1.27.5.2)
- Generalist perspective
- Pareto's Law (Fig. 1.1.27.9)



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

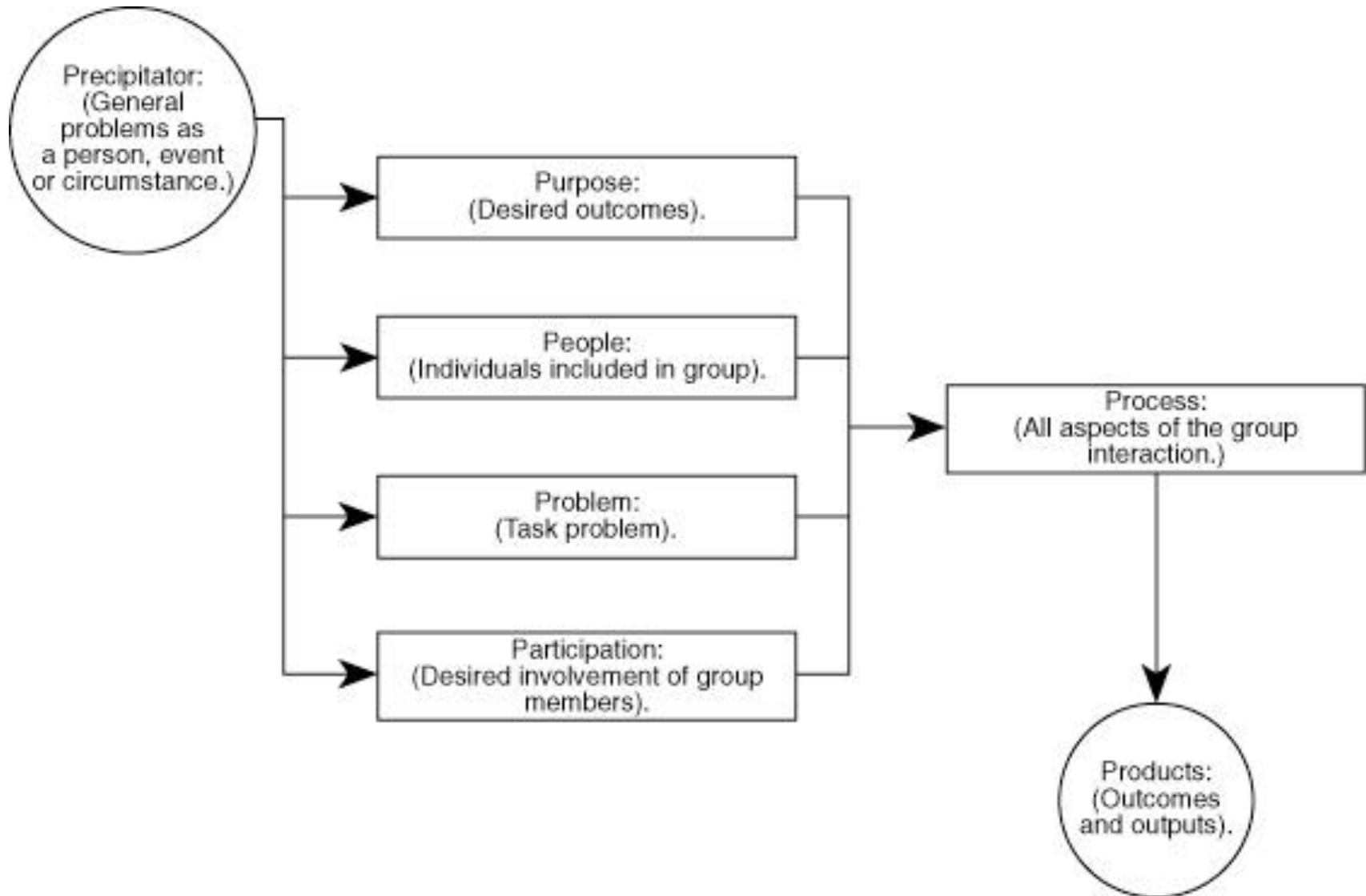
Foundation Concepts III

## Integrator Role

- Bring together all the pieces of system
- Determine what is moving the system (precipitator)
- Determine right pieces (participants)
- Identify aim of system (purpose)
- Figure out how the pieces work together (participation)
- Figure out what the system does (problem)
- Set up a process to meet its aim (process)
- Verify the product of the system (product)



# MODULE 2: Performance Criteria



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

## Integrator & Environment

- Problems often occur at organizational boundaries--important to understand linkages with outside domains
- Manage competing tasks
  - internal interpretation
  - external coordination



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

## Holistic Perspective

- Requires human minds, not formulae, PCs
- “The significant problems we face cannot be solved at the same level of thinking we were at when we created them.” -Albert Einstein
- Deals with meaning, purpose, essence, soul
- Japanese--pick up more meaning from blank spaces than from written words.
  - Role of haiku (17 syllables)
  - Role of silence



# MODULE 2: Performance Criteria

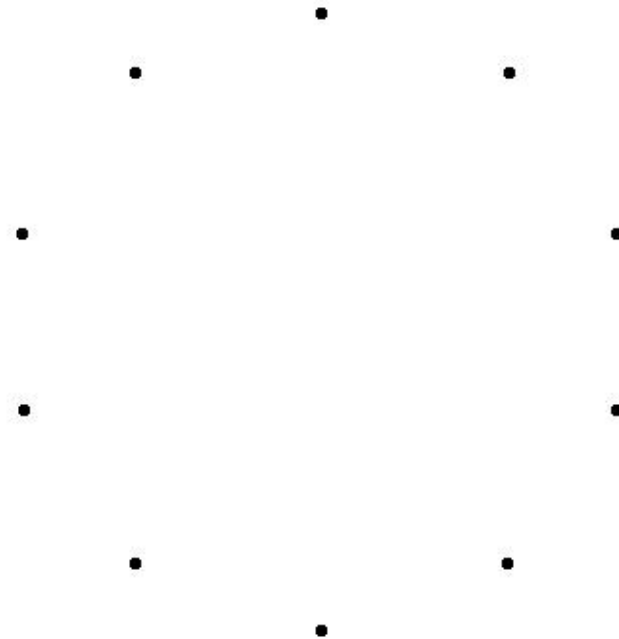
Management System Model

Performance Criteria

Controlling

Foundation Concepts III

WHAT IS THIS?

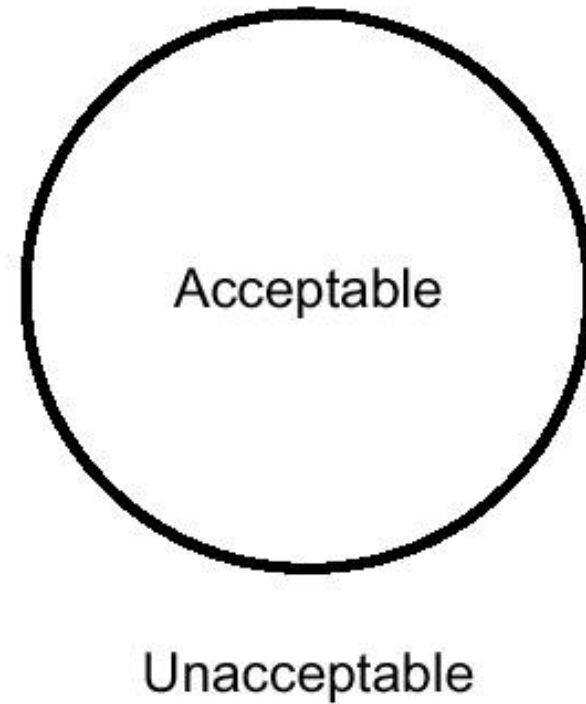
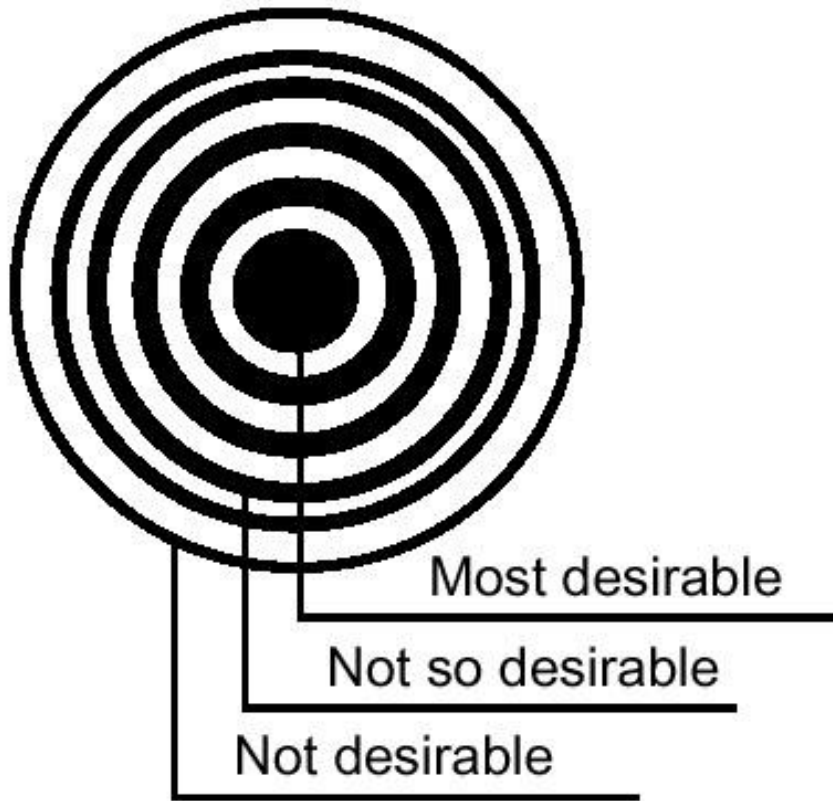




# MODULE 2: Performance Criteria

DESIRABILITY

ACCEPTABILITY



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

## Pareto's Law

- Vital few of great importance
- Useful many
- Originated in distribution of income.
- “20% of the \_\_\_\_\_ account for 80% of \_\_\_\_\_.”
- Useful to portray as a pie chart.



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

## Vilfredo Pareto's 80-20 Principle

- 80% of wealth to 20% in Italy in the late 1800's
- The 'significant few' against the 'insignificant many'

## Interesting Stats:

- 80 percent of U.S. families did not buy or read a book last year.
- 3 billion people live on less than \$2 per day
- Microsoft CEO Bill Gates has more wealth than the bottom 45 percent of American households combined.

***United Nations Development Program***



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

Foundation Concepts III

## Edward N. Wolff at New York University (2004)

### US Households

- Top 1%: have 39.7% of Financial Wealth
- Top 20%: have 90.2% of Financial Wealth
- Bottom 80% have 9.8% of Financial Wealth



# MODULE 2: Performance Criteria

Management System  
Model

Performance Criteria

Controlling

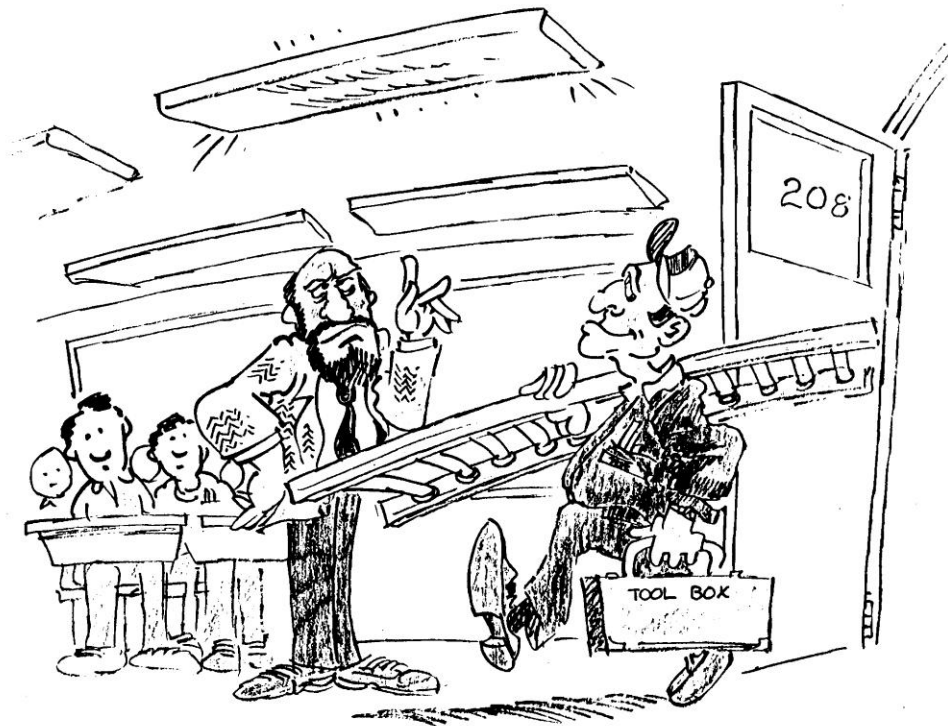
Foundation Concepts III

## Generalist Perspective

- Generalize learnings from one situation to another.
- Example: Learn how to cook from chemistry lab.
- Specialist is like hammer looking for a nail, in the extreme.
- Generalists plow between the furrows
- Specialists plow the furrows deeper



# MODULE 3: Information Portrayals



## INFORMATION PORTRAYALS Turning Data into Information



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory & Process Steps

Guidelines for Information Creation

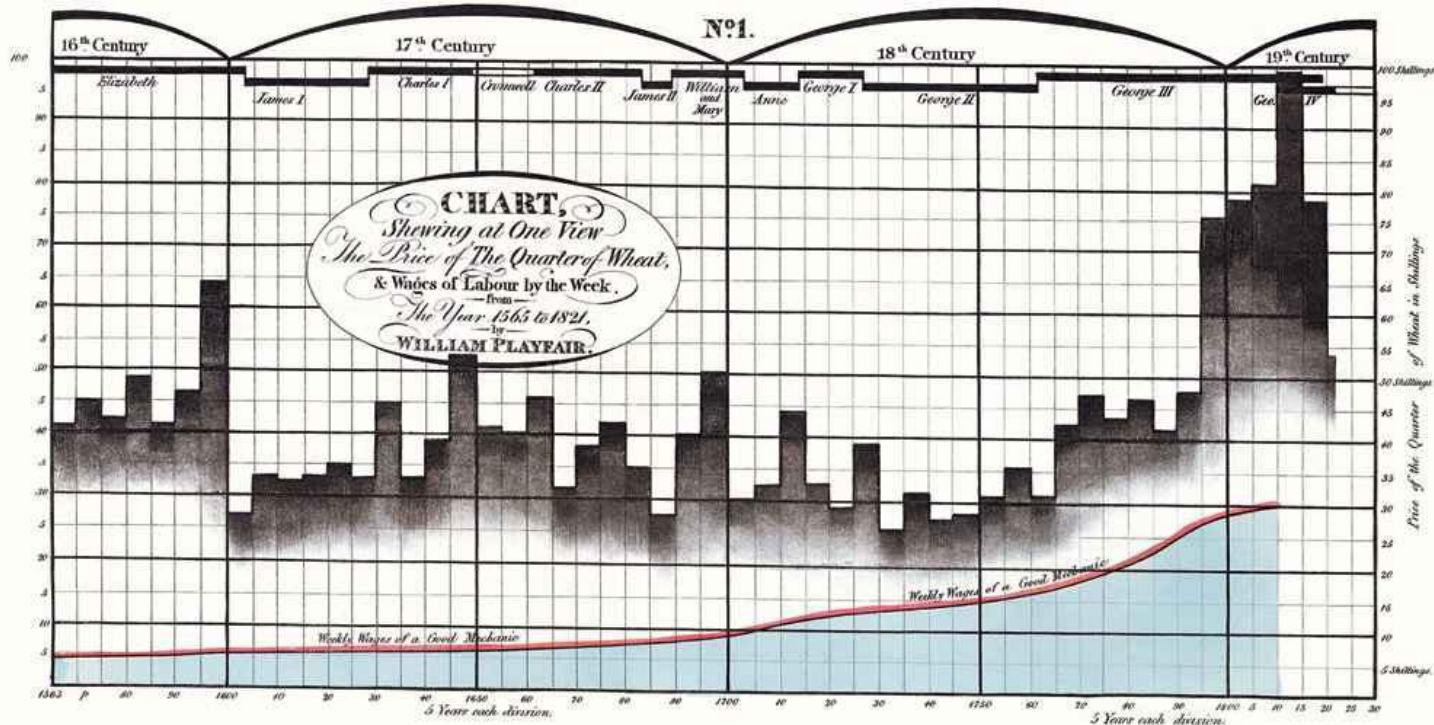
What Not to Do

Standards / Measurements

IN Class Exercise

References

## The Advent of Graphing – 1822 William Playfair



<http://www.economist.com/images/20071222/5107CR1B.jpg>



# MODULE 3: Information Portrayals

## Creating Information Portrayals

- Mixture of Art and Science
- (B.C.) Before Computer
- Rich, connected information
- Cannot be created with just Microsoft Excel
- Communicate a fundamental message
- Not just engineers / mathematicians

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References





# MODULE 3: Information Portrayals

## Using Portrayals for Insight Dr. John Snow



<http://www.csse.monash.edu.au/~cema/courses/CSE5910/lectureFiles/images/lect3b/choleraSnowMap.gif>

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory & Process Steps

Guidelines for Information Creation

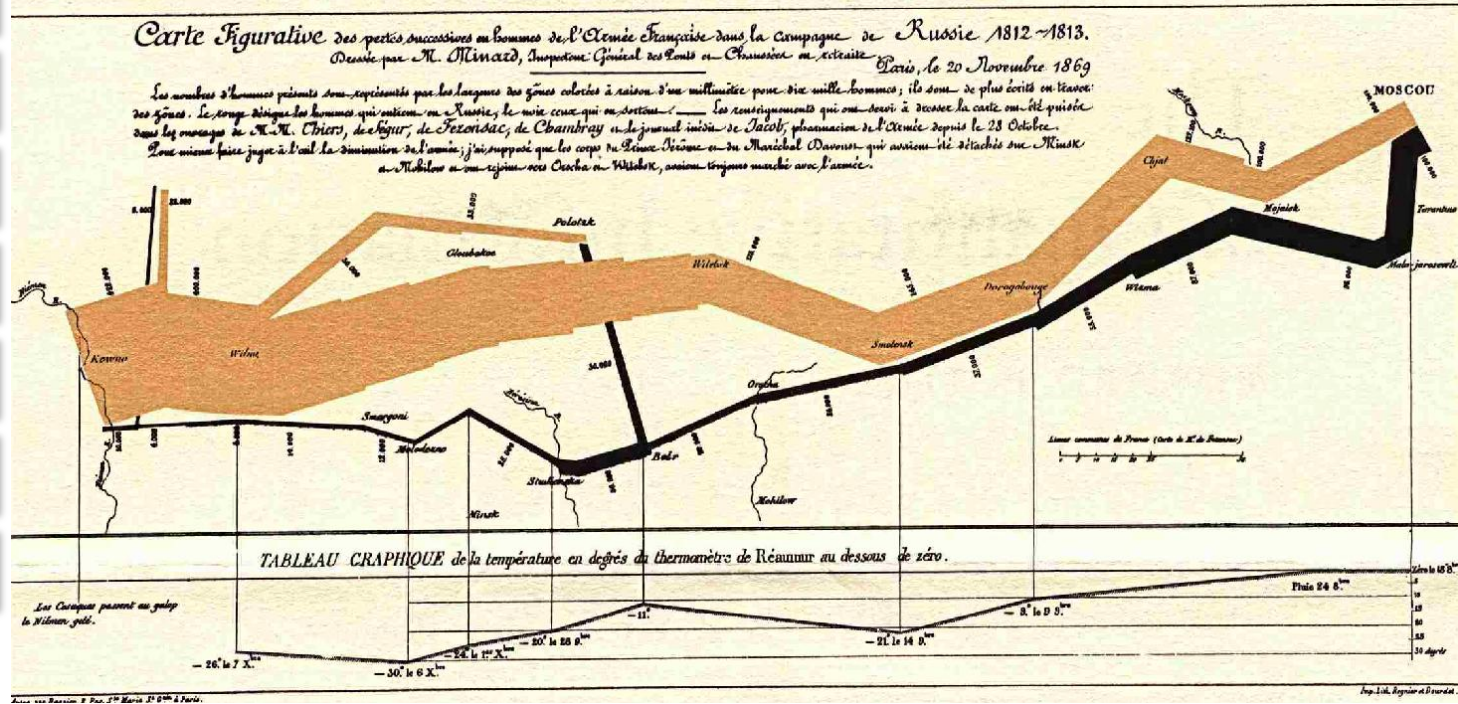
What Not to Do

Standards / Measurements

IN Class Exercise

References

## Improving the “Information Richness” Charles Joseph Minard



[www.lnordell.com/abcdesign/?p=15](http://www.lnordell.com/abcdesign/?p=15)



# MODULE 3: Information Portrayals

## Communicating a Fundamental Message Florence Nightingale - 1856

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

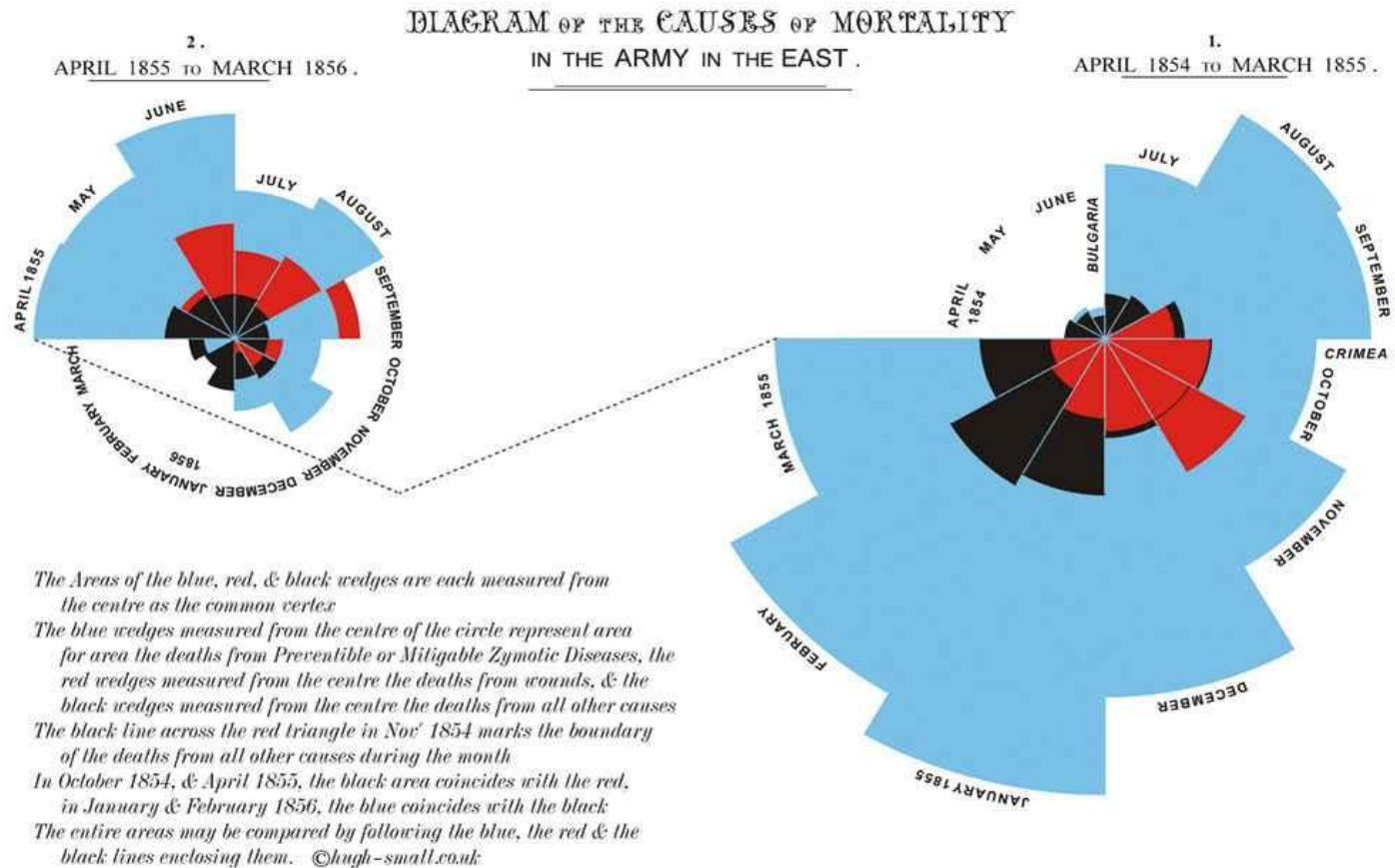
Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References



<http://media.economist.com/images/20071222/5107CR3B.jpg>



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

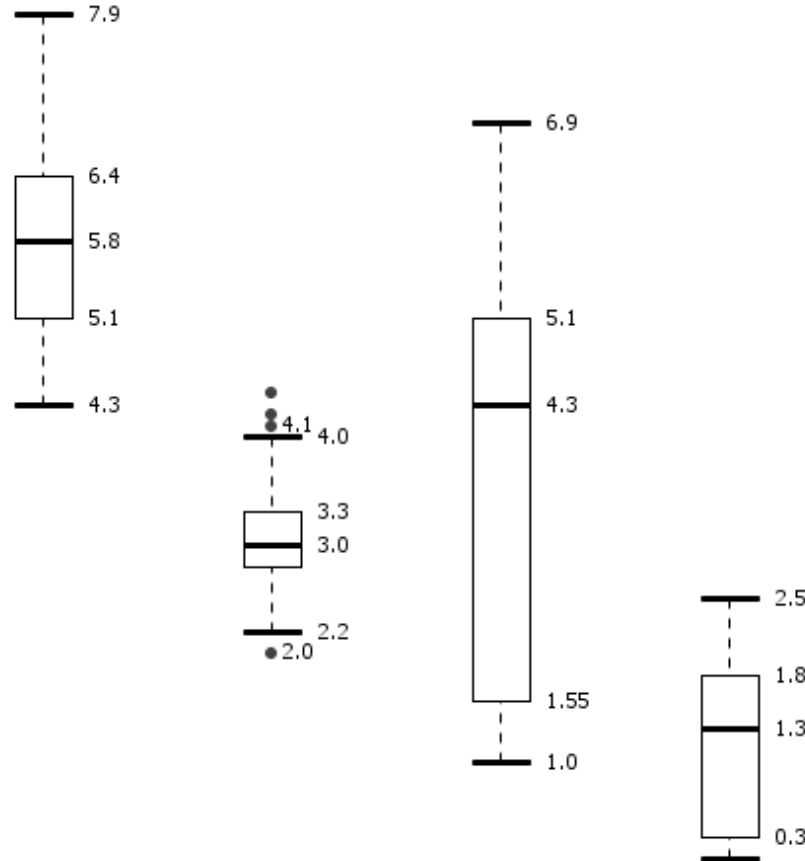
What Not to Do

Standards / Measurements

IN Class Exercise

References

## Communicating Complex Data Simply Tukey's Box Plot



[http://informationandvisualization.de/files/boxplot\\_knime.png](http://informationandvisualization.de/files/boxplot_knime.png)



# MODULE 3: Information Portrayals

## Creating a Simple, but Meaningful Portrayal Edward Tufte

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

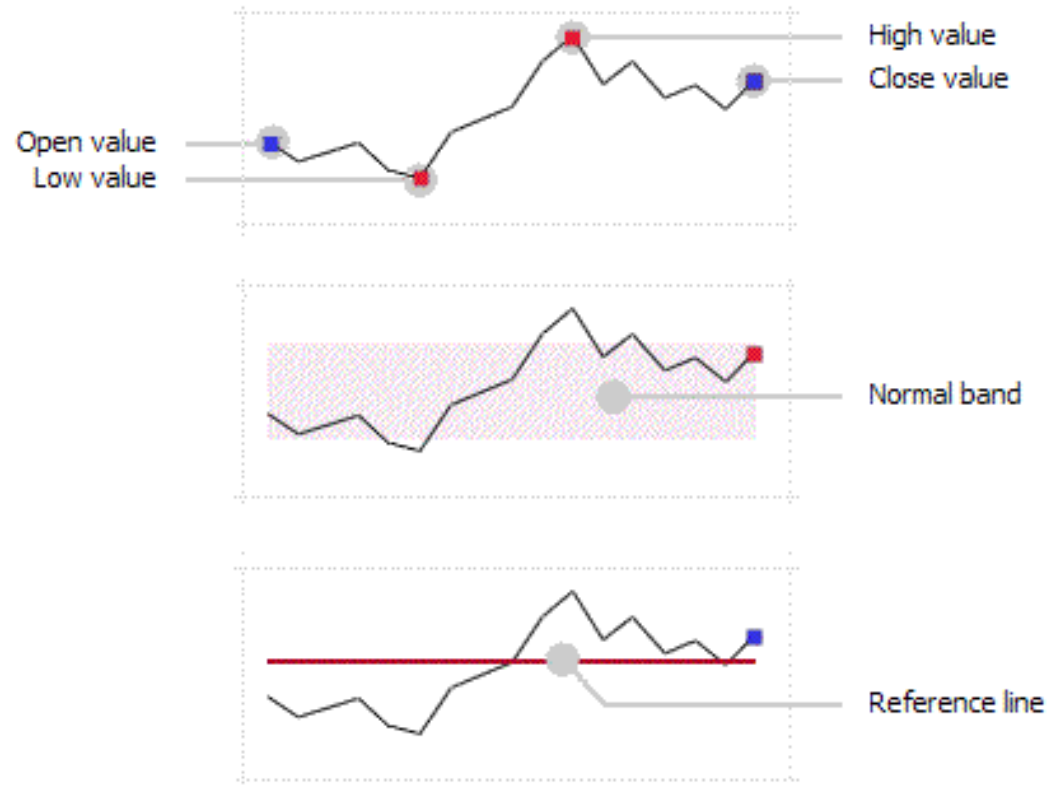
Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References



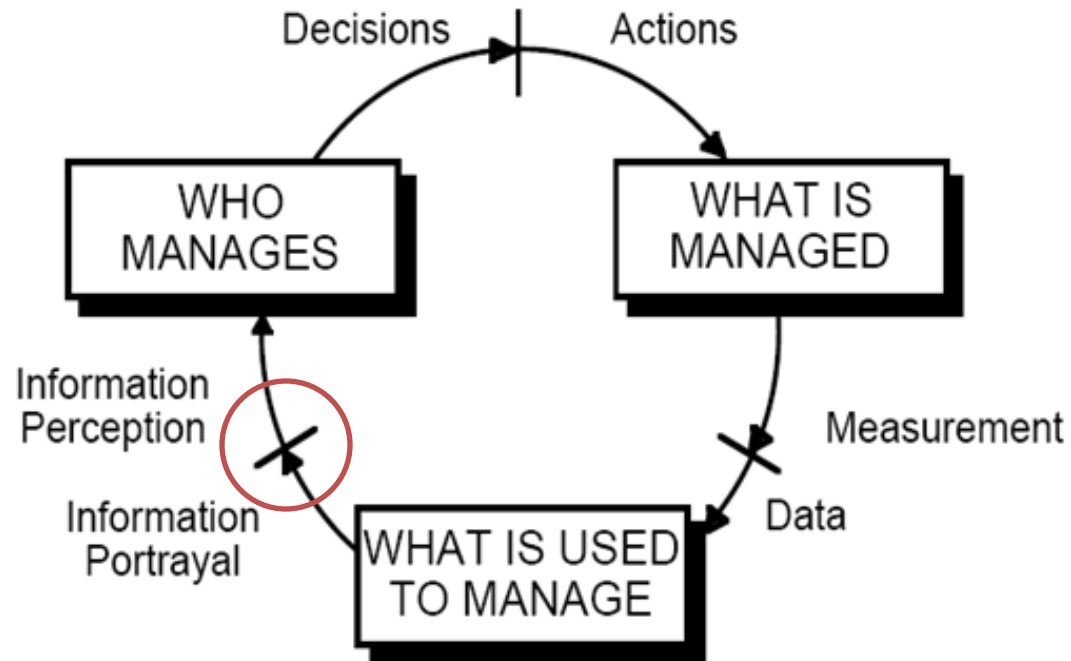
[http://www.modeladvisor.com/general\\_use/ms\\_office\\_tools/spreadsheets/microcharts\\_pro\\_edition/images/shot\\_microcharts\\_sparkline.gif](http://www.modeladvisor.com/general_use/ms_office_tools/spreadsheets/microcharts_pro_edition/images/shot_microcharts_sparkline.gif)



# MODULE 3: Information Portrayals

How do you 'portray' information so that it is 'perceived' best by 'Who Manages'?

## MSM: Management System Model



Historical Context

Milestones & Researchers

Information Theory & Process Steps

Guidelines for Information Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

**“Every time you buy a newspaper, you are paying for information. Economic theorists have explained why you should: information confers a benefit that is worth paying for. Life is a choices among gambles.”**

***How the Mind Works***  
***Steven Pinker     1997***



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

## Harold Kurstedt Information Theory

- Fact + Specifier
- Datum
- Information through Comparison of Data

## Russell Ackoff

- Data
- Information
- Knowledge
- Understanding
- Wisdom





# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

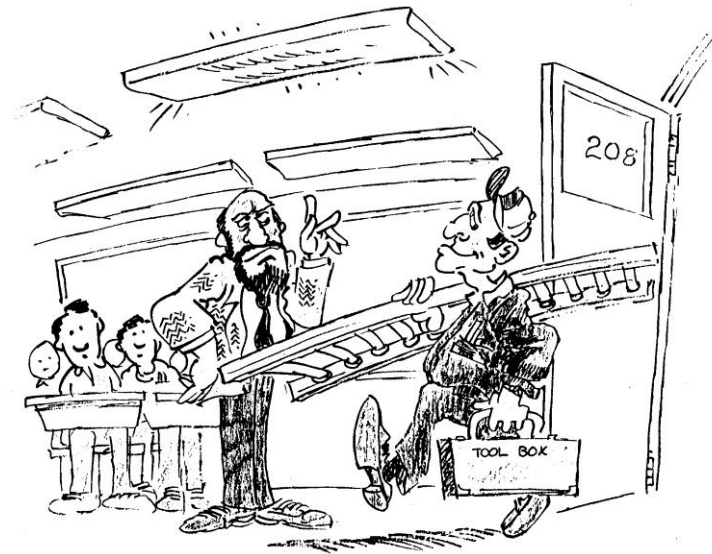
Standards / Measurements

IN Class Exercise

References

## Information & Noise

- Magical number (7) +/- 2
- Chunking (phone numbers)
- Is it noise or information depends on the unit of interest. (Ex. Noisy light fixture)
- Information overload--too much noise or unprocessed data



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

## Information & Noise

According to a research at Cambridge University, it doesn't matter in what order the letters in a word are, the only important thing is that the first and last letter be at the right place. The rest can be a total mess and you can still read it without problem. This is because the human mind does not read every letter by itself, but the word as a whole. Amazing huh?



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

## Predicting Information Portrayal Preferences

- Meyers Briggs Type Indicator archetype
- Intuitive-charts, graphs, trends
- Sensing-details, structure



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

## Managing 'Informal' Information

- Head off the painful cures
- Practice prevention
- Find out information before it's too late



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

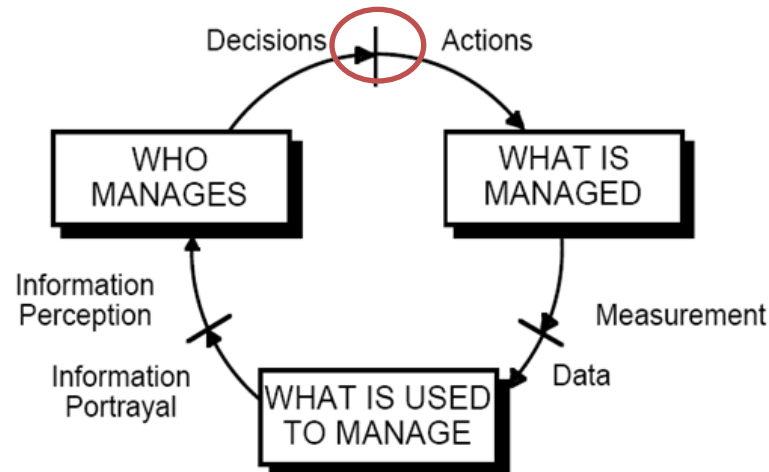
IN Class Exercise

References

## Decision / Action Interface

- Who does what as a result of information?
- If you can't answer the above question, you don't need the information.
- Analytical process starting with decisions you make and working back to information you need.

### MSM: Management System Model



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

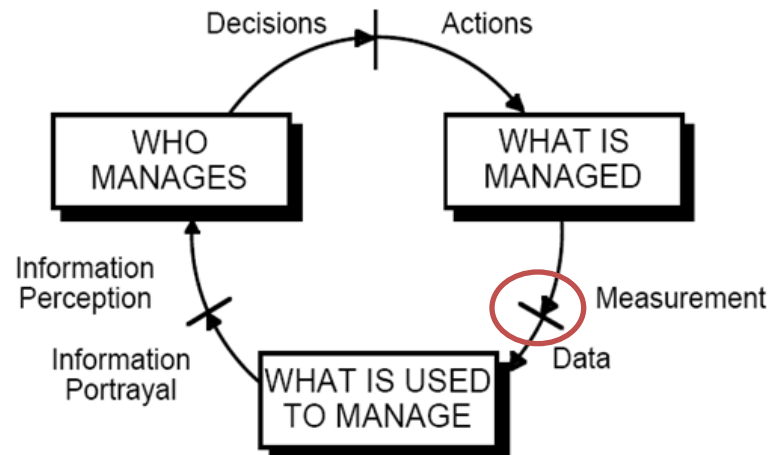
IN Class Exercise

References

## Measurement – Data Interface

- Sensors
- Data-to-information chain

### MSM: Management System Model



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

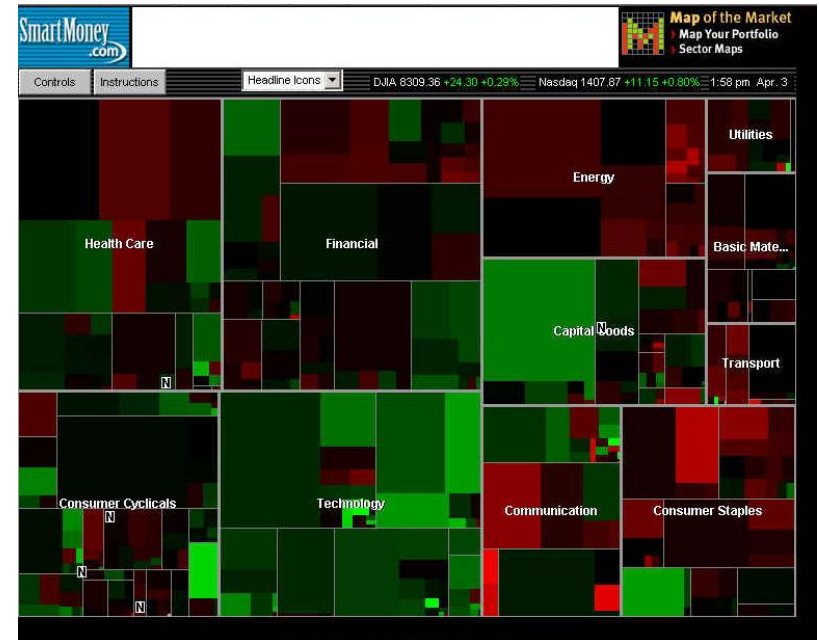
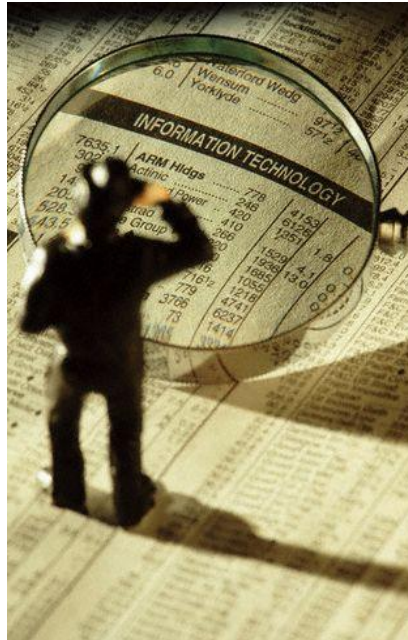
Standards / Measurements

IN Class Exercise

References

## Information Richness

- Potential information-carrying capacity of data
- DDI: Data Density Index – Edward Tufte
- Lie Factor - Edward Tufte



# MODULE 3: Information Portrayals

## Level of Information Richness

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

Information Richness	Medium	Feedback	Channel	Source	Language
High	Face-to-Face	Immediate	Visual, Audio	Personal	Body, Natural
	Telephone	Fast	Audio	Personal	Natural
	Written, Personal	Slow	Limited Visual	Personal	Natural
	Written, Formal	Very Slow	Limited Visual	Impersonal	Natural
Low	Numeric, Formal	Very Slow	Limited Visual	Impersonal	Numeric





# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

## Steps to Creating an Effective Info. Portrayal

- Identify the Purpose
- Realize the Objectives
- Define the Message
- Understand the Audience
- Craft the Portrayal



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

## Identify the Purpose

- **Transfer** – presentation, bias, communication.  
Making evident the ‘phenomenon.’
- **Prospecting**- research, searching, interactive.

## GAPMINDER EXAMPLE Manny Ramirez HR



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

## Realize the Objective

- Easy flow of attention
- Show phenomenon
- Reducing unnecessary distraction
- Immediacy
- Impact
- Interocularity
- Inescapability
  
- (Tukey 1990)



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

## Define the Message

- Is the value small, medium, large?
- Is the change up, down, neutral?
- Is the change big, small, medium?
- Do the changes grow, shrink?
- Does the scatter plot change as we move?
- What is the phenomenon?

(Tukey 1990)

Why are you even showing this?



# MODULE 3: Information Portrayals

## Understand the Audience

- Familiarity with the underlying data
- Experience with portrayal methods
- Journals vs. presentations
- Technological savvy

(Tukey 1990)

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

## Craft the Portrayal

- Selection of portrayal type
- Design of portrayal
- Details within the portrayal

(Tukey 1990)

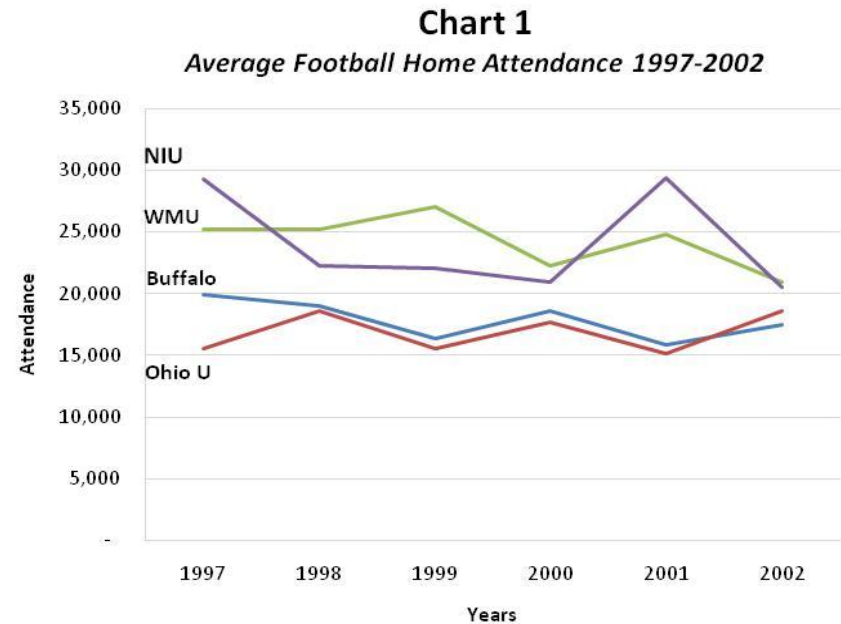


# MODULE 3: Information Portrayals

## First Decision: Graph vs. Table

TABLE 1					
Average Football Home Attendance 1997-2002					
Select MidAmerican Conference Schools					
		Buffalo	Ohio U.	WMU	NIU
Years	1997	19,935	15,552	25,180	29,242
	1998	19,019	18,571	25,238	22,235
	1999	16,360	15,527	27,030	22,090
	2000	18,578	17,688	22,273	20,943
	2001	15,839	15,156	24,783	29,362
	2002	17,473	18,562	20,963	20,557
Avg.		17,867	16,843	24,244	24,071

- Raw, condensed, calculated values
- Can be Overwhelming
- Requires Analysis to find trends
- Left Brained Focus
- Requires attention to rounding




- Right & Left Brained
- Highlights multiple trends
- Requires attention to scale
- Requires attention to layout
- Instantaneous Impact

# MODULE 3: Information Portrayals

## First Decision: Graph vs. Table



**TABLE 1**  
Average Football Home Attendance 1997-2002



		Select MidAmerican Conference Schools			
		Buffalo	Ohio U.	WMU	NIU
Years	1997	19,935	15,552	25,180	29,242
	1998	19,019	18,571	25,238	22,235
	1999	16,360	15,527	27,030	22,090
	2000	18,578	17,688	22,273	20,943
	2001	15,839	15,156	24,783	29,362
	2002	17,473	18,562	20,963	20,557
Avg.		17,867	16,843	24,244	24,071

**TABLE 1**

Average Football Home Attendance 1997-2002  
Years

Select MAC Schools

	1997	1998	1999	2000	2001	2002	Average
Buffalo	19,935	19,010	16,360	18,578	15,839	17,473	17,866
Ohio U	15,552	18,571	15,527	17,688	15,156	18,562	16,843
WMU	25,180	25,238	27,030	22,273	24,783	20,963	24,245
NIU	29,242	22,235	22,090	20,943	29,362	20,557	24,072

- Eliminate excessive digits
- Pre-calculate totals / averages
- Importance of ordering
- Eliminate white space
- Attention to travel of the eye
- TOP: Compare against schools by year
- BOTTOM: View trend by school by year





# MODULE 3: Information Portrayals

## Selecting the “Right Graph”

Historical Context

Milestones & Researchers

Information Theory & Process Steps

Guidelines for Information Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

BASIC CHART FORMS

SCATTER	SURFACE	CURVE	STEP	COLUMN	BAR	PIE	
							COMPONENT
							ITEM
							TIME SERIES
							FREQUENCY
							CO-RELATION

KINDS OF COMPARISON



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

## Guidelines & Rules of Thumb

- Correct Scaling
- No 'baseline jiggling'
- Correct Ordering
- Guiding the eye
- Maximizing Data Density
- Correct Labeling & Titling
- Data values when necessary

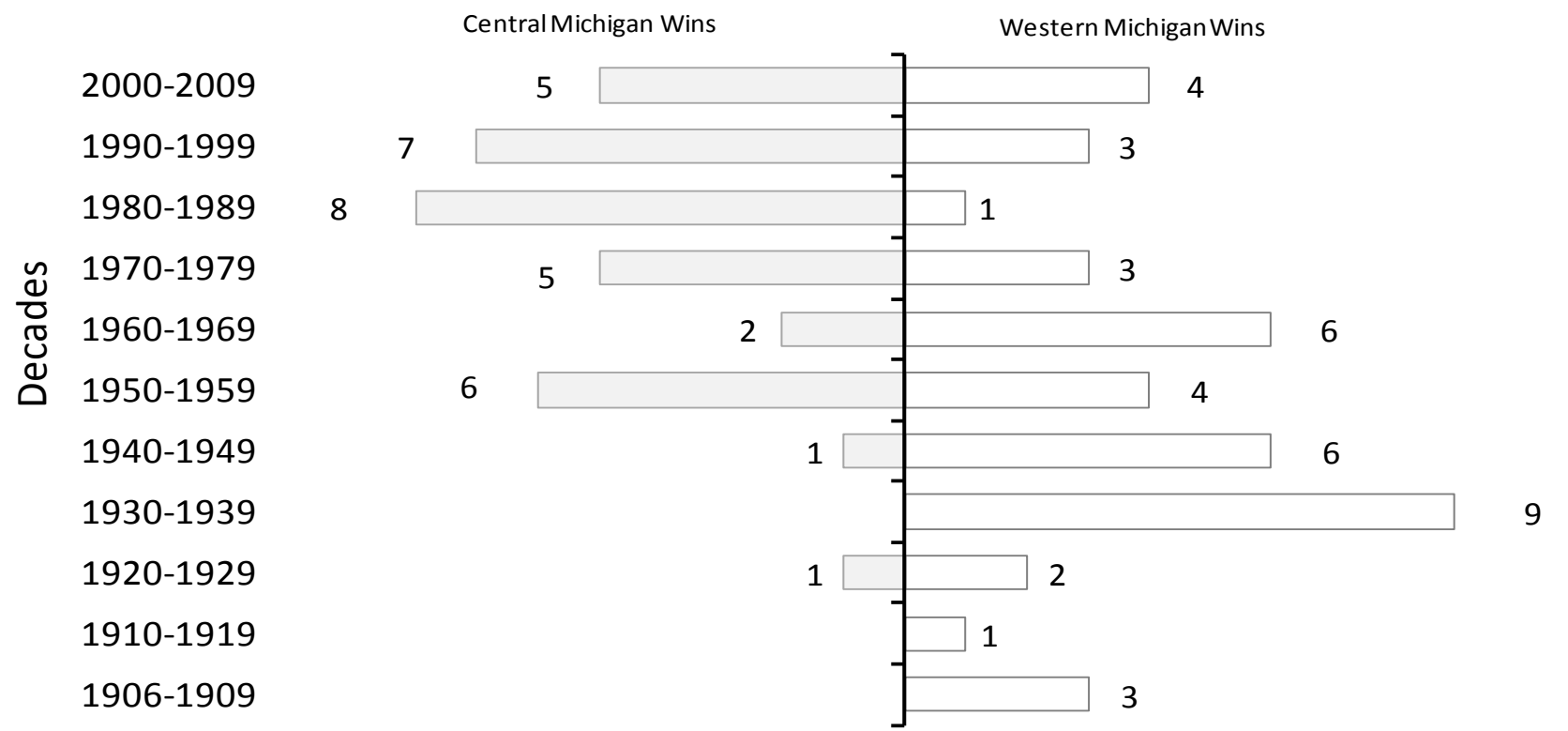


# MODULE 3: Information Portrayals

Chart 1

**Chart 1:**

*Western Michigan vs. Central Michigan Rivalry Game  
Number of Wins by Team by Decade*



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

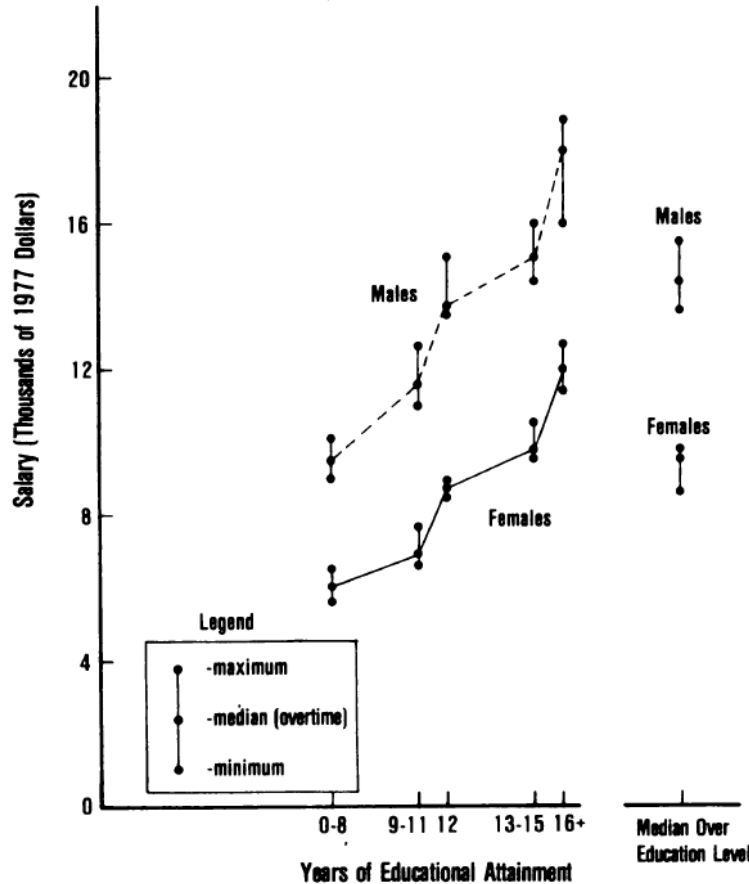
Standards / Measurements

IN Class Exercise

References

## What NOT to Do

**MEDIAN INCOME OF YEAR-ROUND FULL TIME WORKERS  
25-34 YEARS OLD BY SEX AND EDUCATIONAL ATTAINMENT:  
1968-1977 (IN CONSTANT 1977 DOLLARS)**



- Chart junk
- Multiple data lines
- Data in two graphs
- Trends are not obvious

Wainer 1984



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory & Process Steps

Guidelines for Information Creation

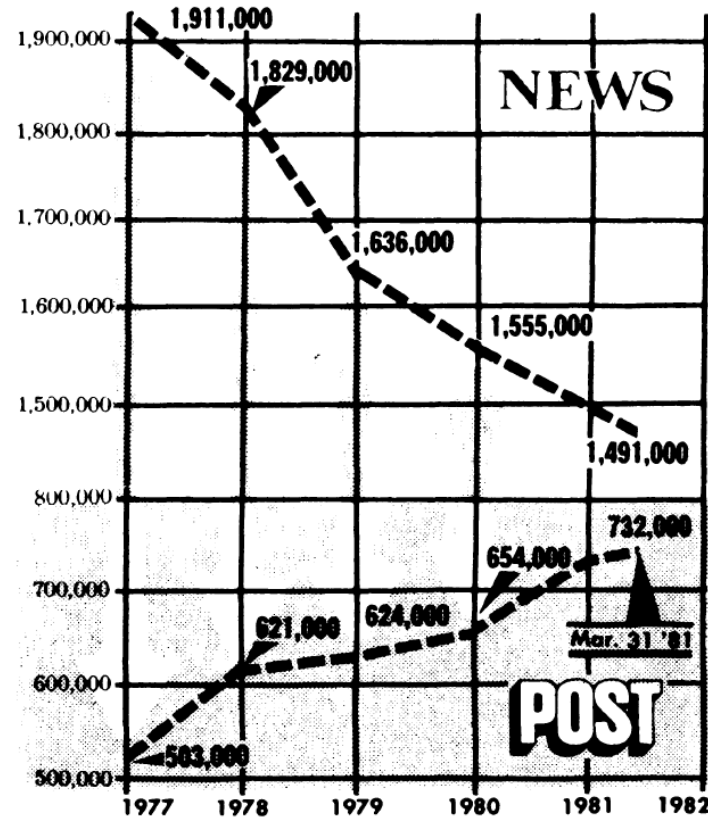
What Not to Do

Standards / Measurements

IN Class Exercise

References

## What NOT to Do



- Unethical
- Inaccurate Scale
- Chart Junk

Wainer 1984

Figure 12. Changing scale in mid-axis to make large differences small (© 1981, New York Post).



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

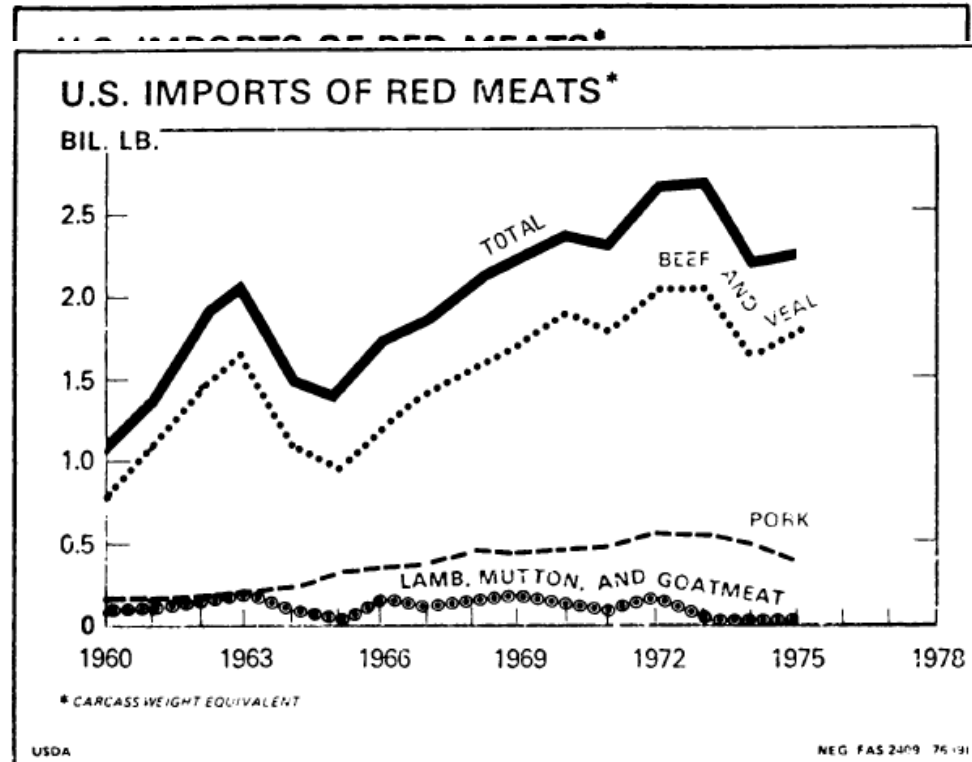
What Not to Do

Standards / Measurements

IN Class Exercise

References

## What NOT to Do



- Magnitude of beef overshadows others
- Individual trends hard to see



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

IN Class Exercise

References

## Standards / Measurements

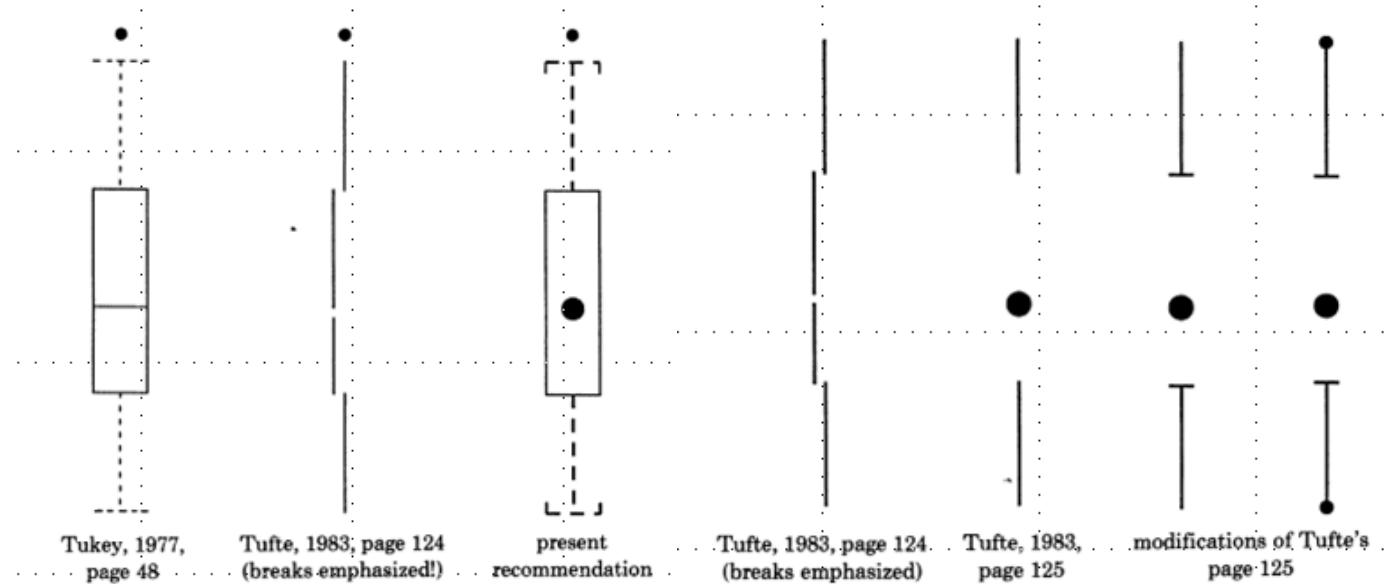


FIG. 1. Three stages of evolution (backward as well as forward) of the schematic-plot style.

- DDI: Data Density Index
- DI (Efficiency) = pieces of information / inches<sup>2</sup> of graphic



# MODULE 3: Information Portrayals

## Standards / Measurements

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

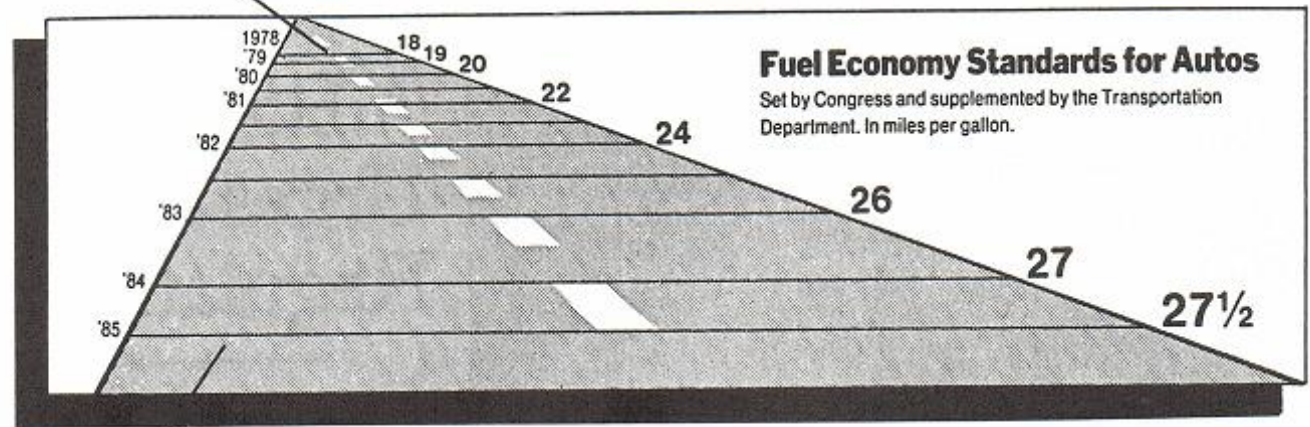
What Not to Do

Standards / Measurements

IN Class Exercise

References

This line, representing 18 miles per gallon in 1978, is 0.6 inches long.



This line, representing 27.5 miles per gallon in 1985, is 5.3 inches long.

Tufte 2001 p. 57

- Lie Factor= size of effect in graph / size of effect in data





# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory & Process Steps

Guidelines for Information Creation

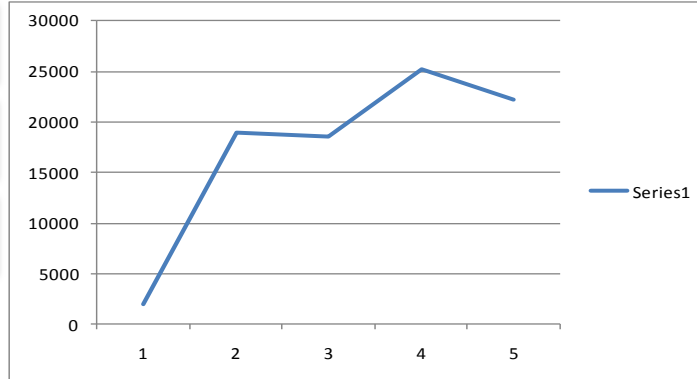
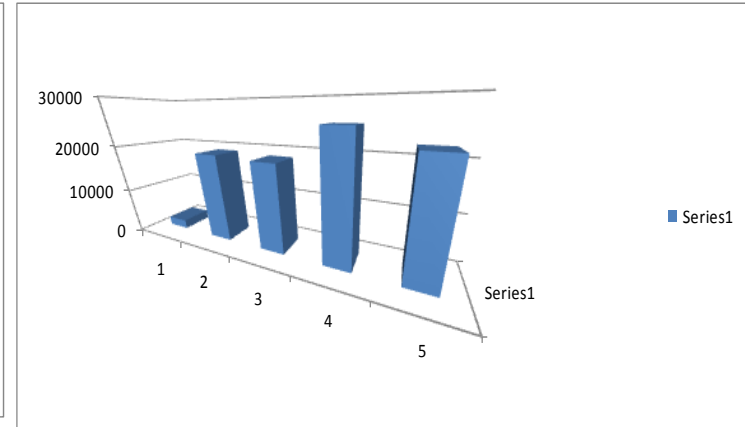
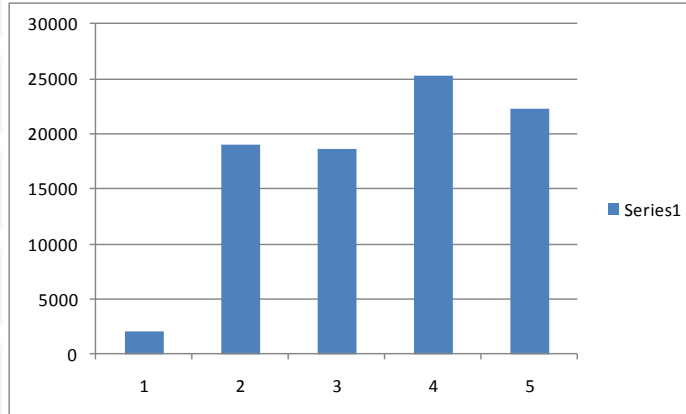
What Not to Do

Standards / Measurements

IN Class Exercise

References

## Cognitive Measurements



# MODULE 3: Information Portrayals

## Judge the Portrayal

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

In Class Exercise

References



[Xcelsius Present – Fast Track to Nowhere](#)

[www.perceptualedge.com](http://www.perceptualedge.com)



# MODULE 3: Information Portrayals

## Linear vs. Quadratic Change

Historical Context

Milestones & Researchers

Information Theory & Process Steps

Guidelines for Information Creation

What Not to Do

Standards / Measurements

In Class Exercise

References



## Linear vs. Quadratic Change

by [Robert Kosara](#), 2008-09-19



# MODULE 3: Information Portrayals

## Color / Shape for Portrayal

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

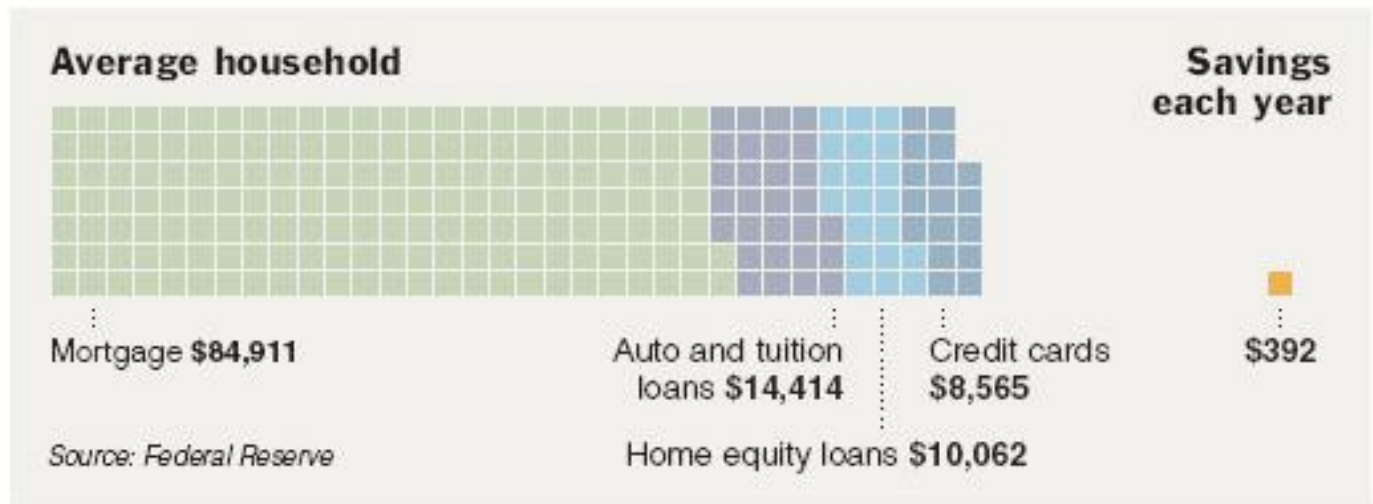
Standards / Measurements

In Class Exercise

References

The New York Times

July 20, 2008



**Given a Shovel, Americans Dig Deeper Into Debt**  
By [GRETCHEN MORGENSON](#)



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

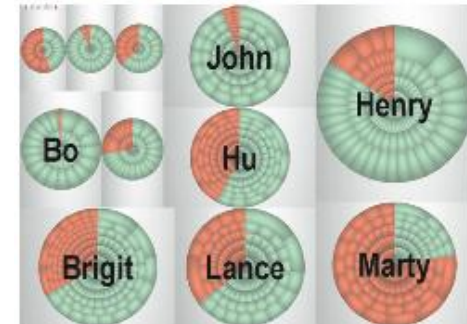
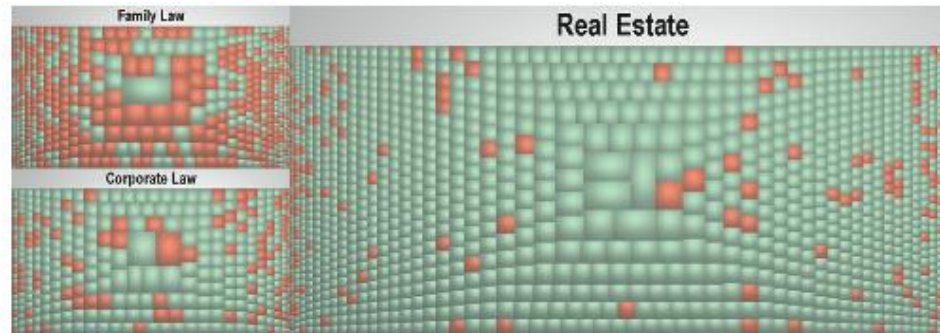
What Not to Do

Standards / Measurements

In Class Exercise

References

## Tree Maps



Vliegen and van Wijk published a very interesting paper at InfoVis 2006 on [Visualizing Business Data with Generalized Treemaps<sup>\(ref\)</sup>](#), in which they took the elements of the treemap to construct bar and pie charts. In the illustration below, orange elements mean cases for which a notary firm made a loss, green are cases that provided revenue. The different kinds of visualization provide for easier access for people not familiar with treemaps, and make it possible to compare different criteria.

### Beyond Treemaps: Bar and Pie Charts! Treemaps

by [Robert Kosara](#), 2008-04-13



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory & Process Steps

Guidelines for Information Creation

What Not to Do

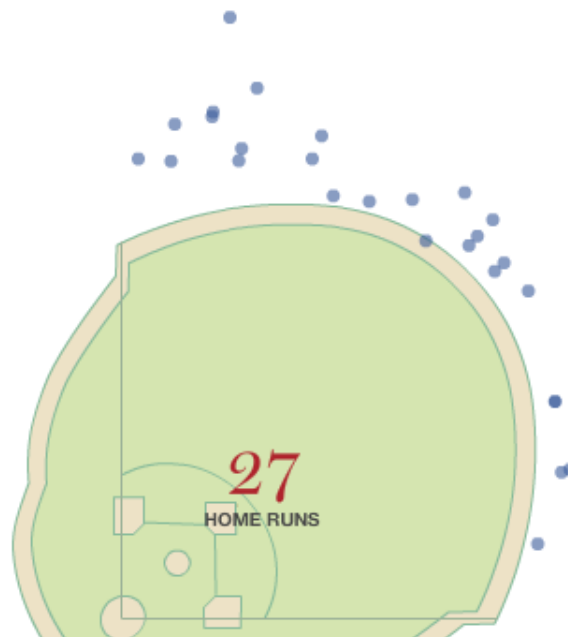
Standards / Measurements

In Class Exercise

References

## Interactive Information Portrayals

**Where they landed** Each dot represents a Manny HR. Click on any point to display more information about it in the chart below.



### Homers by ballpark

All ballparks
Fenway Park
Jacobs Field
Yankee Stadium

### Rogers Centre

Tropicana Field
Camden Yards
US Cellular Field
Kauffman Stadium
Metrodome
Safeco Field
McAfee
Coliseum
Angel Stadium

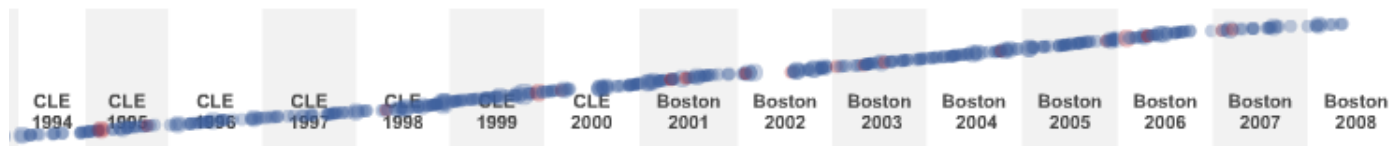
**Opposing pitchers** These pitchers are the most frequent victims of Manny's swing at Rogers Centre.

Chris Carpenter	2
Tanyon Sturtze	2
Pat Hentgen	2
Roy Halladay	2
Al Leiter	1

**Pitch count** Each block indicates how many HRs were hit on that pitch count at Rogers Centre. Darker squares represent more HRs. Click a block to display those hits.

		Strikes		
Balls				
	0-0	0-1	0-2	
1-0	1-1	1-2		
2-0	2-1	2-2		
3-0	3-1	3-2		

**Timeline** Each clickable dot represents a game in which Manny hit a HR. Click once on a year to zoom in, click again to zoom out.



[http://www.boston.com/sports/baseball/redsox/extras/manny\\_500\\_homeruns/](http://www.boston.com/sports/baseball/redsox/extras/manny_500_homeruns/)

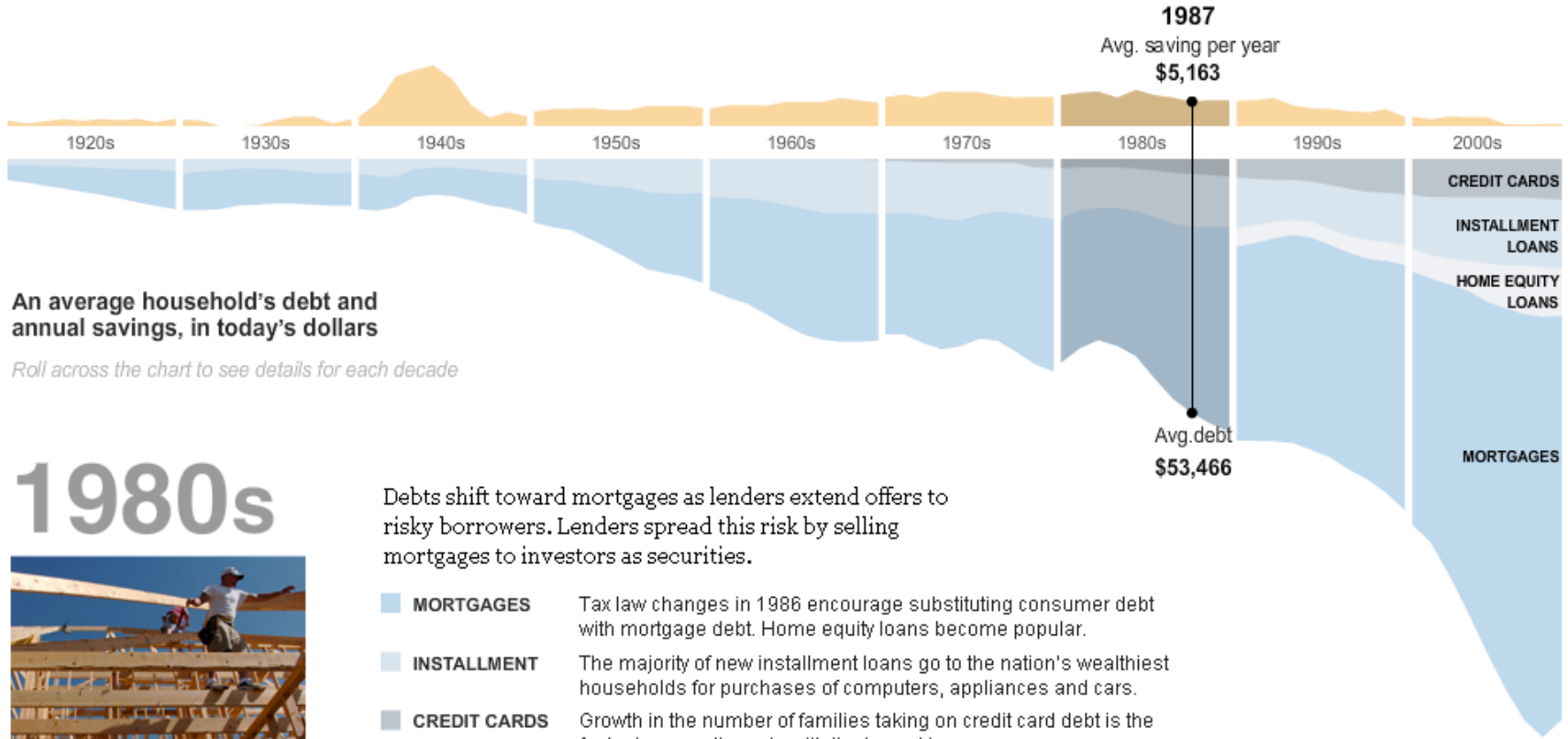


# MODULE 3: Information Portrayals

<http://www.nytimes.com/interactive/2008/07/20/business/20debt-trap.html>

The American Way of Debt By Amy Schoenfeld and Matthew Bloch

BACK TO MENU X



An average household's debt and annual savings, in today's dollars

Roll across the chart to see details for each decade



Part One

▲ Series Index



# MODULE 3: Information Portrayals

## Interactive Information Portrayals

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

In Class Exercise

References

News

Patterns

About

Contact

Community

### Scatterplot

#### Pattern Properties

##### Created

2008-07-28 18:26:27

##### Last Edit

2008-07-28 18:38:59

##### Category

Display Patterns  
Correlations

#### Related Patterns

##### Specialization

Bubble Chart

#### Community

##### Statistics

346 Views

##### Rating

☆☆☆☆☆ 0 votes

##### Latest Comment

...

##### Affiliate Links

[See Pattern in IDL Browser](#)

Layout

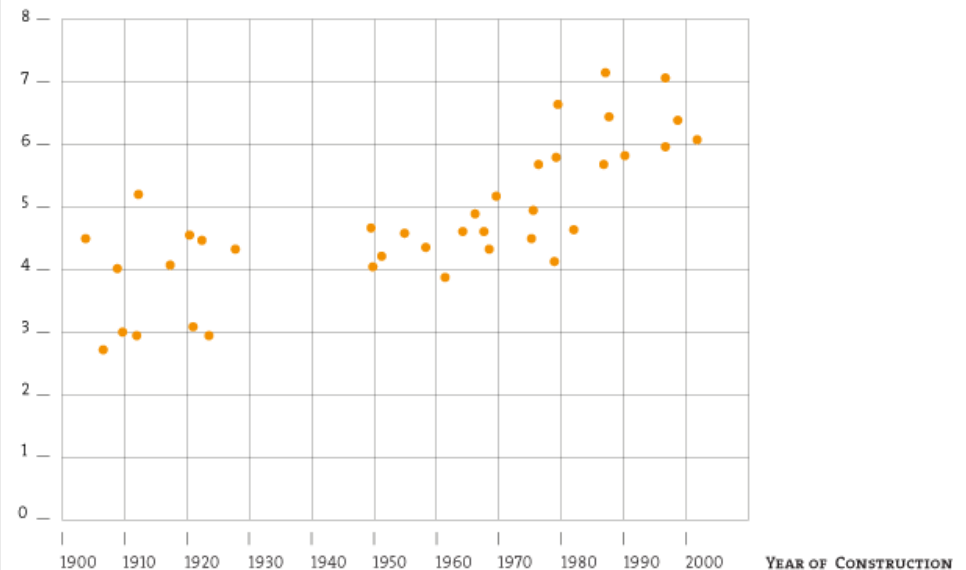
Fact Sheet

Discussion

### HOUSING RENTS 2006

Monthly Base Rent by Year of Construction

#### BASIC RENT PER SQM [EUR]



<http://interface.fh-potsdam.de/infodesignpatterns/patterns.php>





# MODULE 3: Information Portrayals

## Purpose of Portrayals

Historical Context

Milestones & Researchers

Information Theory & Process Steps

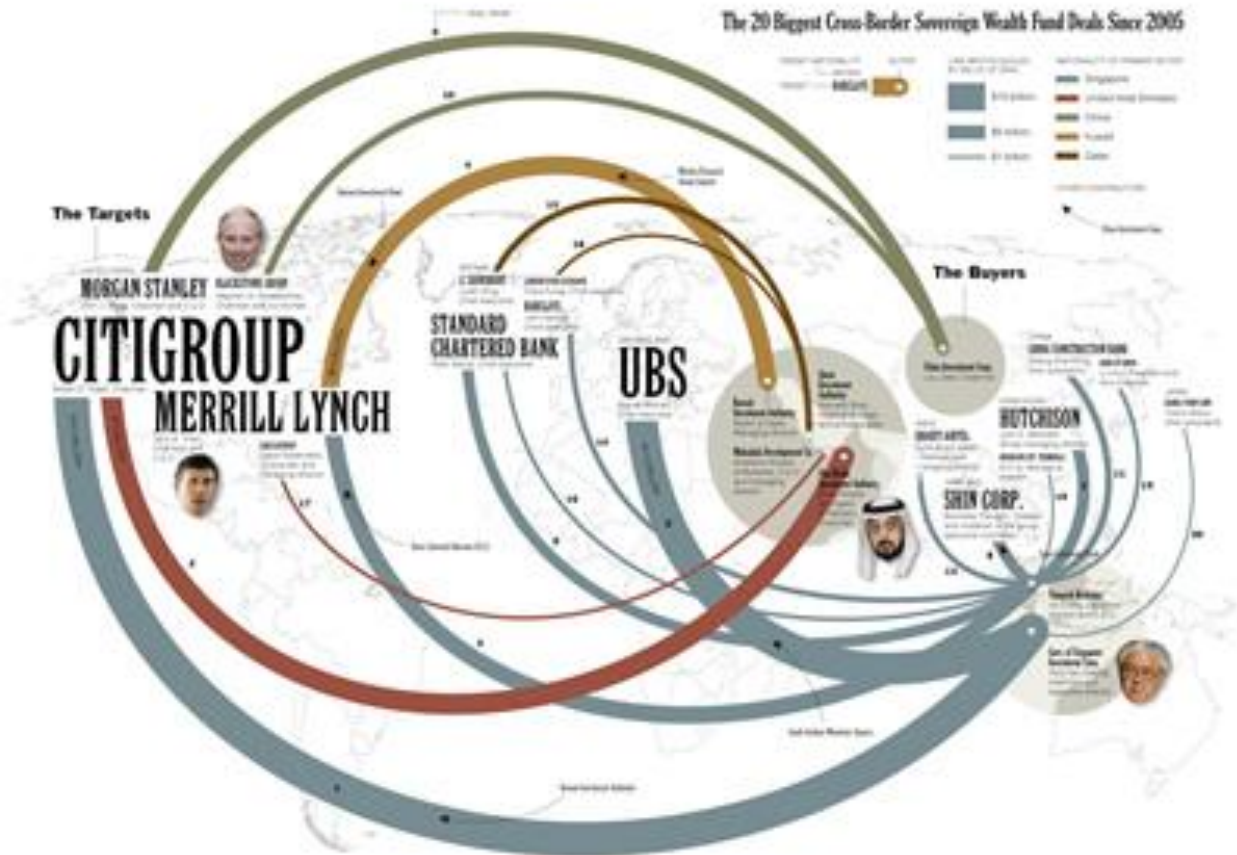
Guidelines for Information Creation

What Not to Do

Standards / Measurements

In Class Exercise

References



<http://dealbook.blogs.nytimes.com/2008/04/02/follow-the-money/>



# MODULE 3: Information Portrayals

Historical Context

Milestones & Researchers

Information Theory & Process Steps

Guidelines for Information Creation

What Not to Do

Standards / Measurements

In Class Exercise

References

## Portrayals as a Competitive Advantage

**KAYAK™** Flights Hotels Cars Vacations Cruises Deals Buzz Sign In Register

[Modify or Start Search Over](#) Milwaukee, WI to Kalamazoo, MI Sun 26 Oct 2008 – Sun 2 Nov 2008

[Track fares by email](#) [Kalamazoo Flight Deals](#) sponsored  
Big Savings on Kalamazoo Flights. Hurry, Space is Limited. Book Now.  
[www.iFly.com/kalamazoo-flights](http://www.iFly.com/kalamazoo-flights)

**Filter to Narrow Results**

**Stops** Best

- nonstop
- 1 stop [\\$431](#)
- 2+ stops [\\$493](#)

**Airlines**

- All Best
- American Airlines [info](#)
- Delta [\\$488](#)
- Northwest [\\$431](#)
- Multiple Airlines [\\$511](#)

[Star Alliance](#) [SkyTeam](#) [oneworld](#)  
[See airline fees](#)

**Flight Times**

**Depart**  takeoff  landing

takeoff  
Sun 5:30a - 9:15p [show all](#)

**Return**  takeoff  landing

takeoff  
Sun 6:30a - 7:00p [show all](#)

**List View** **Matrix View** **Chart View** \$ (USD) [change currency](#)

**Best Fare Trend Departing Any Day, Oct 2008**

Are your dates flexible? Use this chart to find the cheapest departure date.

**Best Fare Trend Departing, Sunday, October 26, 2008** [browse fare history](#)  
(chart unavailable) [Why?](#)

**More travel options for Kalamazoo**

[Flight to Kalamazoo](#) sponsored **CHECIN**  
Compare cheap flights from 40+ major

[www.kayak.com](http://www.kayak.com)



# MODULE 3: Information Portrayals

## Portrayals as Fun

Historical Context

Milestones & Researchers

Information Theory & Process Steps

Guidelines for Information Creation

What Not to Do

Standards / Measurements

In Class Exercise

References



Results 1 - 3 out of 3

[SPY](#) Updated about 7 hours ago  
Published by Swivel Technology Demo

	Jan 29, 1993 12:00AM	Jul 7, 2008 12:00AM	Change	Low	High
<b>3 matching columns</b>					
Close	43	125	↑ 82.0 (191%)	43	156
Adj Close	34	125	↑ 91.0 (268%)	33	155
Open	43	126	↑ 83.0 (193%)	43	156

[www.swivel.com](http://www.swivel.com)



## Business Value

### INTELLIGENT SOLUTIONS



## Getting Data In, Getting Information Out

By Lisa Loftis

**T**he business intelligence (BI) center of excellence (COE) is a set of people, processes and technologies for promoting collaboration and the application of BI best practices. This group can be composed of a set of cross-functional teams that work to drive BI through the enterprise. Implemented properly, a COE with robust capabilities can provide considerable value to the organization. In addition to preparing the organization to deploy advanced BI applications, such as operational BI and event-based marketing, some of the benefits include:

- *Treating data as an asset.* Recognizing data as a strategic asset entails developing policies governing the data, establishing quality standards for the data and assigning formal data stewardship. The COE can spearhead these activities and monitor compliance.

- Establish a technical metadata repository.
- Communicate what data is available to the GIO center.
- Establish a culture of reuse for data mappings to operational systems, ETL code and enterprise data models.
- Work with the business community to identify business data stewards and data quality standards.

GIO is a business-oriented group that acts as a bridge between business communities using BI and the IT developers creating the data warehouse. They focus on understanding business needs and translating those needs into specifications for reports, dashboards and other data delivery mechanisms. They ensure that new data requirements are communicated back to the GDI center, and they communicate data quality problems to both the GDI center and the business community. They develop custom BI reports, scorecards and dashboards; handle much of the training and



# MODULE 3: Information Portrayals

## Business Value

Intelligence is the ability to solve problems. It is also commonly referred to as practical sense or the ability to get along well in all sorts of situations. People cannot see, hear, touch, smell or taste intelligence. On the other hand, the more intelligence people have, the better their ability to respond to situations around them.

On a similar note, we can define intelligence in business intelligence (BI) as the ability to realize business success with easy access to actionable information through timely and accurate insight into business conditions. It is crucial to examine BI initiatives from the perspective of the value created. If decision-makers do not understand the economic benefit generated by BI, they may grow to distrust the recommendations it generates. They may return to strategy by intuition and prioritization based on a hunch.

How are data, information, intelligence and BI interrelated?

**Data** generated by business events is raw without context, like customer data, product data and transactions.

**Information** is data with context and meaning; for example, information about product purchases made by the specific customers.

**Intelligence** is actionable information insight and is used by various information consumers to achieve business objectives: Which group of customers buys which products? Is there a trend in purchases of these products by these

customers? How can we use the trend to predict what will happen in the future?

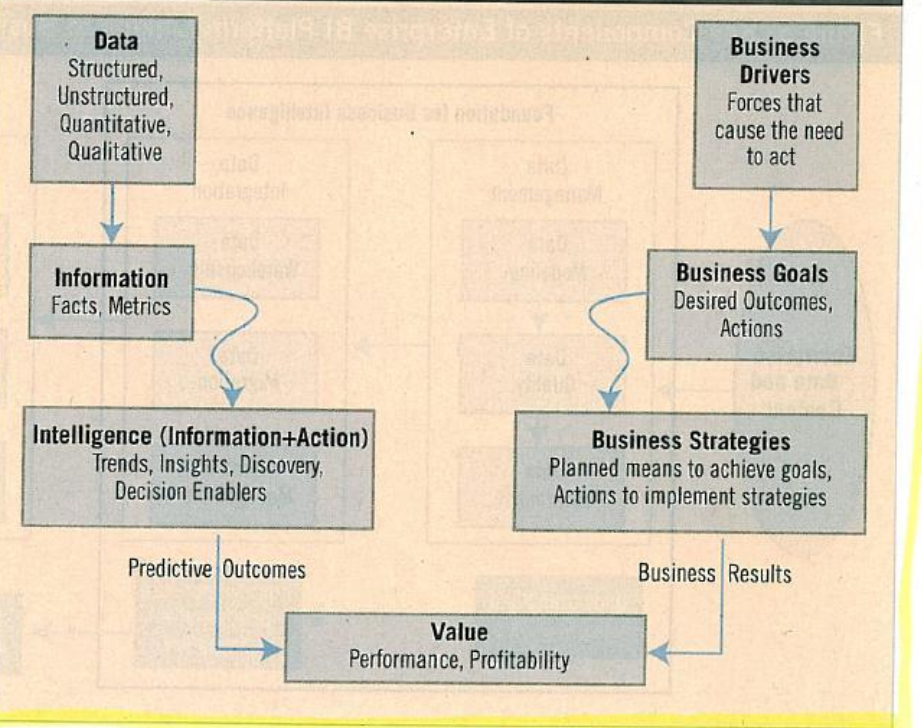
**BI** is intelligence based on business information, past actions and strategies for the future.

BI is all about achieving greater profitability by analyzing huge amounts of data and numbers - presenting them, qualifying the assessments, finding trends and issues hidden in them, empowering action to resolve issues and providing

actionable insights.

The economic benefit of BI is often complex and difficult to quantify. Several factors may contribute to the overall revenue or profitability statistics that an organization needs to measure. A common factor in determining economic benefit is ROI on BI strategies or other metrics that quantify the number of sales, number of new customers acquired, etc. These numbers tell us how many and how much. Other factors such as customer cen-

Figure 1: Intelligent Business Paradigm



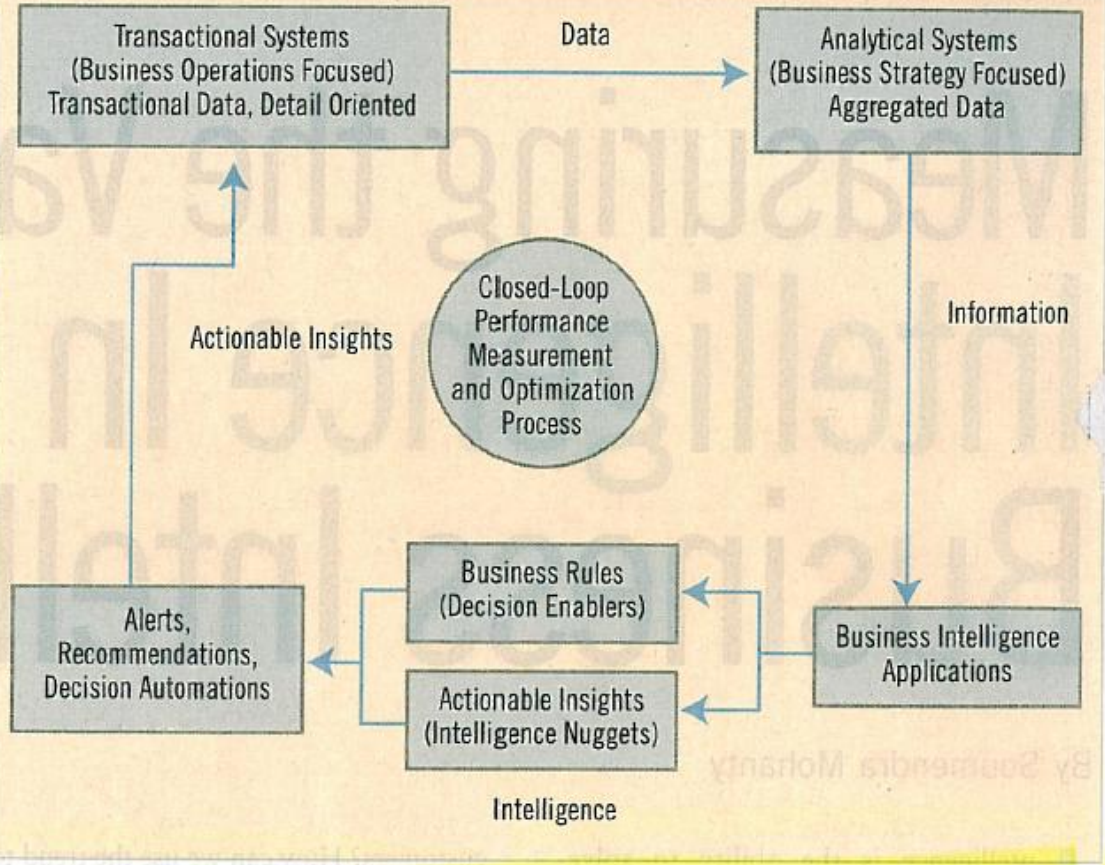
# MODULE 3: Information Portrayals

## Business Value

tricity, lifetime value and wallet share are also critical. Negative economic impacts like losses due to charge-offs and fraud should also be measured and considered. Additional pertinent questions include:

- Are we doing the right things? What is proposed for what business outcome, and how do we know which initiatives within the program contribute to the achievement of business strategy?
- Are we doing them the right way? What management and operational practices have we put in place to maximize our chances of success? Have we moved from intention to realization, and is the information accessible to the right people at the right time?
- Are we getting them done well? Are we applying the defined practices in the optimal way and monitoring them to ensure that they remain effective?
- Are we getting the benefits? How will the benefits be delivered? What is the value of the program? How do we measure it? What factors influence success or failure?

Figure 2: Closed-Loop Business Performance Measurement and Optimization



# MODULE 3: Information Portrayals

## References

Data Visualization Article (How to see data differently)

<http://www.cnn.com/2009/TECH/11/02/data.viz/index.html>

New data website for localized data analysis

<http://www.everyblock.com/>

IBM's open source visualization website

<http://manyeyes.alphaworks.ibm.com/manyeyes/>

Good visualizations on the recovery

[http://money.cnn.com/news/storysupplement/economy/stimulus\\_jobs/index.htm](http://money.cnn.com/news/storysupplement/economy/stimulus_jobs/index.htm)

Good visualization on the recovery

[http://money.cnn.com/galleries/2009/news/0910/gallery.economic\\_recovery/index.html](http://money.cnn.com/galleries/2009/news/0910/gallery.economic_recovery/index.html)

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

In Class Exercise

References



# MODULE 3: Information Portrayals

## References

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

In Class Exercise

References

Cox, D.R. Some Remarks on the Role in Statistics of Graphical Methods *Journal of the Royal Statistical Society. Series C (Applied Statistics)*, Vol. 27, No. 1 (1978), pp. 4-9.

Ehrenberg, A. Rudiments of Numeracy *Journal of the Royal Statistical Society. Series A (General)*, Vol. 140, No. 3 (1977), pp. 277-297.

Kurstedt, H. A. 1998. ISE 4015 Course Pack [MSE Textbook]. Blacksburg, VA: Virginia Tech.

Tufte, E.R. (2001). *The visual display of quantitative information*. Cheshire, CT: Graphics Press.





# MODULE 3: Information Portrayals

## References

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

In Class Exercise

References

Tukey, J. Data-Based Graphics: Visual Display in the Decades to Come *Statistical Science*, Vol. 5, No. 3 (Aug., 1990), pp. 327-339.

Wainer, H. How to Display Data Badly *The American Statistician*, Vol. 38, No. 2 (May, 1984), pp. 137-147.

Yates, J. 1985. Graphs as a Managerial Tool: A Case Study of Du Pont's Use of Graphs in the Early Twentieth Century. *The Journal of Business Communication* 22: 5-33.

Zelazny, G. 1977. *Choosing and Using Charts*. London, England: Video Arts Ltd



# MODULE 3: Information Portrayals

## References

Historical Context

Milestones & Researchers

Information Theory &  
Process Steps

Guidelines for Information  
Creation

What Not to Do

Standards / Measurements

In Class Exercise

References

Other good visualizations

<http://www.presentationzen.com/>

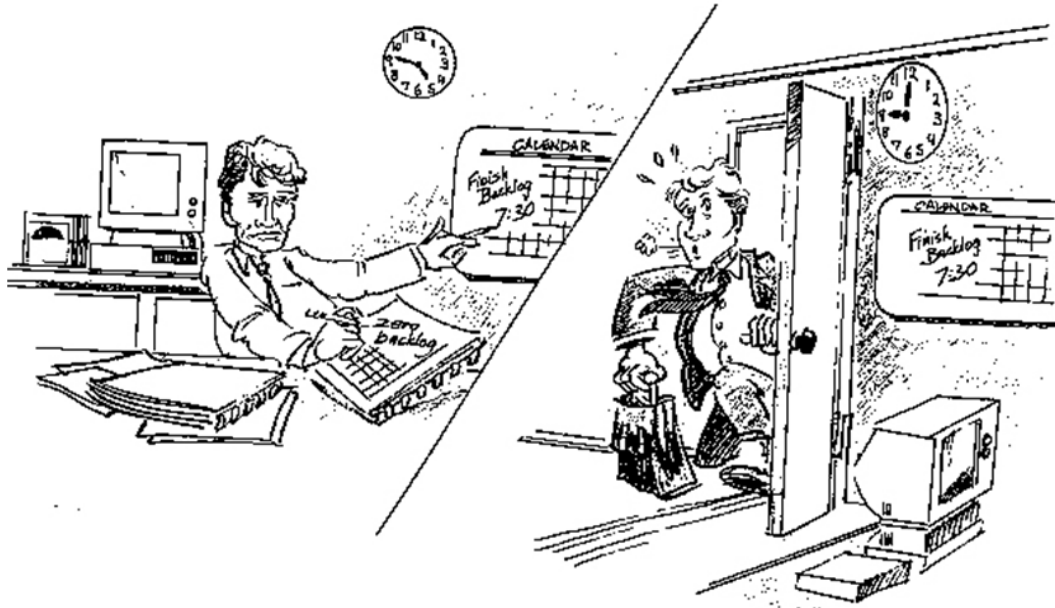
<http://www.garreynolds.com/Presentation/tutorial.html>

[GAPMINDER EXAMPLE](#)

[ENRON Explorer](#)



# MODULE 4: The ABC Model & Management Frameworks



## The ABC Model and Management Frameworks



# MODULE 4: The ABC Model & Management Frameworks

ABC Model

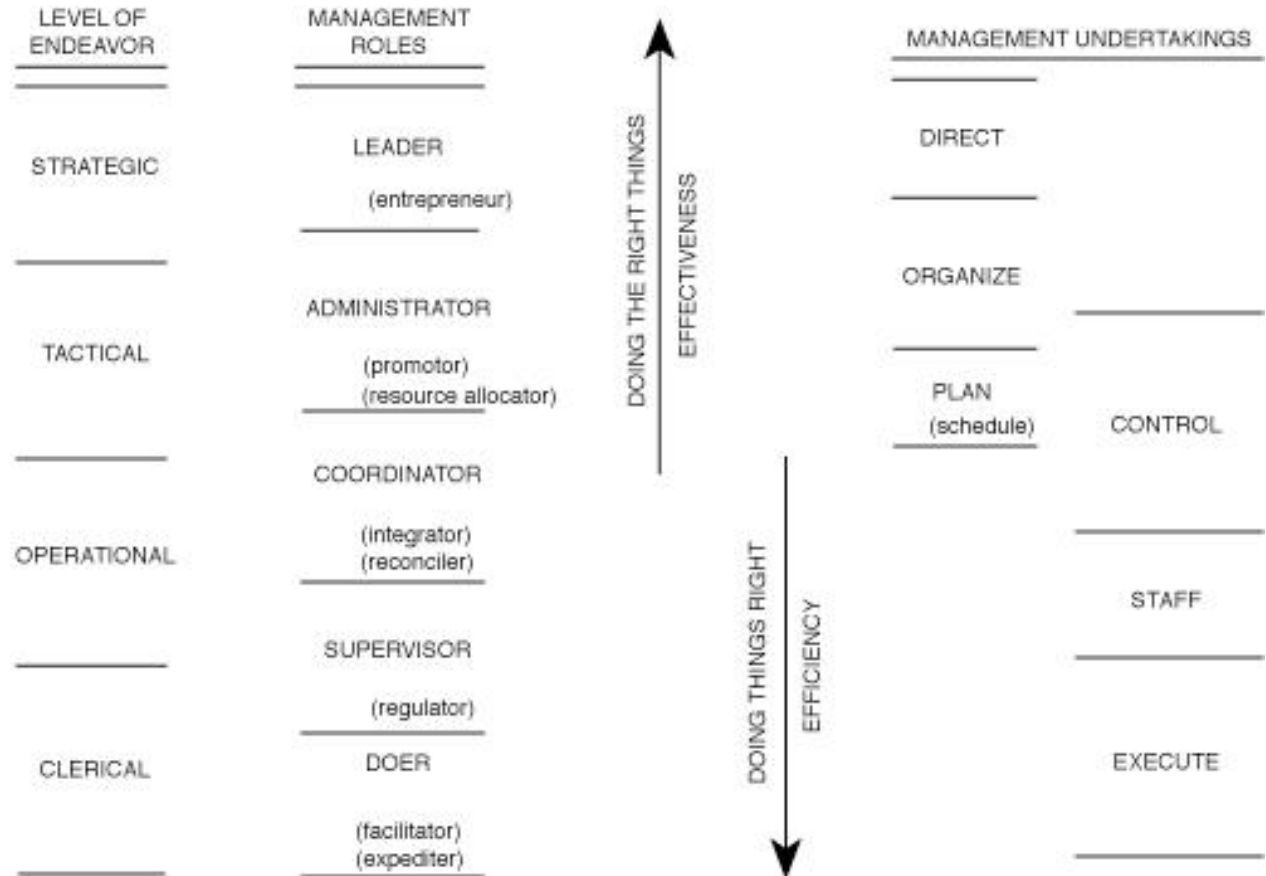
Systems Frameworks

Management System Model Theory

Systems Skills

Communication Skills

## WHAT DOES A MANAGER DO?



# MODULE 4: The ABC Model & Management Frameworks

## The ABC Model

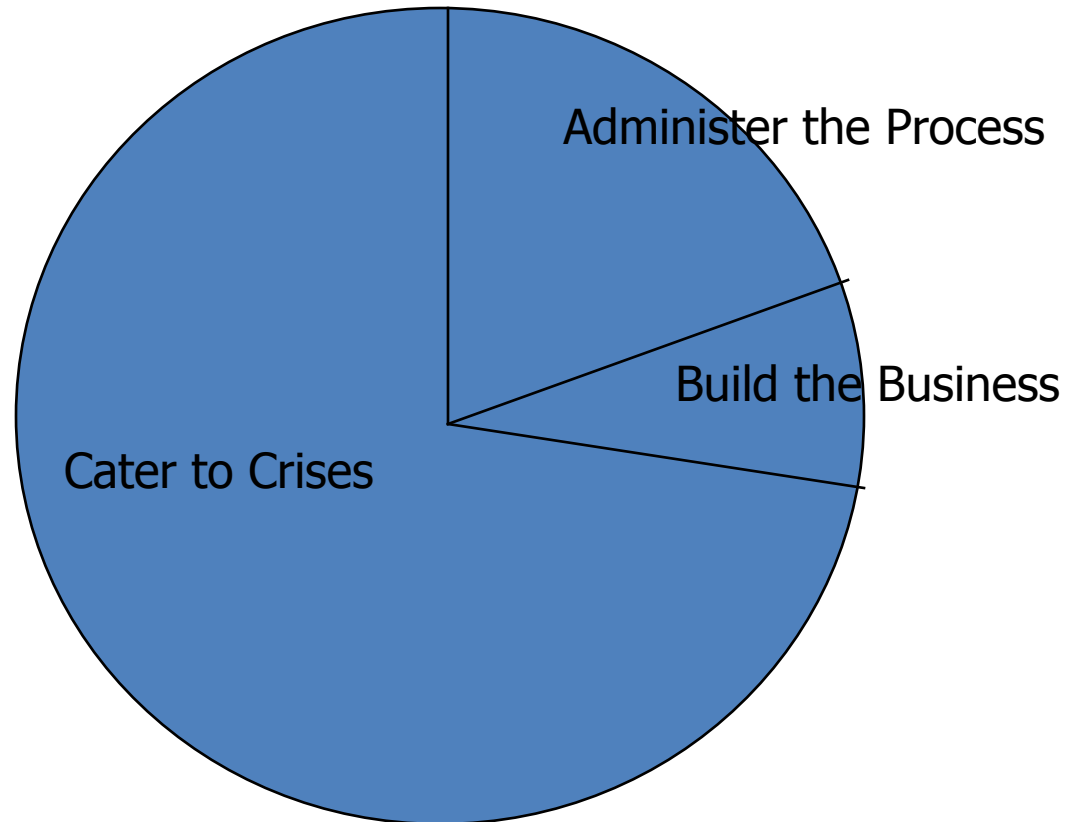
ABC Model

Systems Frameworks

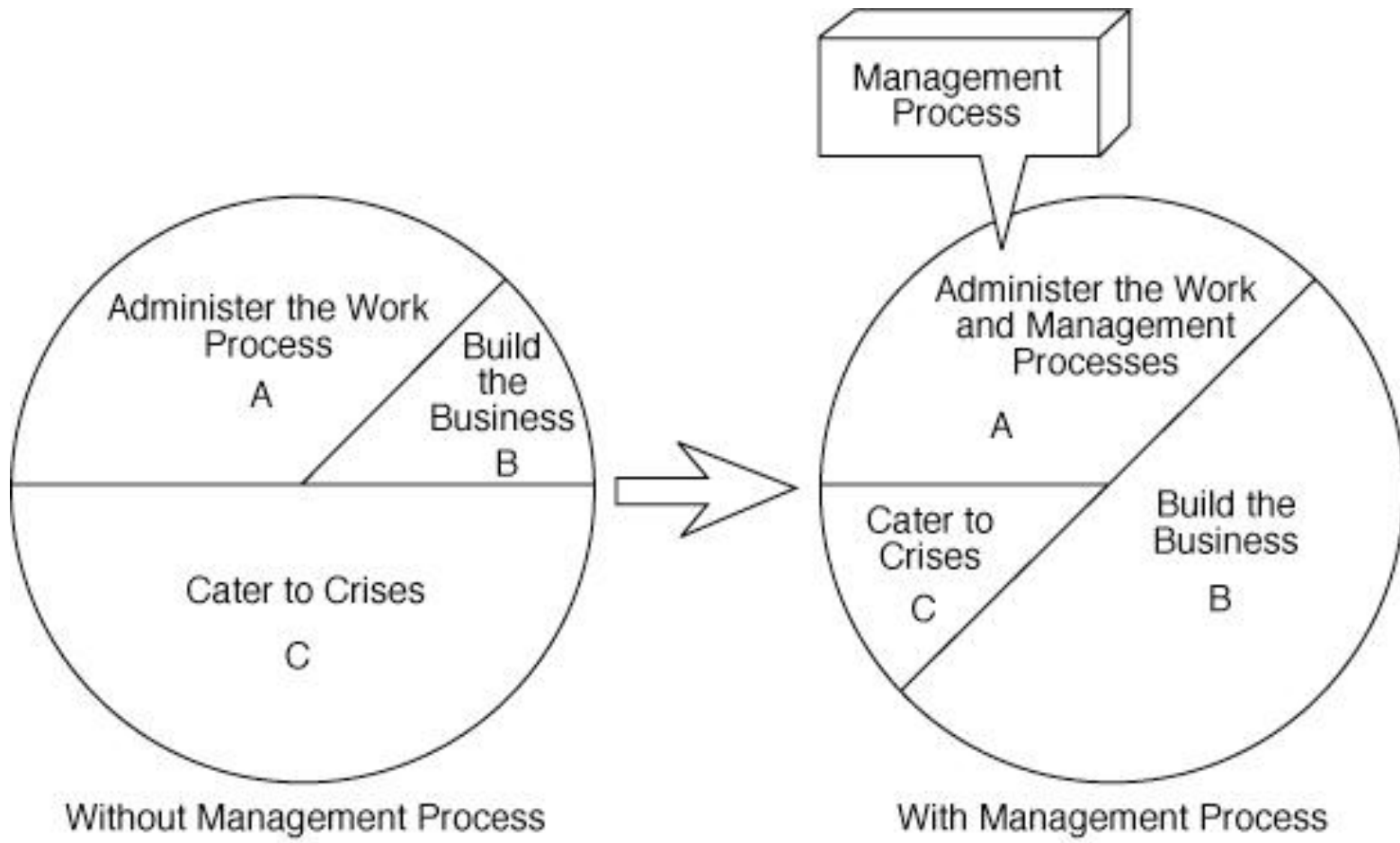
Management System  
Model Theory

Systems Skills

Communication Skills



## The ABC Model and Management Process



# MODULE 4: The ABC Model & Management Frameworks

## Our Crises are of our Own Making

ABC Model

Systems Frameworks

Management System  
Model Theory

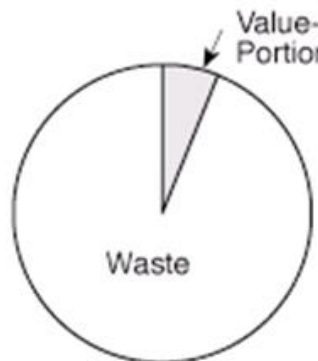
Systems Skills

Communication Skills



# MODULE 4: The ABC Model & Management Frameworks

How People Spend Time in Typical Factory



"Waste": waiting for materials, watching machine running, producing defects, looking for tools, fixing machine breakdown, producing unnecessary items, etc.

How Machines Are Utilized in Typical Factory



"Waste": unnecessary movement of machine, setup time, machine breakdown, unproductive maintenance, producing defective products, producing products when not needed, etc.

How Materials Spend Time in Typical Factory



"Waste": transportation, storage, inspection and rework.





# MODULE 4: The ABC Model & Management Frameworks

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills

## Important vs. Urgent

- Work on the important before the urgent.
- Covey: can't and won't power get in the way of willpower



# MODULE 4: The ABC Model & Management Frameworks

## Covey's Urgency Matrix

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills

		Time Management Matrix	
		Urgent	Not urgent
Important	I	crises pressing problems deadline-driven projects	II prevention relationship building recognizing new opportunities planning, recreation
	III	interruptions some calls, mail, reports, meetings	IV trivia some mail, calls time wasters
Not important			

(from Covey, 1989, p. 151)



# MODULE 4: The ABC Model & Management Frameworks

ABC Model

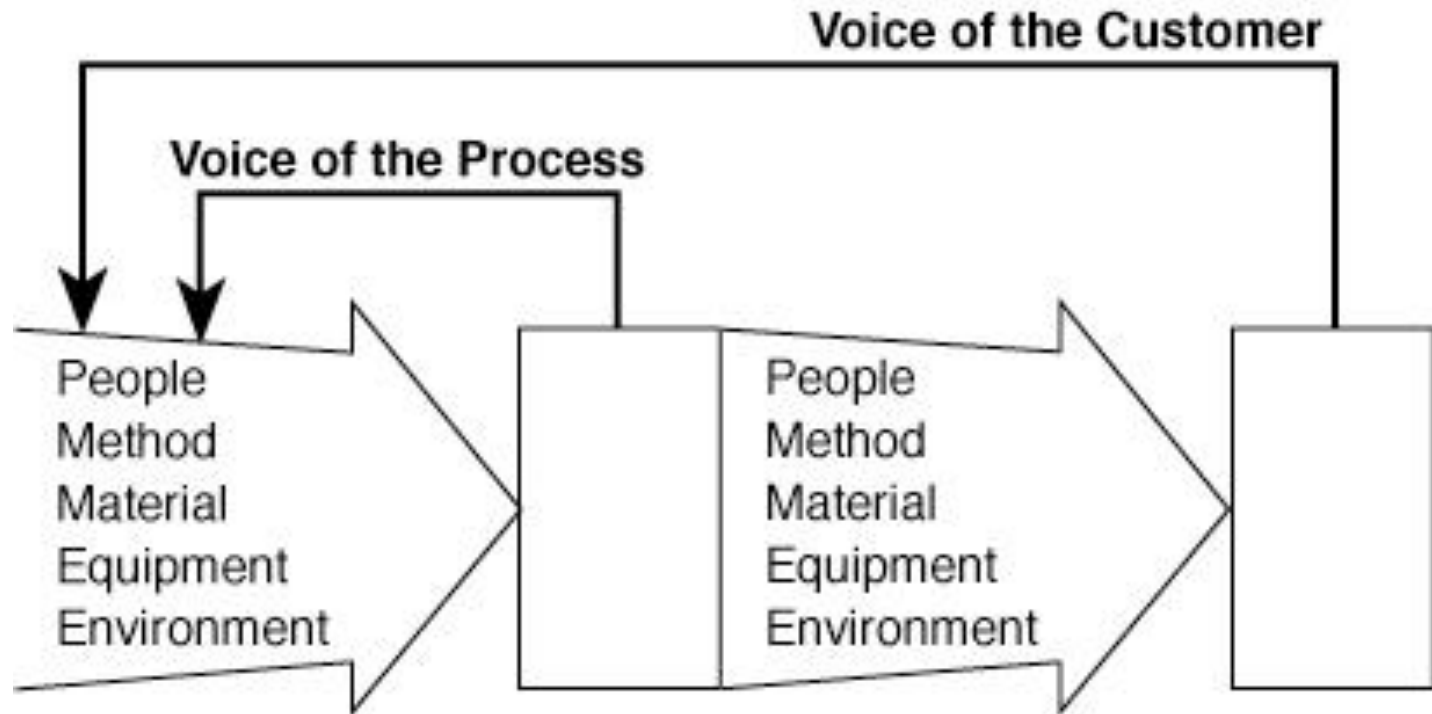
Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills

## Suzuki's Voice of the Customer and Voice of the Process



# MODULE 4: The ABC Model & Management Frameworks

## Strengths & Weaknesses of Models

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills

- Relatedness
- Transparency
- Robustness
- Fertility
- Ease of Enrichment



## Lewin's Core Principle

- “We are likely to modify our own behavior when we participate in problem analysis and solution and likely to carry out decisions we have helped make.”

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills



# MODULE 4: The ABC Model & Management Frameworks

ABC Model

Systems Framework

Management System  
Model Theory

Systems Skills


Communication Skills

## THREE MATURITY STAGES MUST PROCEED IN SEQUENCE.

MATURITY

STAGES

Stages

- 
- OPTIMIZATION - Modification of the plan and control to improved performance
  - CONTROL - Steady state achieved by eliminating variations
  - VISIBILITY - Complete cognizance of cause and effect relationships

IIE1 334



## 5 Pursuits Run for Uncertain to Certain

### Uncertainty



**Perplexity** - Can specify neither the start nor the end.

**Problem** - Can specify the start but not the end.

**Program** - Know the start and have qualitative fix on the end.

**Project** - Know the start and have specifications for the end.

**Process** - Repeatedly achieve the same known end.



# MODULE 4: The ABC Model & Management Frameworks

ABC Model

Systems Framework

Management System  
Model Theory

Systems Skills

Communication Skills

Uncertainty



don't know WWA and WWWTB; thus don't know HTGT

know WWA but not WWWTB; thus don't know HTGT

know WWA and qualitatively know WWWTB; thus qualitatively know HTGT

know WWA and WWWTB specifically; thus figuring HTGT is straight-forward

know WWA, WWWTB, and repetatively do HTGT





# MODULE 4: The ABC Model & Management Frameworks

ABC Model

Systems Framework

Management System  
Model Theory

Systems Skills

Communication Skills

## EFFORT IS AIMED OR FOCUSED DEPENDING ON RESPONSIBILITY.

COMPREHENSIVENESS

ENDEAVORS

Endeavors

STRATEGIC

- Global efforts are aimed in a general direction using qualitative measures.

TACTICAL

- Wide efforts are directed toward a tangible result using quantitative standards.

OPERATIONAL

- Limited efforts are focused on a fixed outcome using restricted methods.

CLERICAL

- Local efforts are constrained to an explicit path using specific steps.

IIE1 333



# MODULE 4: The ABC Model & Management Frameworks

ABC Model

Systems Framework

Management System  
Model Theory

Systems Skills

Communication Skills

## DECISIONS INCLUDE INFORMATION AND/OR JUDGMENT.

---

### STRUCTURE

DECISIONS

STRUCTURED

- Routine decisions involving information only

SEMI-STRUCTURED

- Less routine decisions involving both information and judgment

UNSTRUCTURED

- Unprecedented decisions involving judgment, insight, and intuition with little or no established information

Decisions

IIE1 332



# MODULE 4: The ABC Model & Management Frameworks

ABC Model

Systems Framework

Management System  
Model Theory

Systems Skills

Communication Skills

## Evolve from Unstructured to Structured Decisions.

- Tobacco sniffer
- Expert systems help managers make semi-structured decisions.



# MODULE 4: The ABC Model & Management Frameworks

## Using the Frameworks.

- Tell you what management tools work.
- And which ones won't.
- Note the assumptions and constraints and redesign tools, if possible.
- CPM only applies to projects.
  - Strip away the constraint of defined end and see how bottlenecks can be managed in other pursuits.

ABC Model

Systems Framework

Management System  
Model Theory

Systems Skills

Communication Skills



# MODULE 4: The ABC Model & Management Frameworks

## Who Manages

- Anyone who uses information to make decisions resulting in actions that affect what is managed.

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills



ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills

## Characteristics of Who Manages

- History
  - Experience, education, record
- Cognitive Style
  - MBTI, KTS, decision style
- Human characteristics
  - EQ, KSAs, traits,.



# MODULE 4: The ABC Model & Management Frameworks

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills

## What is Used to Manage (Converts data to information)

- Relationships & structures
- Methods
- Guides & rules
- Precedents
- Data-to-information chain



# MODULE 4: The ABC Model & Management Frameworks

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills

## Skills Useful in Applying Management Tools. (Converts data to information)

- Fig. 1.5.5.1





# MODULE 4: The ABC Model & Management Frameworks

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills

## System Analysis Skills.

- Mod 1.5.5.3



# MODULE 4: The ABC Model & Management Frameworks

## General Skills of Systems Analysis

- Iteration and recursion
- Hierarchical decomposition
- Use of graphs, charts, diagrams
- Use of models
- Balancing analysis and synthesis
- Creative skills
- Problem solving

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills



# MODULE 4: The ABC Model & Management Frameworks

## Problem Solving Skills

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills



# MODULE 4: The ABC Model & Management Frameworks

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills

## Communication Skills for Systems Analysts

Who's your audience?

- Problem-solving work sessions
- Technical reviews
- Reports (oral and written)



# MODULE 4: The ABC Model & Management Frameworks

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills

## Audience + Purpose = Design

- Who is your audience?
- What is your purpose?
- Write these down!
- Now, prepare the communication and choose the right media (or medium).



# MODULE 4: The ABC Model & Management Frameworks

## Preparing Presentations

- See Mod. 1.5.8.5.2 worksheet.
- Will drive the building of your presentation.
- Fig. 1.5.8.5.3
- Many subsequent worksheets.

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills



# MODULE 4: The ABC Model & Management Frameworks

## Listening Skills

- Most-used skill in communication.
- Most-used skill in learning.
- Least understood communication skill.
- Speaker: 200 wpm, listener: 300-500 wpm.

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills



# MODULE 4: The ABC Model & Management Frameworks

## Oral Communication Model

- Fig. 1.5.8.5.10.2

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills





## Sequential Actions for Effective Listening

- **Relate**
  - Receive
  - Request
  - Relax
  - Relate
  - Recognize
  - Reciprocate

Fig. 1.5.8.5.10.3

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills



ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills

## Sequential Actions for Effective Listening

- **Remember/retain**
- **Reflect**
  - reflect
  - restate
  - recap
- **Respond**
  - relieve
  - respond



## Sequential Actions for Effective Listening

- **React**
  - responsive
  - responsible

ABC Model

Systems Frameworks

Management System  
Model Theory

Systems Skills

Communication Skills



# MODULE 4: The ABC Model & Management Frameworks

## STOP Process

ABC Model

Systems Frameworks

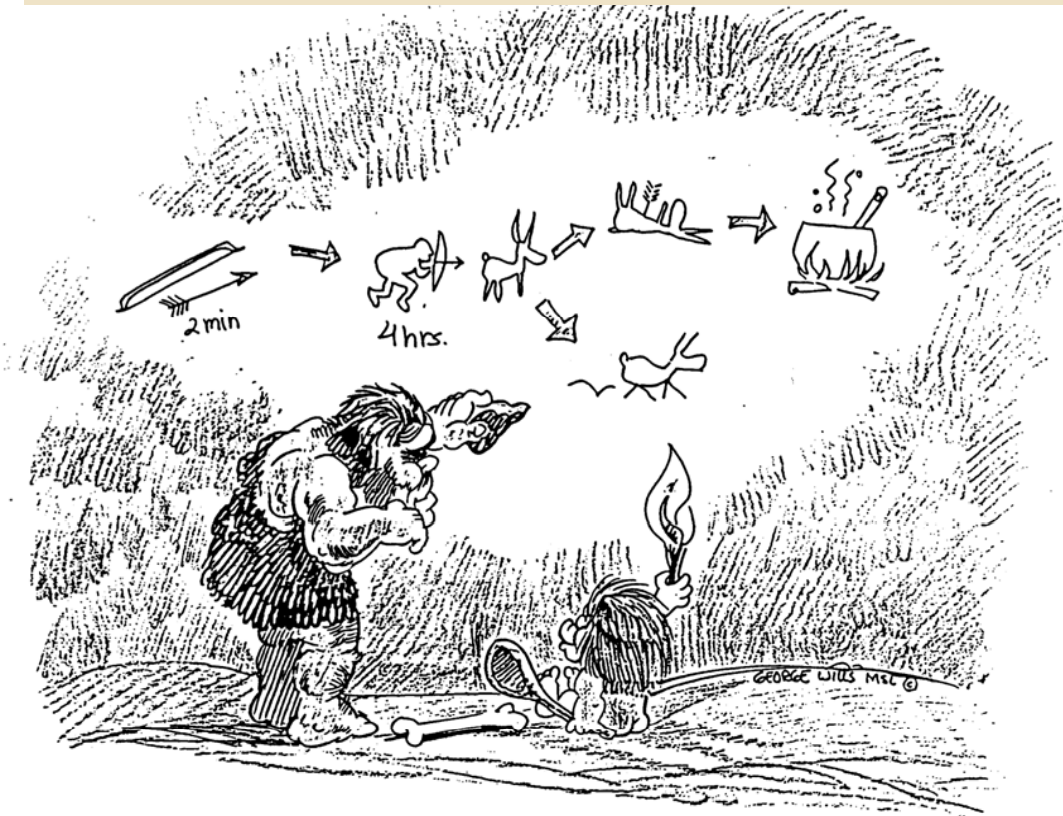
Management System  
Model Theory

Systems Skills

Communication Skills



# MODULE 5: Data Flow Diagrams



## DATA FLOW DIAGRAMS Mapping Data Flow in a System



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References

## Physical vs. Logical Models

### MAJOR CHARACTERISTICS OF MODELS

	Physical	Logical
<b>Viewpoint</b>	How procesing is done	What the system does
<b>Processes</b>	Sequential	Often parallel
<b>Names</b>	Documents, people, forms	Underlying data and processes
<b>Data Flows</b>	Excess (tramp) data	Only data used or produced by the process
<b>Controls</b>	Includes controls for crossing man-machine boundaries	Limited to essential business controls

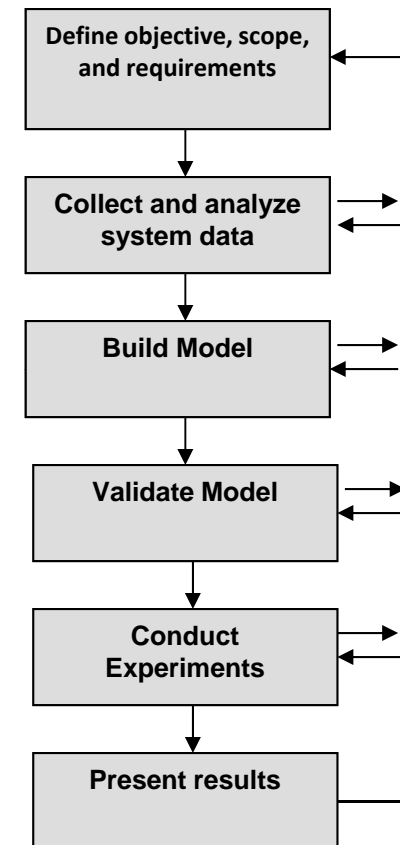
**Figure 2.1.5.3.c.** Summary of key differences between physical and logical models. (adapted from Powers, Adams, & Mills, p.161)



# MODULE 5: Data Flow Diagrams

## General Modeling Steps

- DEFINE SCOPE
- COLLECT SYSTEM DATA
- ANALYZE DATA
- BUILD MODEL
- VALIDATE MODEL
- CONDUCT EXPERIMENTS
- REPEAT 2-6 AS NECESSARY
- PRESENT RESULTS

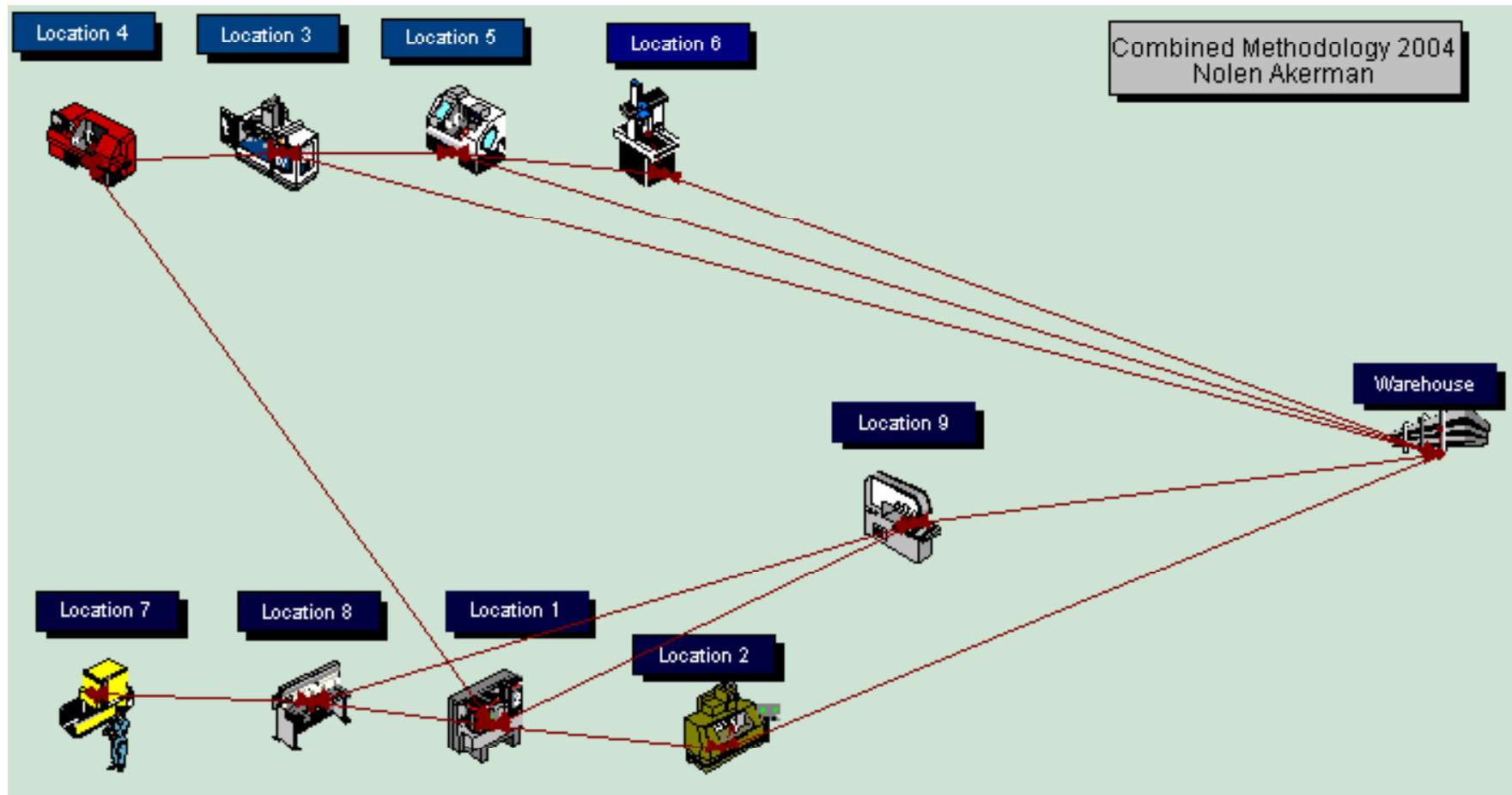


**Figure 3: Pritsker and Pegden's Iterative Process of Simulation**



# MODULE 5: Data Flow Diagrams

## Physical System Modeling

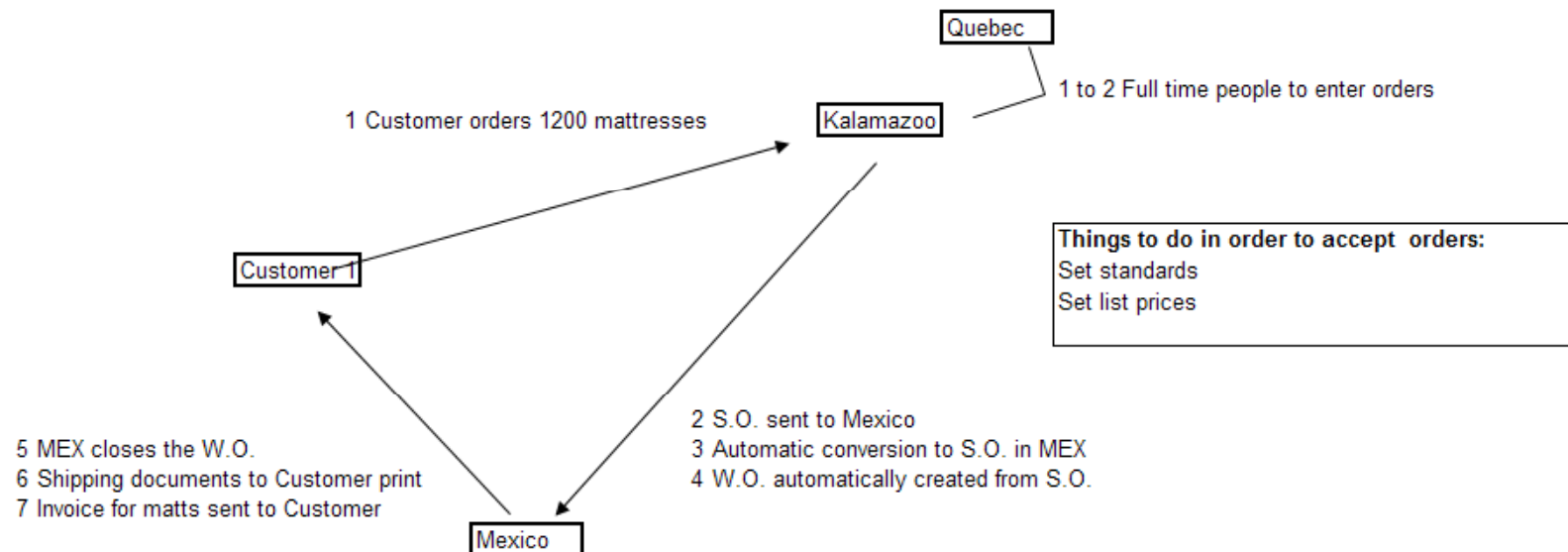




# MODULE 5: Data Flow Diagrams

## Logical System Modeling – Context Diagram

Situation: Customer buys from Acquired Company



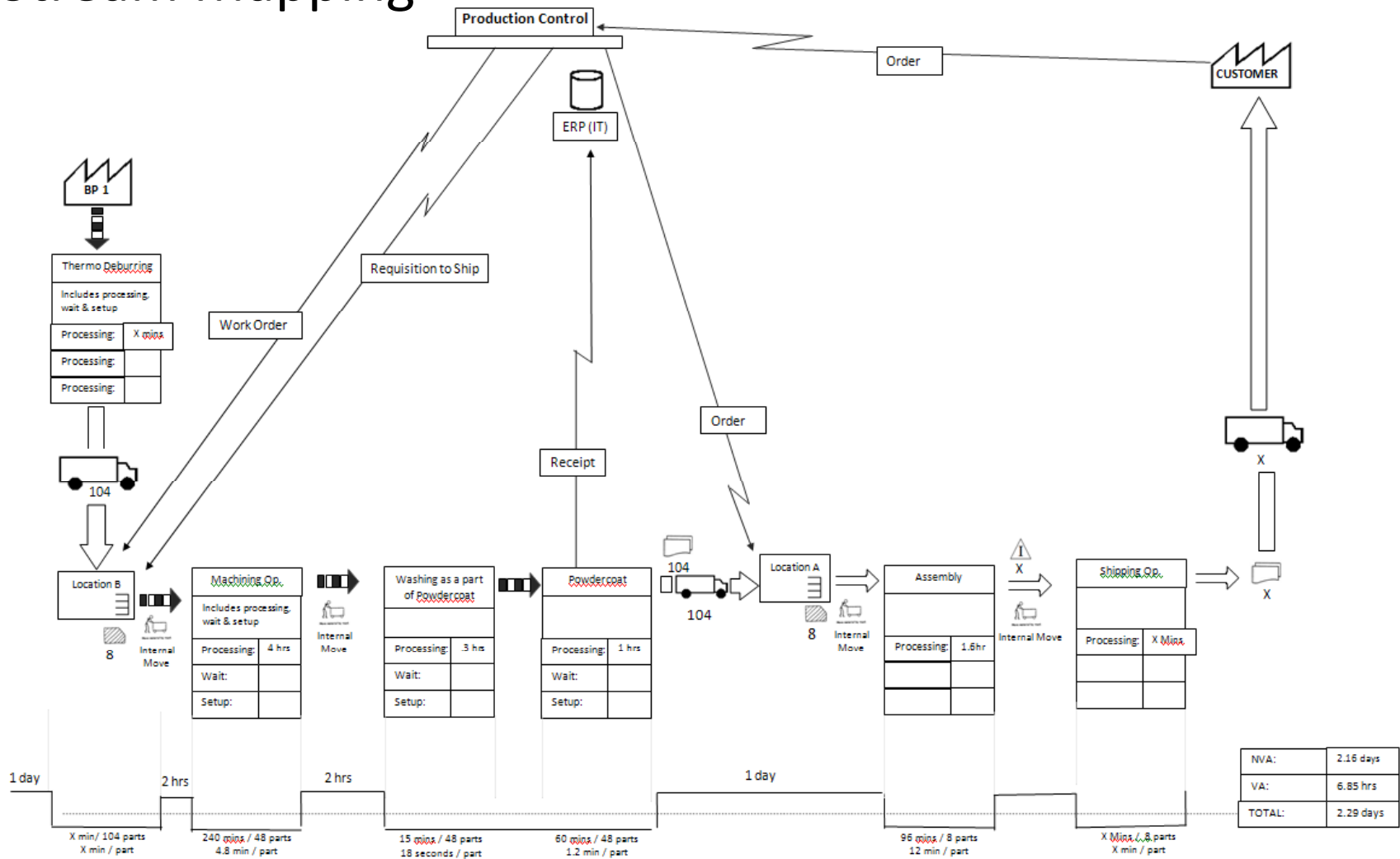
Questions:

- Do we let Acquired Company keep their current PO system?
- Can we do the inventory adjustments this would require?



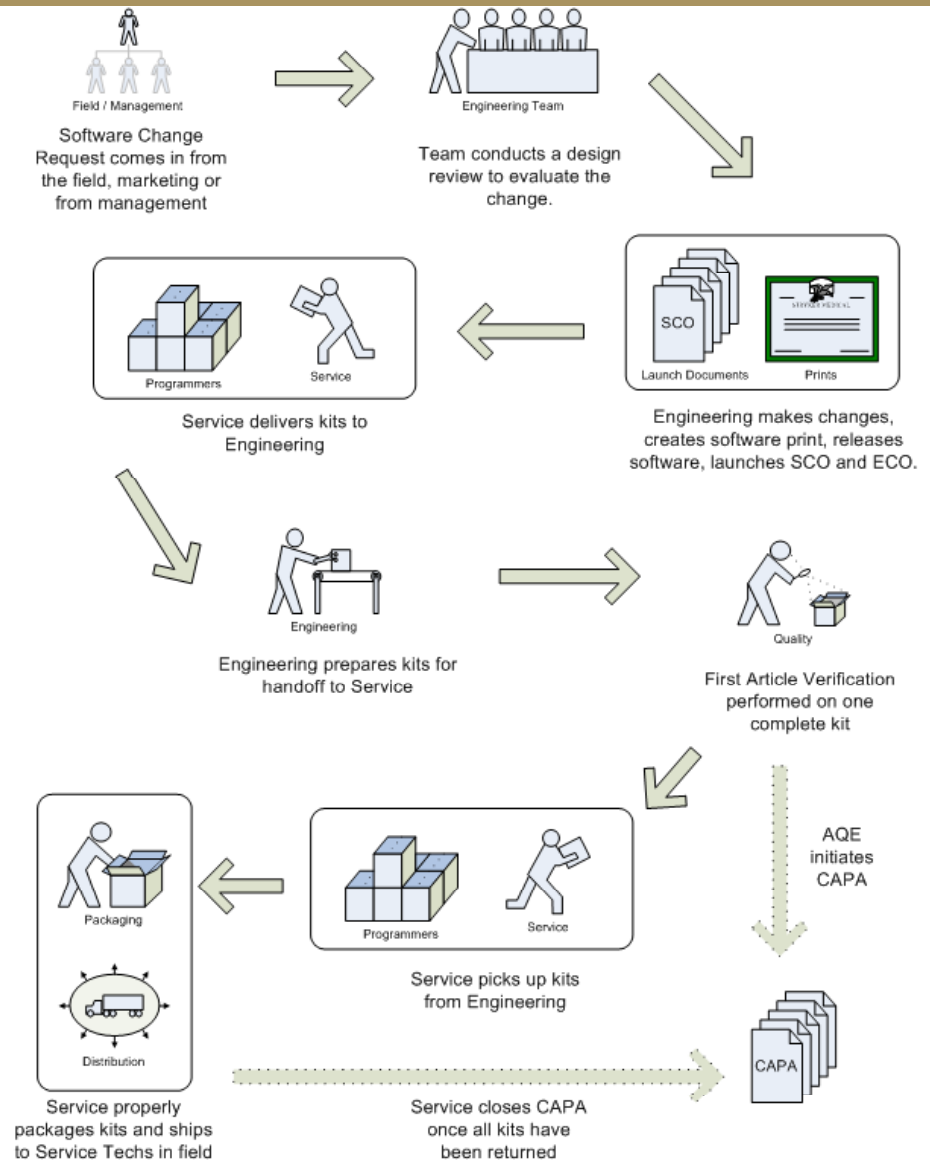
# MODULE 5: Data Flow Diagrams

## Value Stream Mapping



# MODULE 5: Data Flow Diagrams

## Hybrid Model: Rich Picture Diagramming



# MODULE 5: Data Flow Diagrams

Types of Models

Models & DFDs

DFD 'rules'

DFD Example 1: ATM Withdrawal

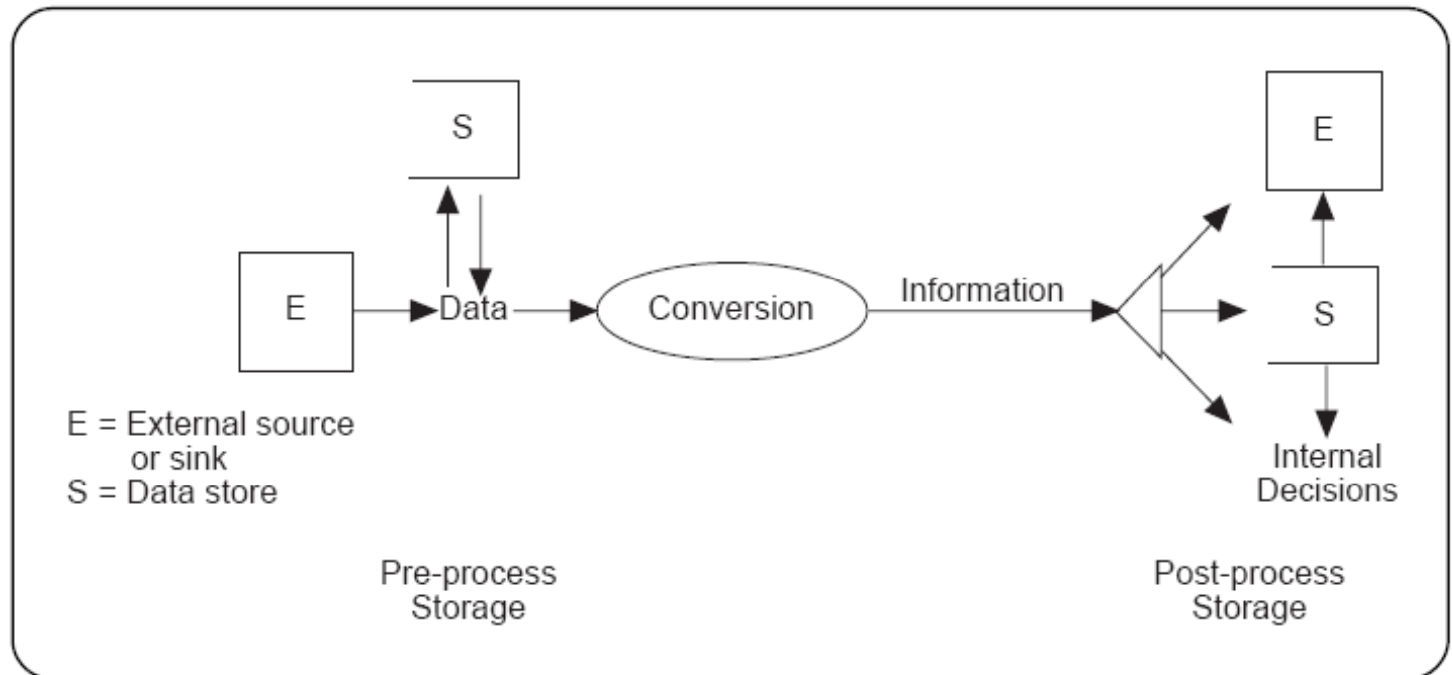
DFD Example 2: Ordering a Pizza

DFD Example 3: Ordering a book online

Creating Qualitative Measures

References

## Analyzing Data

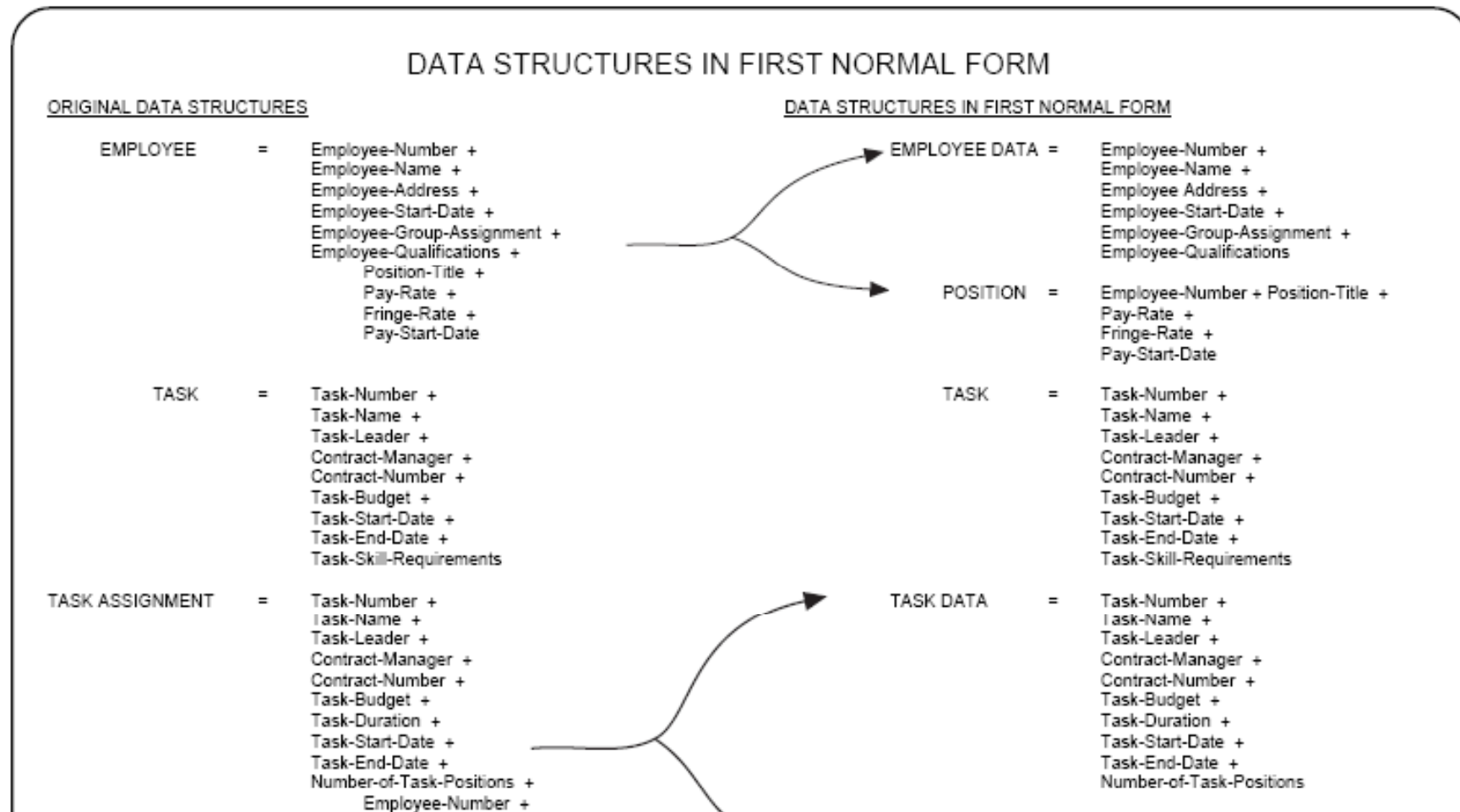


**Figure 2.1.7.3.1.** *The sources and sinks of data and the data stores fit into the data to information conversion process.*



# MODULE 5: Data Flow Diagrams

## Normalizing Data Stores



# MODULE 5: Data Flow Diagrams

## Data Dictionary Example

Index	Sub Index	Data Object	Data Type	Valid Range	Data Size	Network Variable Size	Network Variable Mapping	Mapping Direction
0x6000	0x00	CAN Open Node ID	Integer	0-110	1 Byte	1 Byte	nvoNodeId	nvo
0x6000	0x01	Node Software Part Number	String	"XXXX-XXX-XXX_XX" (X: 0 to 9 or A to Z)	16 Bytes	26 Bytes	nvoSoftNbrVersion	nvo
		Node Software Version Number	String	"v.X.X.XXX" (X: 0 to 9)	10 Bytes			
0x6000	0x09	Bed Type	Enum	0-5	2 Bytes	4 Bytes	nvoBedType	nvo
		Zoom On	Bool (Bitfield :1)	True, False	1 Bit			
		8InchWheel	Bool (Bitfield :1)	True, False	1 Bit			
		Scale	Bool (Bitfield :1)	True, False	1 Bit			
		Bed Exit Single Zone	Bool (Bitfield :1)	True, False	1 Bit			
		Bed Exit Multi Zone	Bool (Bitfield :1)	True, False	1 Bit			
		Bed Status	Bool (Bitfield :1)	True, False	1 Bit			
		Short	Bool (Bitfield :1)	True, False	1 Bit			
		Scale Always On	Bool (Bitfield :1)	True, False	1 Bit			
0x6000	0x10	Bed Motion Lock LED (Dashboard)	Bitfield :2	0-2	2 Bits	6 Bytes	nvoBCFBLedsState	nvo
		Patient Control Lock LED (Dashboard)	Bitfield :2	0-2	2 Bits			
		Low Heigh LED (Dashboard)	Bitfield :2	0-2	2 Bits			
		Brake LED (Dashboard)	Bitfield :2	0-2	2 Bits			
		Bed Exit LED (Dashboard)	Bitfield :2	0-2	2 Bits			
		Bed Zero LED (Dashboard)	Bitfield :2	0-2	2 Bits			
		Side rail LED (Dashboard)	Bitfield :2	0-2	2 Bits			
		Bed Motion Lock Btn LED	Bitfield :2	0-2	2 Bits			
		Fowler 30 Lock Btn LED	Bitfield :2	0-2	2 Bits			
		Patient Control Fowler Lock Btn LED	Bitfield :2	0-2	2 Bits			
		Patient Control Gatch Lock Btn LED	Bitfield :2	0-2	2 Bits			
		Patient Control Bed Up/Down Lock Btn LED	Bitfield :2	0-2	2 Bits			
		Bed Down Btn LED (Not Used)	Bitfield :2	0-2	2 Bits			
		Cardiac Btn LED (Not Used)	Bitfield :2	0-2	2 Bits			
		CPR Btn LED (Not Used)	Bitfield :2	0-2	2 Bits			
		LBS Button LED (Not Used)	Bitfield :2	0-2	2 Bits			
		Scale Button LED (Not Used)	Bitfield :2	0-2	2 Bits			
		Bed Exit Small Zone LED	Bitfield :2	0-2	2 Bits			
Bed Exit Medium Zone LED	Bitfield :2	0-2	2 Bits					
Bed Exit Large Zone LED	Bitfield :2	0-2	2 Bits					



# MODULE 5: Data Flow Diagrams

Types of Models

Models & DFDs

DFD 'rules'

DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References

## CHOOSE YOUR MANAGEMENT ELEMENT FROM A REPRESENTATIVE SAMPLE.

- Inventory - a defined accumulation of a resource
- Activity - a timed effort to achieve a goal under single direction
- Transaction - a transfer of responsibility
- Budget - a comprehensive and specific plan for using resources
- Person - an individual
- Milestone - an important point in time

**Figure 2.1.8.2.a.** *What's your management element?*



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References

## Choosing a Management Element

- Management element is the entity you manage toward which your decision making efforts converge.
- Something in your domain is central to your decision making.





# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

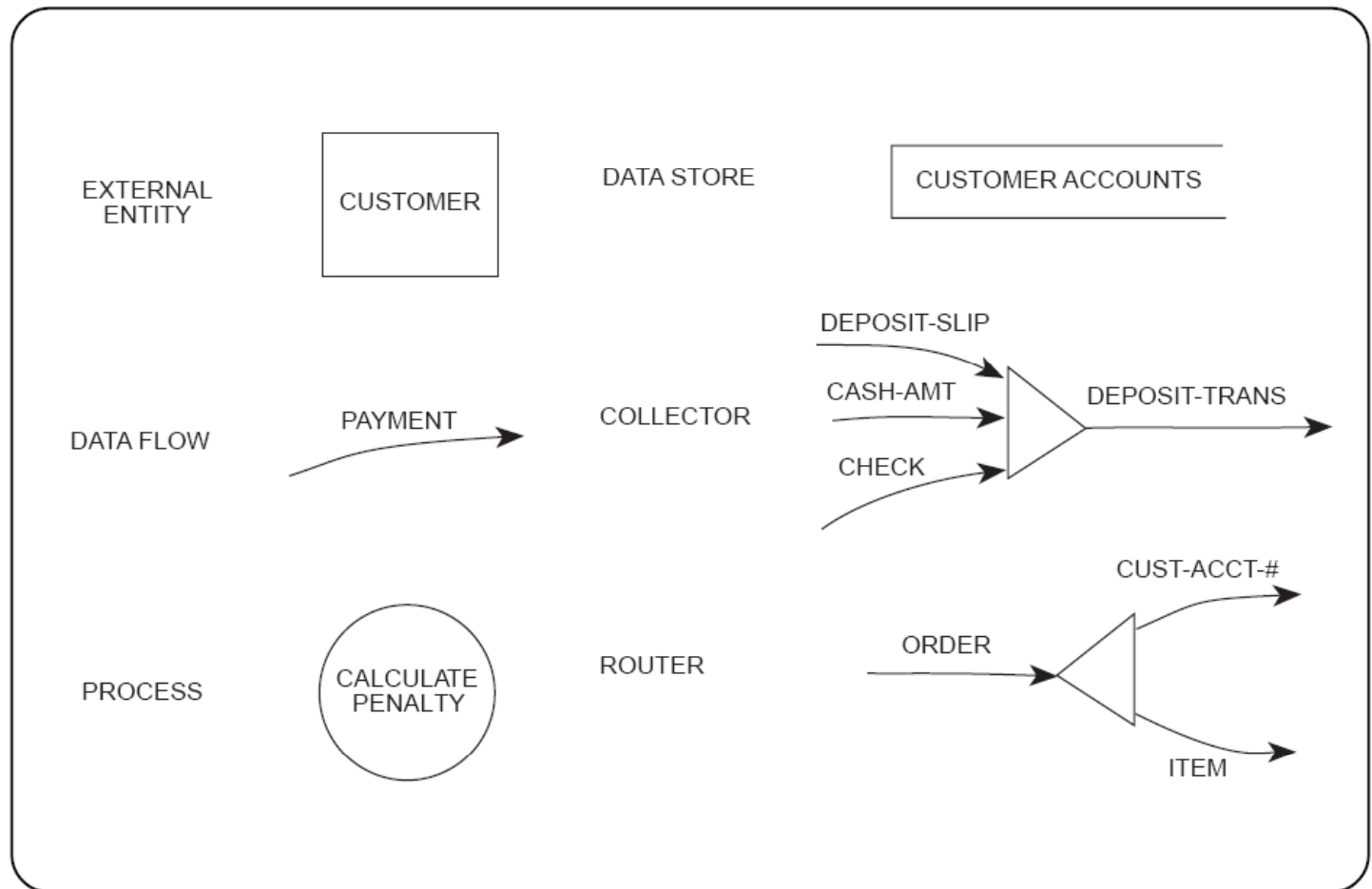
DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References



**Figure 2.1.5.1.a.** Data flow diagram symbols and meanings. (adapted from Powers, Adams, & Mills, p. 258)



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References

## Building Data Flow Diagrams

- Names should have meaningful descriptions.
  - Names for data flows should reflect the data composition.
  - Process bubbles should be named with strong verbs.
- **Warning: Problems in naming indicate lack of system understanding.**



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

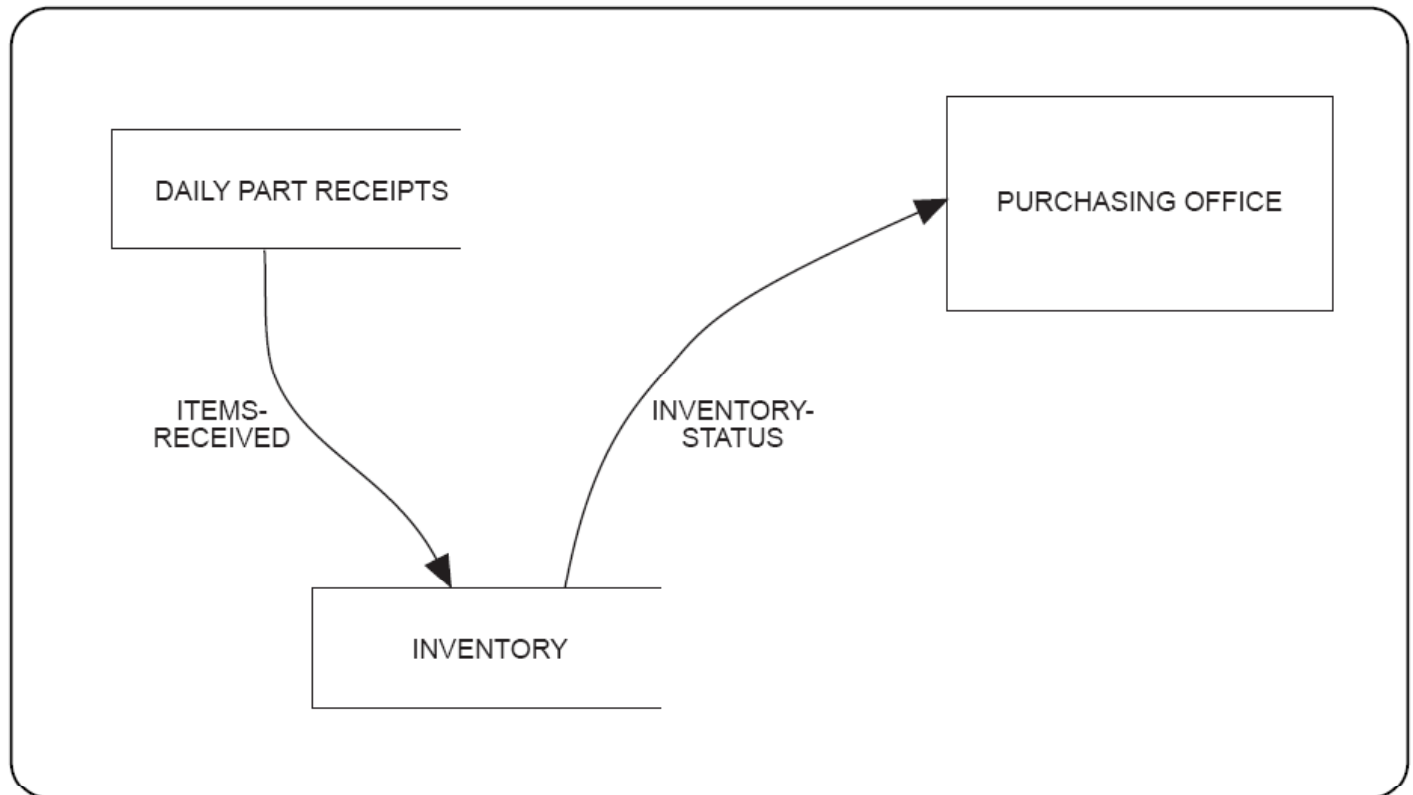
DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References



**Figure 2.1.6.2.a.** *This information flow diagram is incorrect because there are no processing ovals. (adapted from Powers, Adams, and Mills, p. 264)*



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

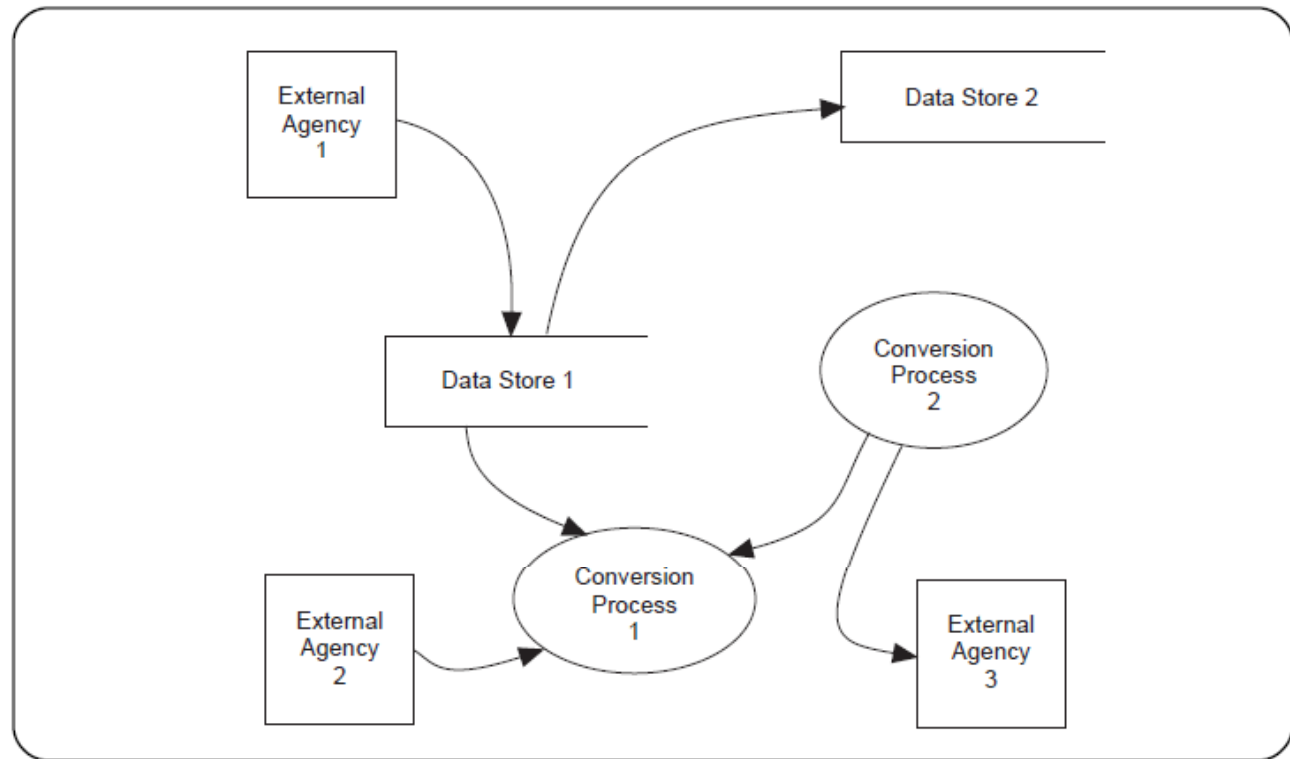
DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References



**Figure 2.1.6.2.c.** Can you find six errors in this information flow diagram? (adapted from Powers, Adams, & Mills, p. 268)



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

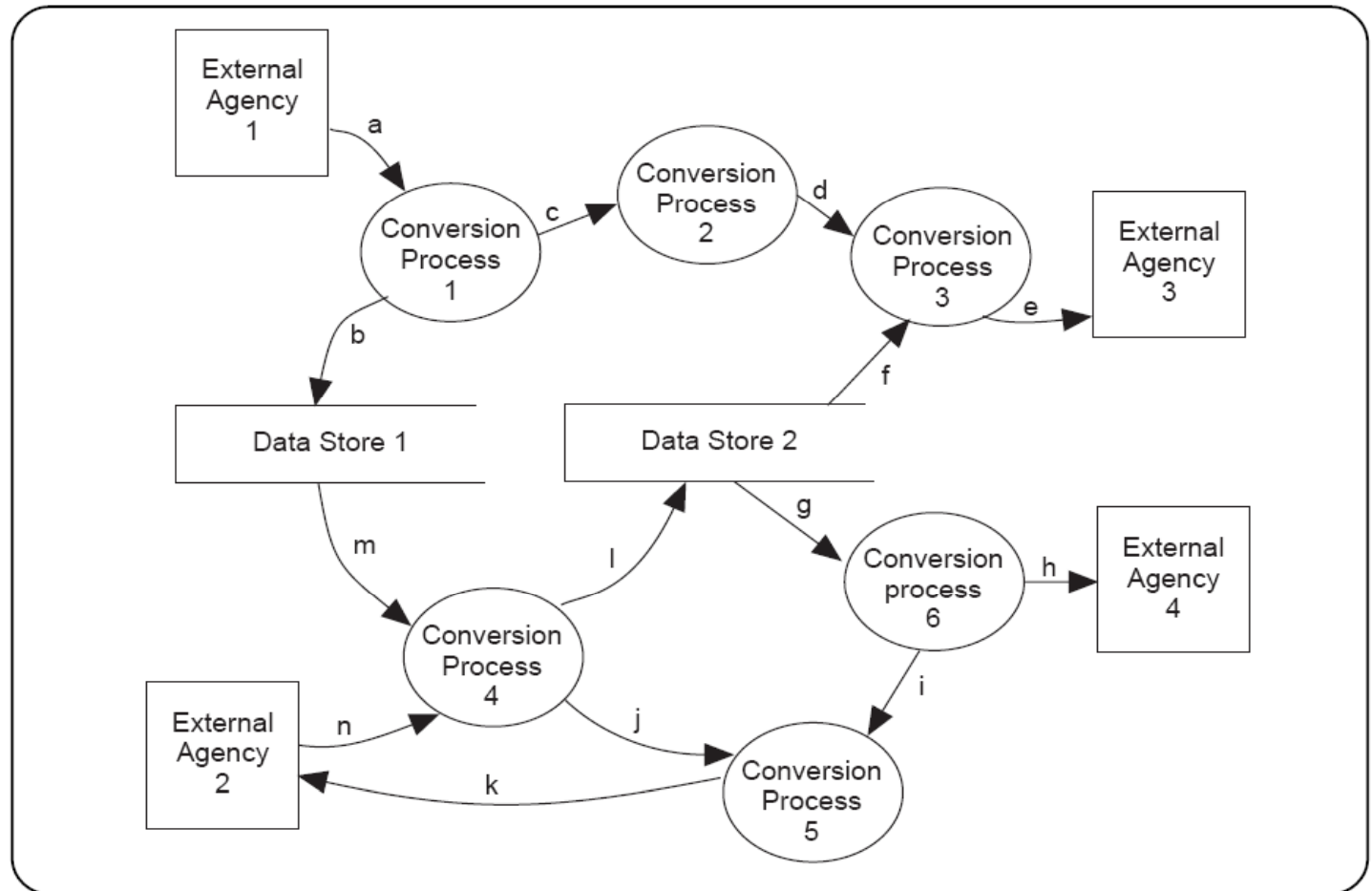
DFD Example 1: ATM Withdrawal

DFD Example 2: Ordering a Pizza

DFD Example 3: Ordering a book online

Creating Qualitative Measures

References



**Figure 2.1.6.2.d.** This level-1 information flow diagram represents a partitioned context diagram.



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

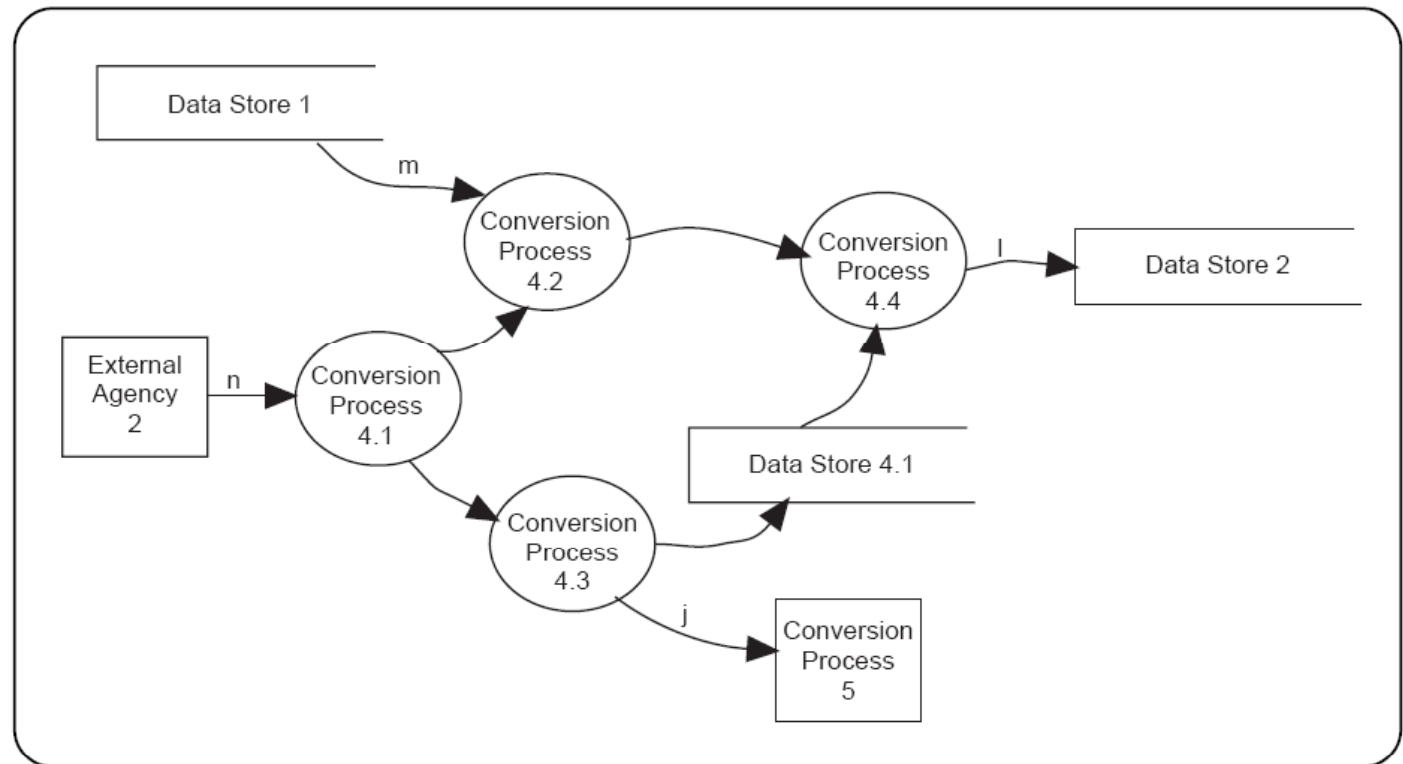
DFD Example 1: ATM Withdrawal

DFD Example 2: Ordering a Pizza

DFD Example 3: Ordering a book online

Creating Qualitative Measures

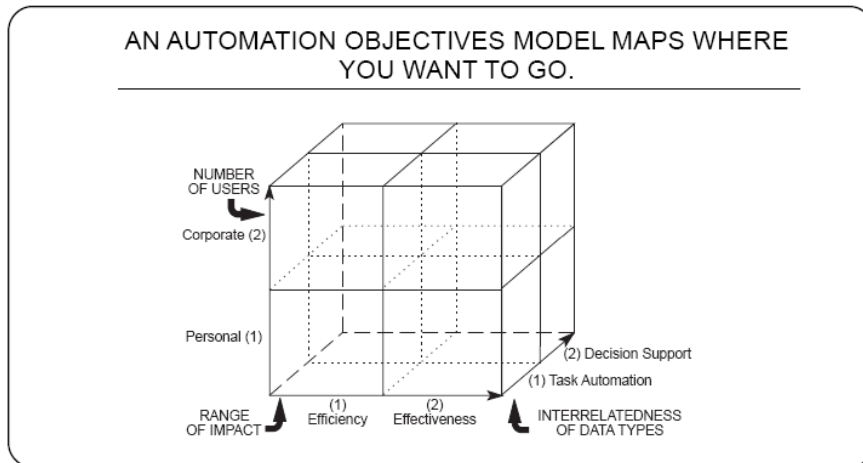
References



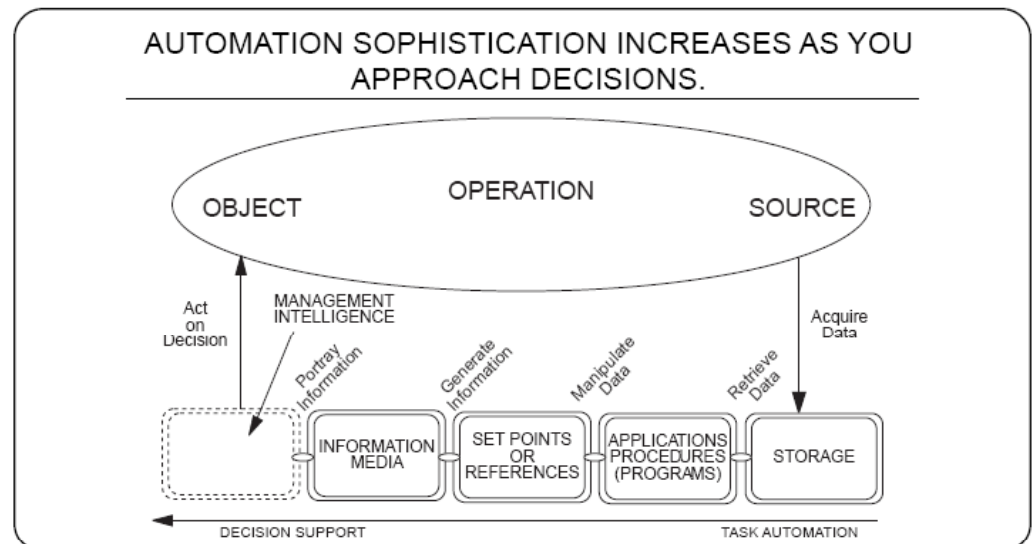
**Figure 2.1.6.2.e.** This level-2 information flow diagram shows the partitions for conversion process 4 shown in Figure 2.1.6.2.d.



# MODULE 5: Data Flow Diagrams



**Figure 2.1.9.4.1.** Use the automation objectives cube as a map to find out where you are, where you want to be, and how to get there from here.



**Figure 2.1.9.4.2.** We can see the progression from task automation to decision support on the data-to-information chain



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References

## Data Flow Diagram (DFD) Exercise: “ATM CASH WITHDRAWAL”

*Create a data flow diagram  
(level 0 and level 1) for a user  
withdrawing money from an  
ATM*





# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References

## Data Flow Diagram (DFD) Exercise: “Ordering a Pizza”

*Create a data flow diagram  
for ordering a pizza over the  
phone for delivery.*



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References

## Data Flow Diagram (DFD) Exercise: “Ordering a Book Online”

*Create a data flow diagram  
for ordering a book online.*



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References

## Evaluating

- To experience something is to evaluate it.
- Product/service
- Program
- Personnel

Where do you find good evaluation information?



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

References

## Making Quantitative Measures – Presidential Debates

### 1. Message

Look for a concise message with no more than three points per topic. Use of stories to illustrate key points is a plus.

#### **Deductions:**

Long-winded or rambling answers.  
Obvious gaffes, such as misstating a well-known fact.

### 2. Speech Pattern

Listen for natural rhythm and pacing.

#### **Deductions:**

Awkward pauses and filler, such as “ummm.”

### 3. Tone of Voice

Listen for passion and confidence without arrogance.

#### **Deductions:**

Monotone voice that expresses no passion.  
Angry tone that comes off as a rant or bluster.  
Rising pitch at the end of sentences.



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM Withdrawal

DFD Example 2: Ordering a Pizza

DFD Example 3: Ordering a book online

Creating Qualitative Measures

References

## Using a Balanced Scorecard

[Software / EE / ATD] Balanced Scorecard				
	Scorecard Measures	Jan	Feb	Mar
Financial	(EE / SW / ATD Expense) / Shipment \$	0.363%	0.357%	0.357%
	EE / SW / ATD Budget (+/-)	\$ 16,608	\$ 26,198	\$ 20,030
	10323:ACTUAL	\$ 110,321	\$ 99,480	\$ 109,811
	10323: BUDGET	\$ 126,929	\$ 125,678	\$ 129,841
	10323: Projection	\$ 126,929	\$ 113,250	\$ 109,300
	10323: Prior Year Actual	\$ 97,757	\$ 106,442	\$ 130,925
	10323: EE / SW / ATD % GROWTH	11.4%	-7.0%	-19.2%
	Monthly Shipments	\$ 30,362,000	\$ 27,893,000	\$ 30,744,000
	Cost Savings from EE / SW / ATD Projects (350k)	\$ -	\$ -	\$ -
	(EE / SW / ATD Hds / Division Hds) <= 1.5%	1.10%	1.12%	1.20%
	EE Heads:	8	8	8
	SW / ATD Heads:	5	5	6
	EE / SW / ATD Total Heads:	13	13	14
Kzoo total heads:	1,178	1,165	1,165	
DHF Audit Findings	0	0	0	
Customers	Open EE/SW/ATD PEPRs <=25	23	19	25
	Oldest EE/SW/ATD PEPRs < 300 days	319	244	272
People	1 Innovation / Training event for EE / SW / ATD per month	0	1	1
	1 Employee of the Month / Meeting Winners from [EE / SW / ATD]	0	0	0
	1 'Special' Engagement event conducted per month	0	1	1
Technical Execution	TBD			
	TBD			
	TBD			
	TBD			



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM Withdrawal

DFD Example 2: Ordering a Pizza

DFD Example 3: Ordering a book online

Creating Qualitative Measures

References

## GUIDE TO PERFORMANCE APPRAISAL

Performance Factors	Excellent (1 out of 15)	Very Good (3 out of 15)	Good (8 out of 15)	Fair (2 out of 15)	Unsatisfactory (1 out of 15)
	Far Exceeds Job Requirements	Exceeds Job Requirements	Meets Job Requirements	Needs Some Improvement	Does Not Meet Minimum Standards
Quality	Leaps tall buildings with a single bound	Must take running start to leap over tall building	Can only leap over a short building or medium one without spires	Crashes into building	Cannot recognize buildings
Timeliness	Is faster than a speeding bullet	Is as fast as a speeding bullet	Not quite as fast as a speeding bullet	Would you believe a slow bullet?	Wounds himself with the bullet
Initiative	Is stronger than a locomotive	Is stronger than a bull elephant	Is stronger than a bull	Shoots the bull	Smells like a bull
Adaptability	Walks on water consistently	Walks on water in emergencies	Washes with water	Drinks water	Passes water in emergencies
Communications	Talks with God	Talks with angels	Talks to himself	Argues with himself	Loses the argument with himself



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM Withdrawal

DFD Example 2: Ordering a Pizza

DFD Example 3: Ordering a book online

Creating Qualitative Measures

References

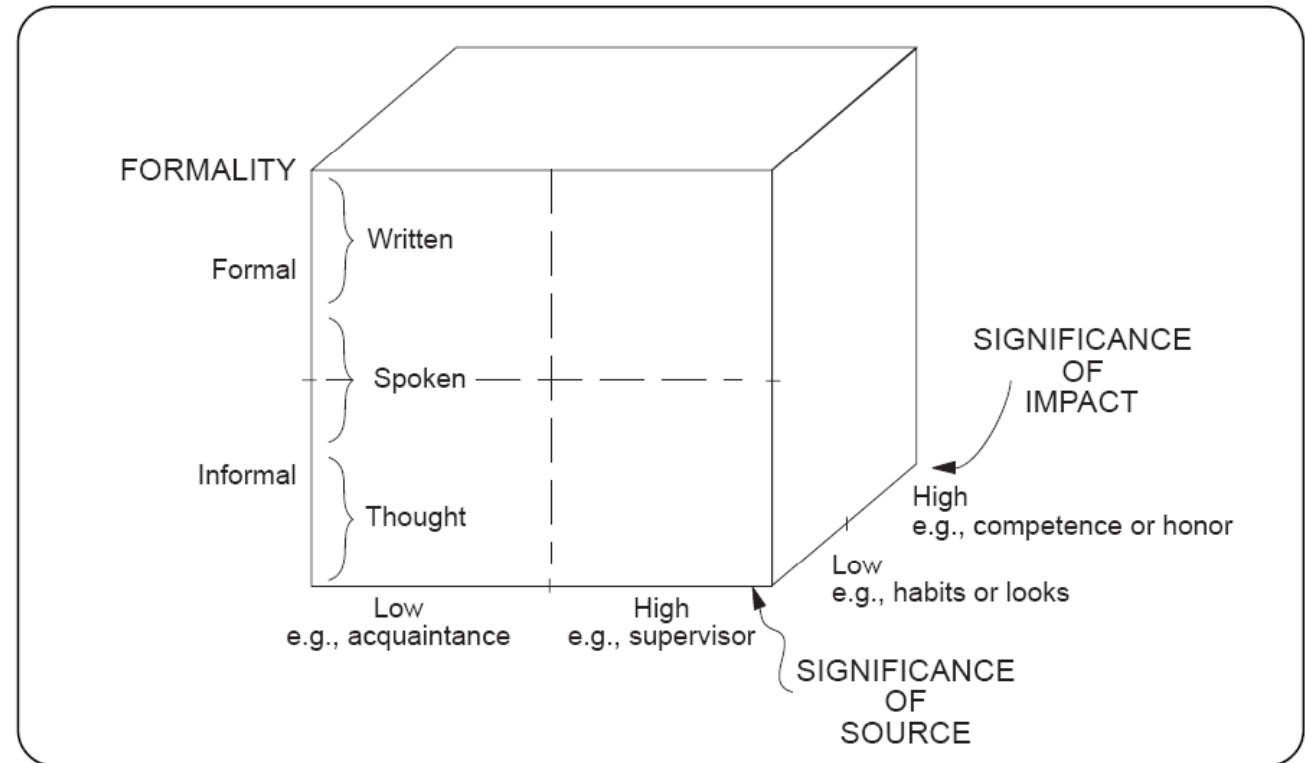
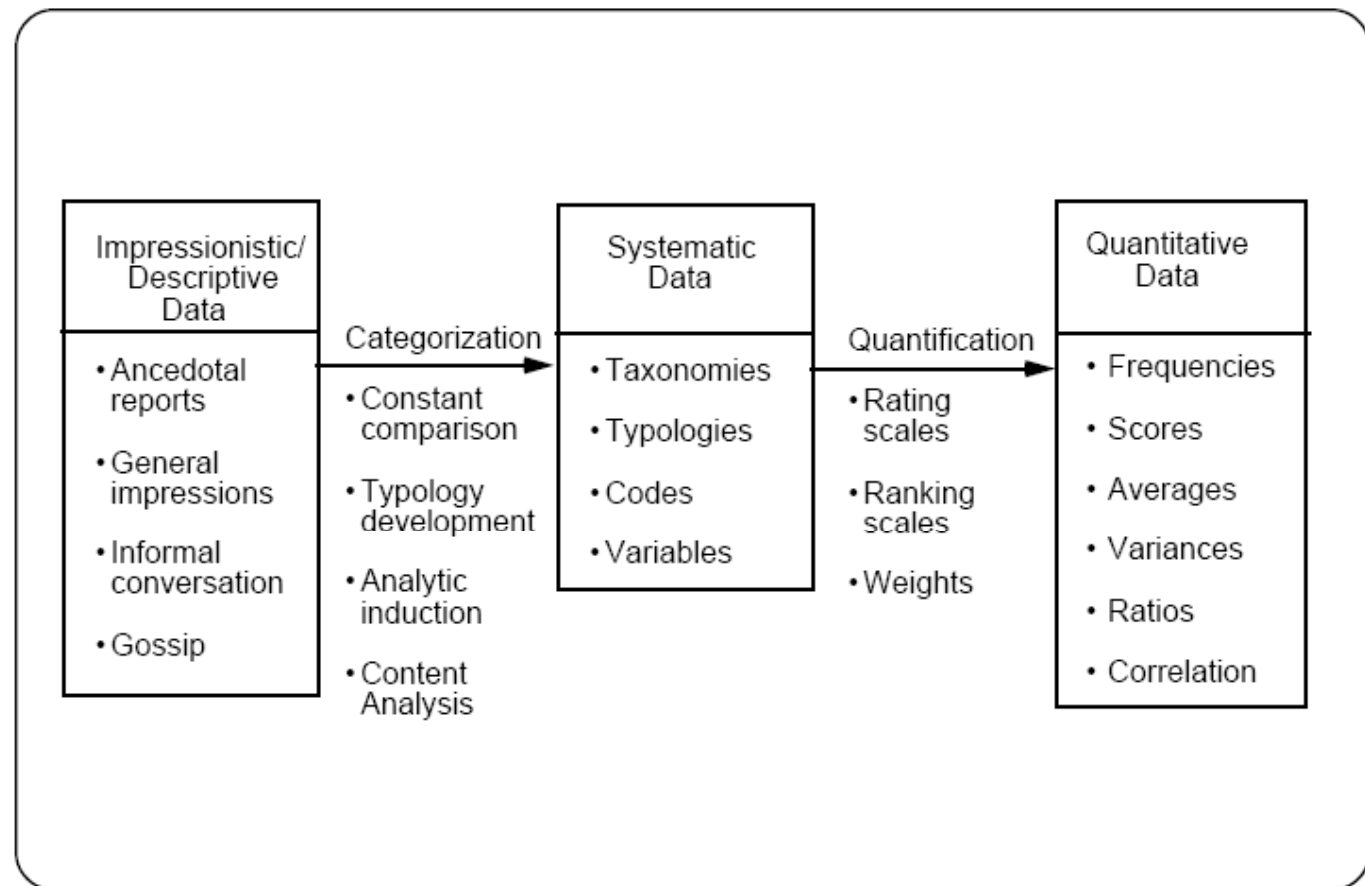


Figure 2.1.10.3.c. Three factors influence the effect of evaluation.



# MODULE 5: Data Flow Diagrams

## Qualitative vs. Quantitative Measures



**Figure 2.1.10.8.** *Qualitative data can be reduced to quantitative data.*





# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM Withdrawal

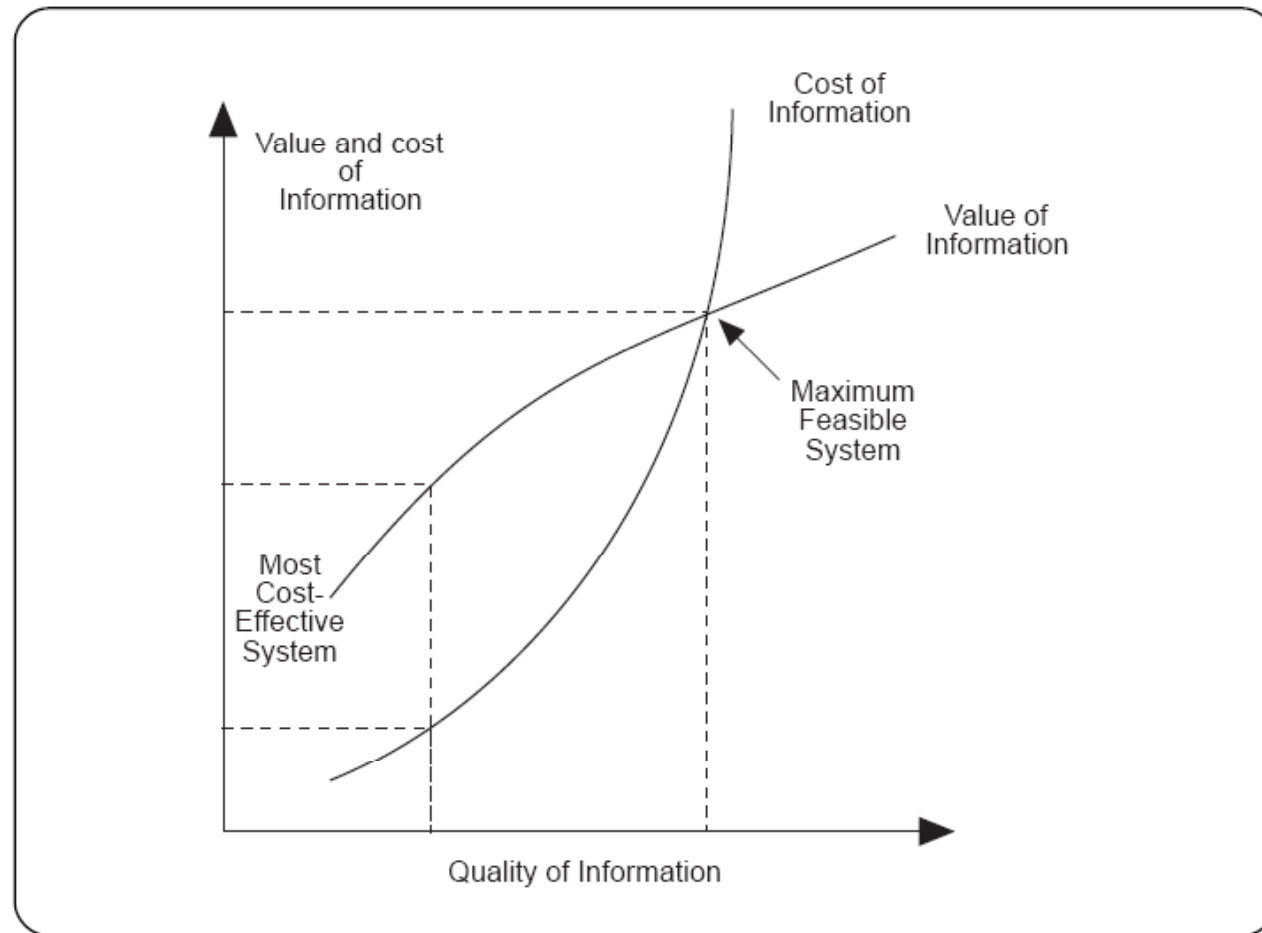
DFD Example 2: Ordering a Pizza

DFD Example 3: Ordering a book online

Creating Qualitative Measures

References

## ROI – Cost of Information



**Figure 2.1.10.6.** *The optimum, most cost-effective system produces the most favorable ratio of information value to information cost.*



# MODULE 5: Data Flow Diagrams

Types of Models

Models and DFDs

DFD 'rules'

DFD Example 1: ATM  
Withdrawal

DFD Example 2: Ordering  
a Pizza

DFD Example 3: Ordering  
a book online

Creating Qualitative  
Measures

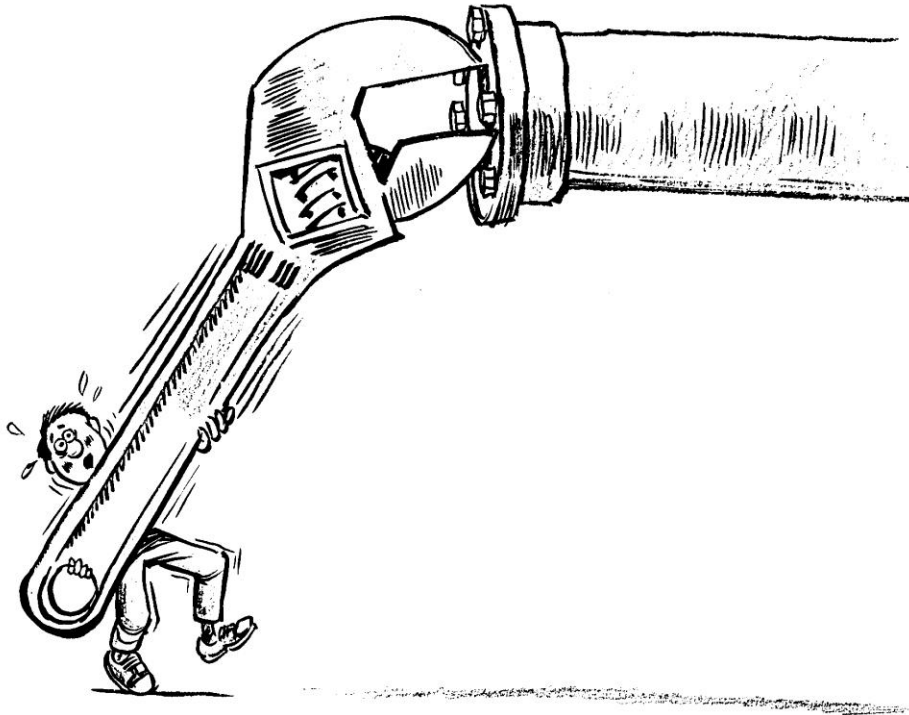
References

## Types of Benefits

- Economic value
- Intangible
- Improved decision making
- Advance business objectives
- Satisfy its users



# MODULE 6: Building Management Tools

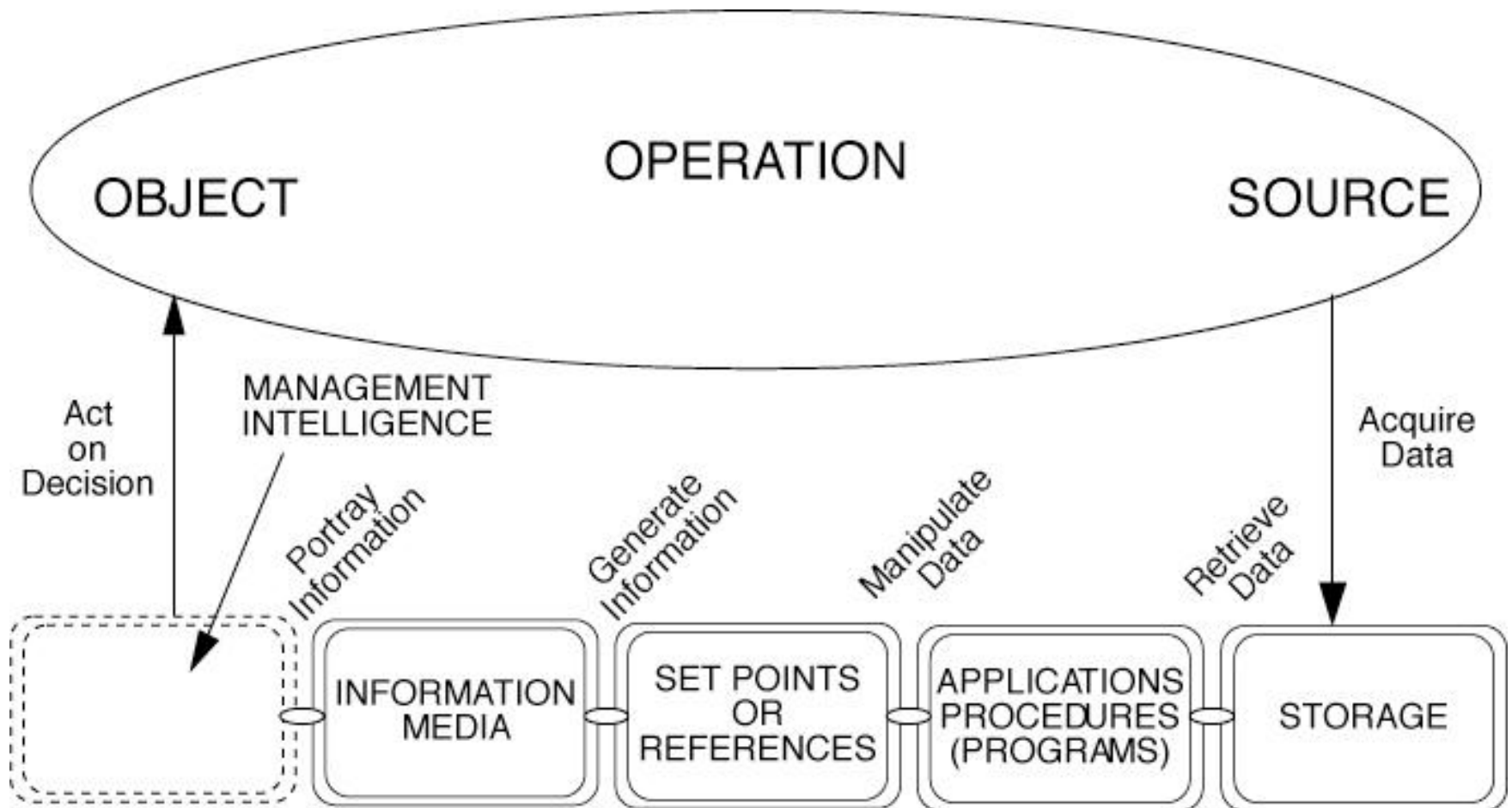


## BUILDING MANAGEMENT TOOLS



# MODULE 6: Building Management Tools

The Data-to-Information Chain Biases Data to Provide Information.



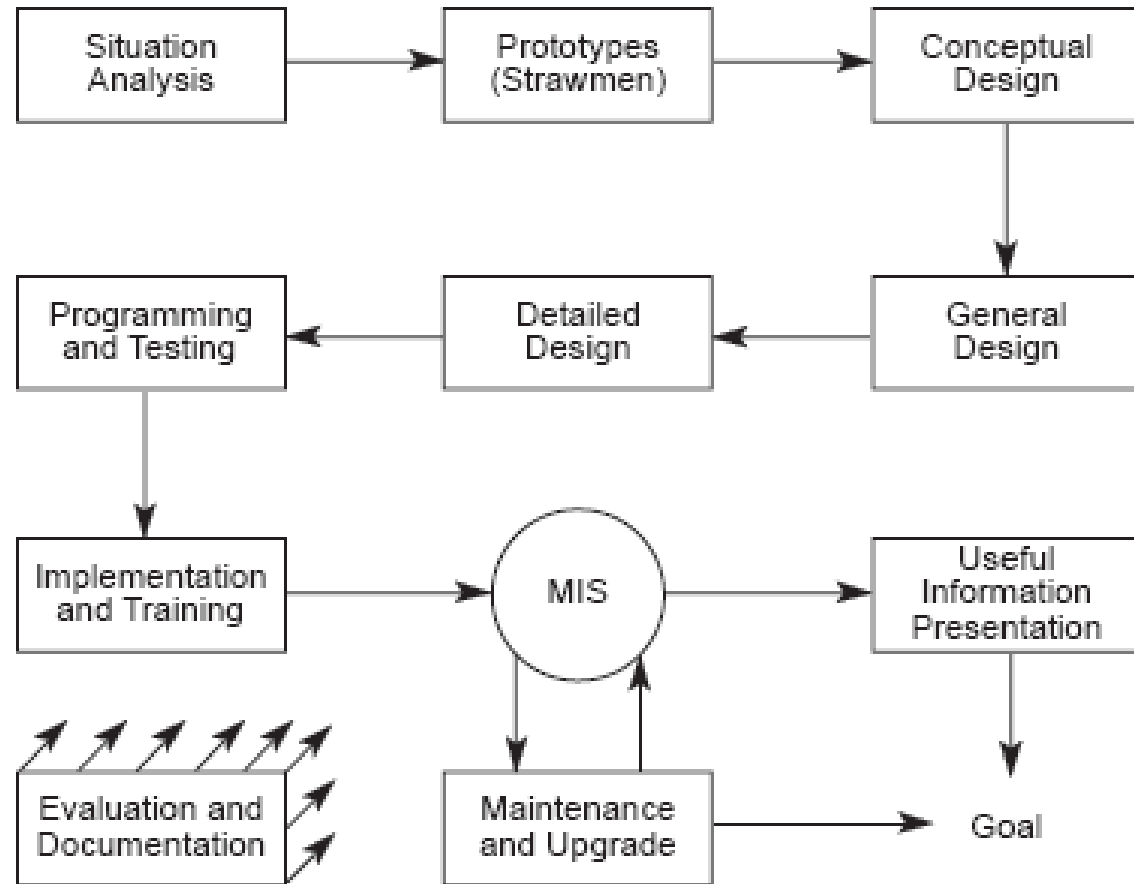
# MODULE 6: Building Management Tools

Building Management Tools

Project Management Tools

Emergency Management Tools

## Process Flow Diagram for Building Management Tools



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Nine Steps for Building Tools

- Situation Analysis
- Prototypes
- Conceptual Design
- General Design
- Detailed Design
- Programming / Testing
- Implementation / Training
- MIS
- Useful Information Presentation



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Analysis Stage

- Situation Analysis
- Prototype Development
- Conceptual Design



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Design Stage

- General Design
- Detailed Design
- Programming and Testing





# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Implementation Stage

- Implementation and Training
- Useful Information Presentation
- Maintenance and Upgrade

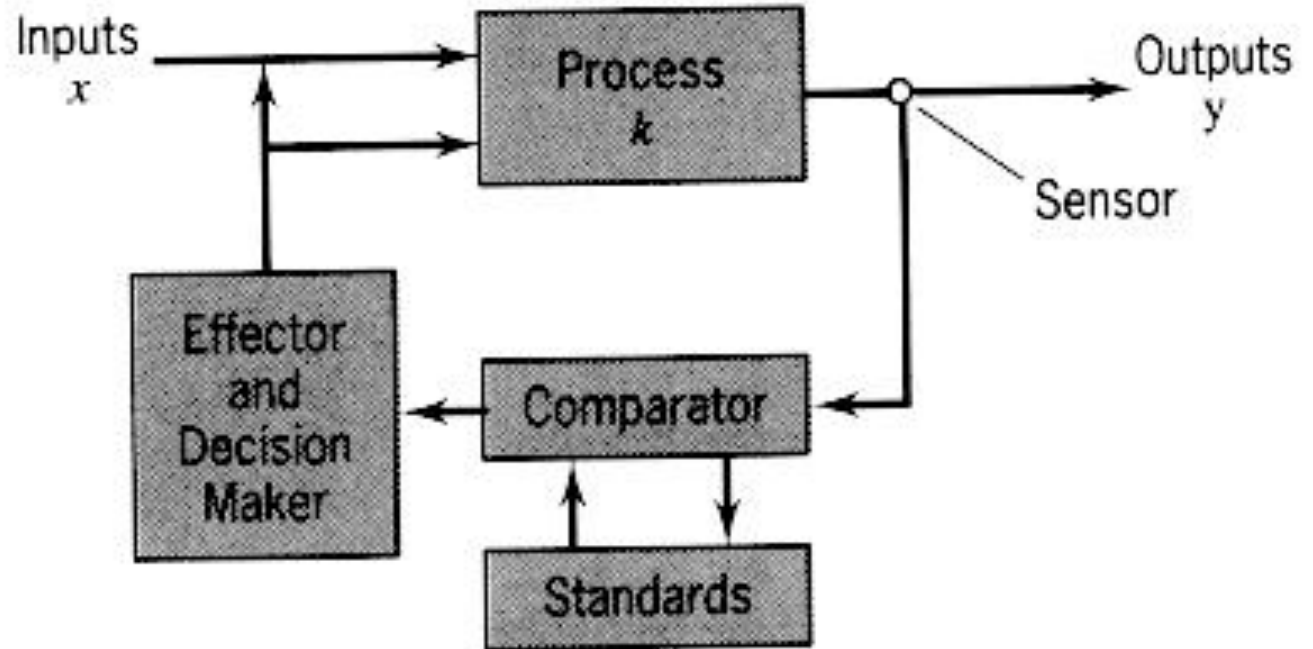


# MODULE 6: Building Management Tools

Building Management Tools

Project Management Tools

Emergency Management Tools



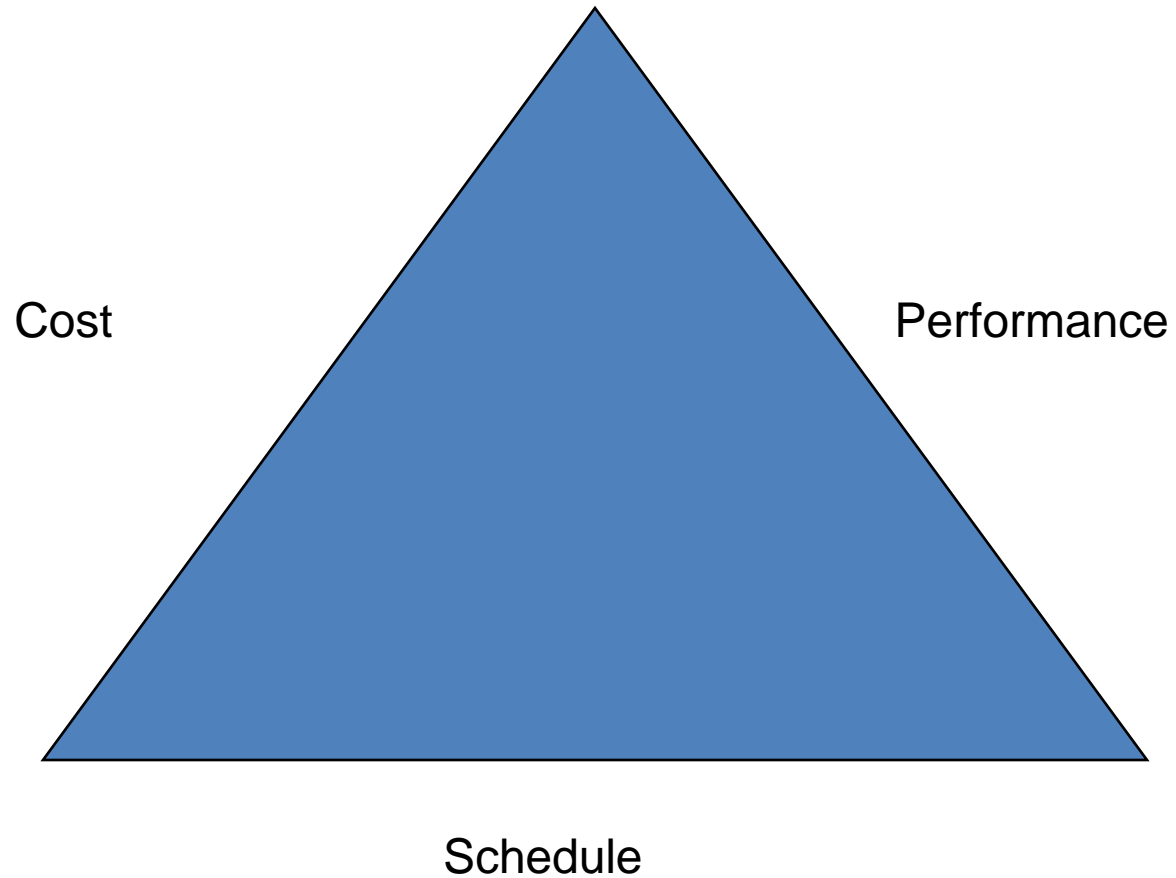
# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Project Managers Manage Cost, Schedule, and Performance



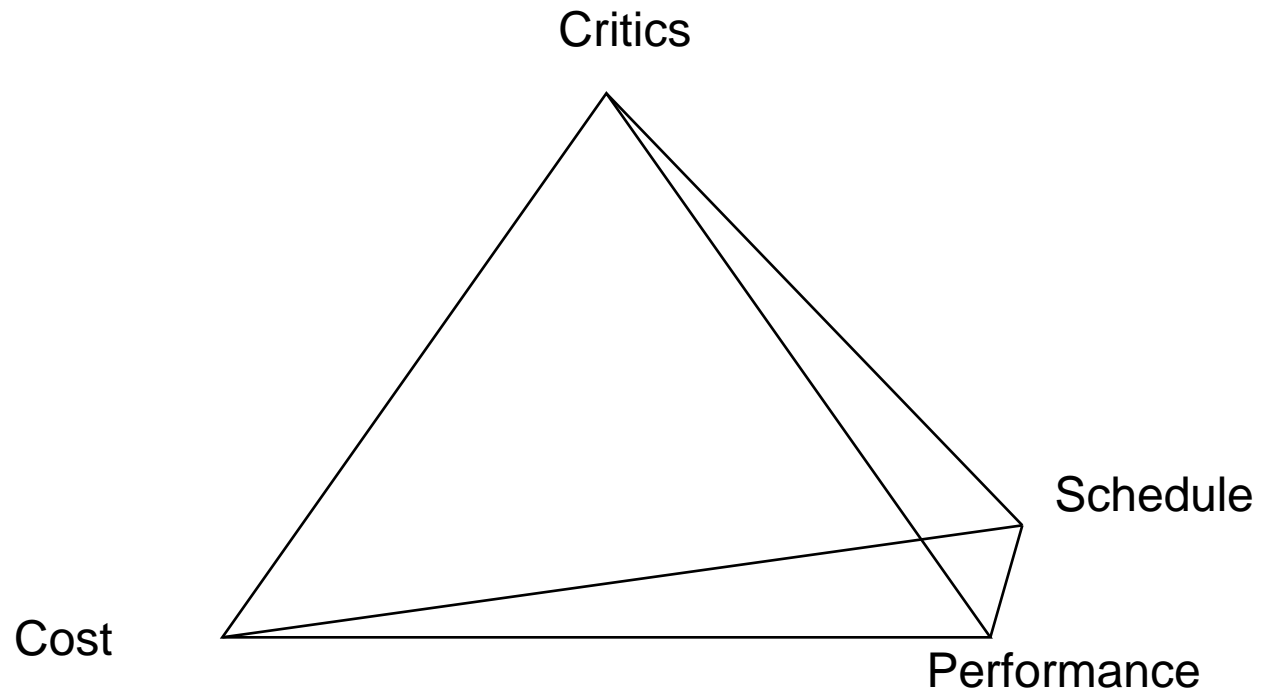
# MODULE 6: Building Management Tools

Building Management Tools

Project Management Tools

Emergency Management Tools

## But Critics Turn the Triangle into a Pyramid



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## A Project is:

- is a one-time activity with a defined objective
- has an associated schedule or due date
- has an established budget.



# MODULE 6: Building Management Tools

Building Management Tools

Project Management Tools

Emergency Management Tools

## Five Pursuits Range for Uncertain to Certain

### Uncertainty



- Perplexity - Can specify neither the start nor the end.
- Problem - Can specify the start but not the end.
- Program - Know the start and have qualitative fix on the end.
- Project - Know the start and have specifications for the end.
- Process - Repeatedly achieve the same known end.



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Projects have Distinct Characteristics

- Interdependencies
- Uniqueness
- Life cycle
- Conflict
- Defined purpose



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Advantages of the Project Approach

- Better defined scope or objectives
- Better results orientation
- Better control
- Shorter development time
- Lower costs
- Higher quality or reliability
- Better organizational coordination
  - *pooled knowledge, communications*
- Better morale & participation





# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Disadvantages of the Project Approach

### More organizational complexity and confusion

- Actions may violate organizational policies
- Overplanning
- Increased conflict



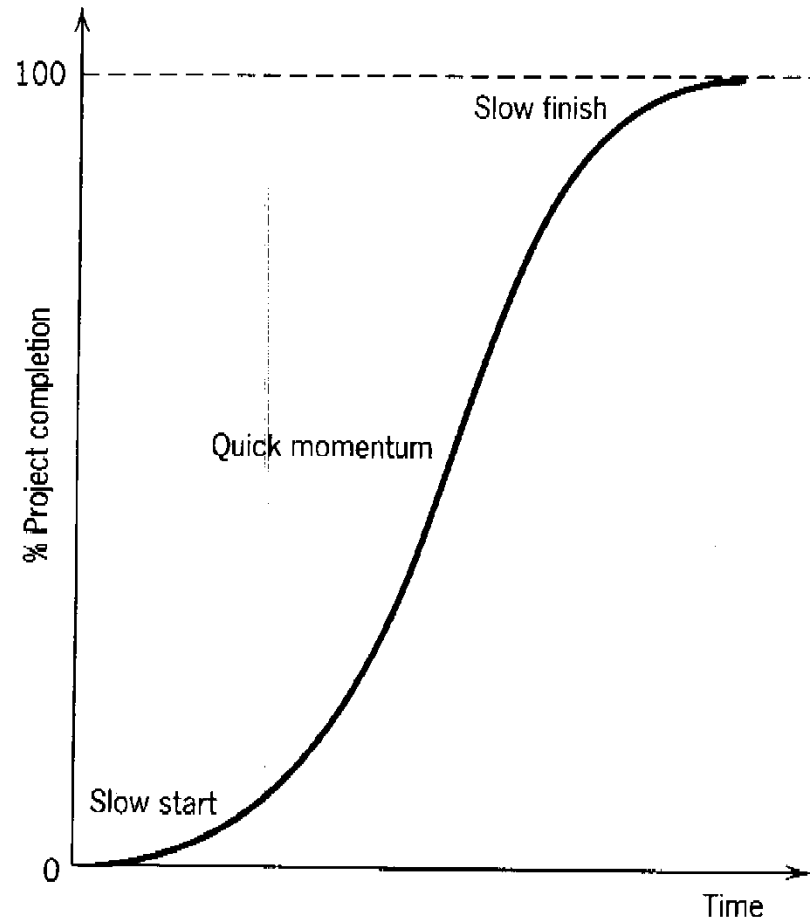
# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Project Life Cycle



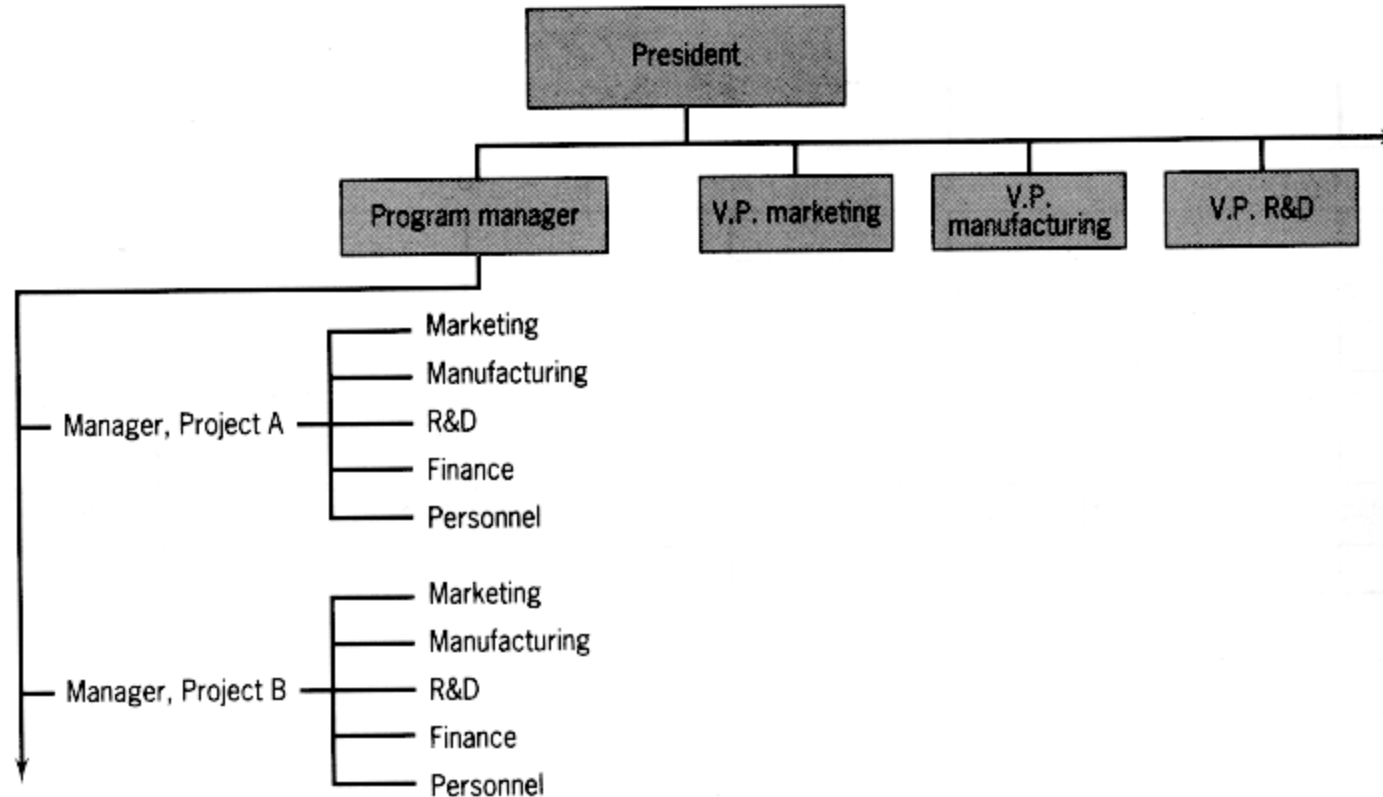
# MODULE 6: Building Management Tools

Building Management Tools

Project Management Tools

Emergency Management Tools

## Pure Project Organization



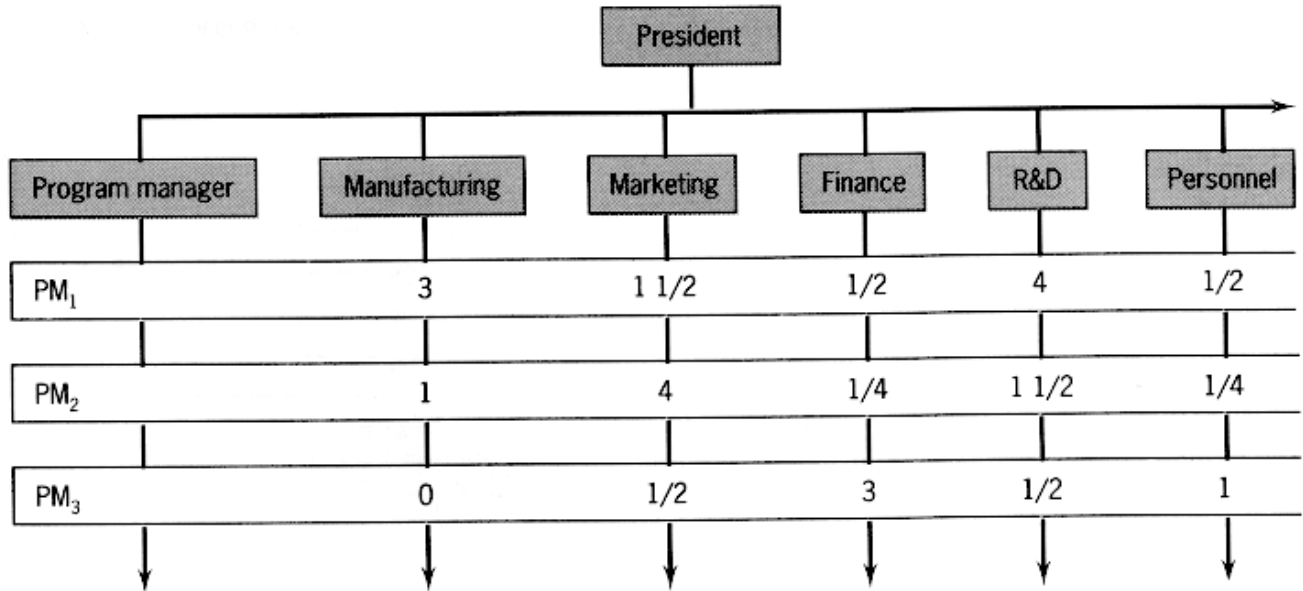
# MODULE 6: Building Management Tools

Building Management Tools

Project Management Tools

Emergency Management Tools

## Project Assignments

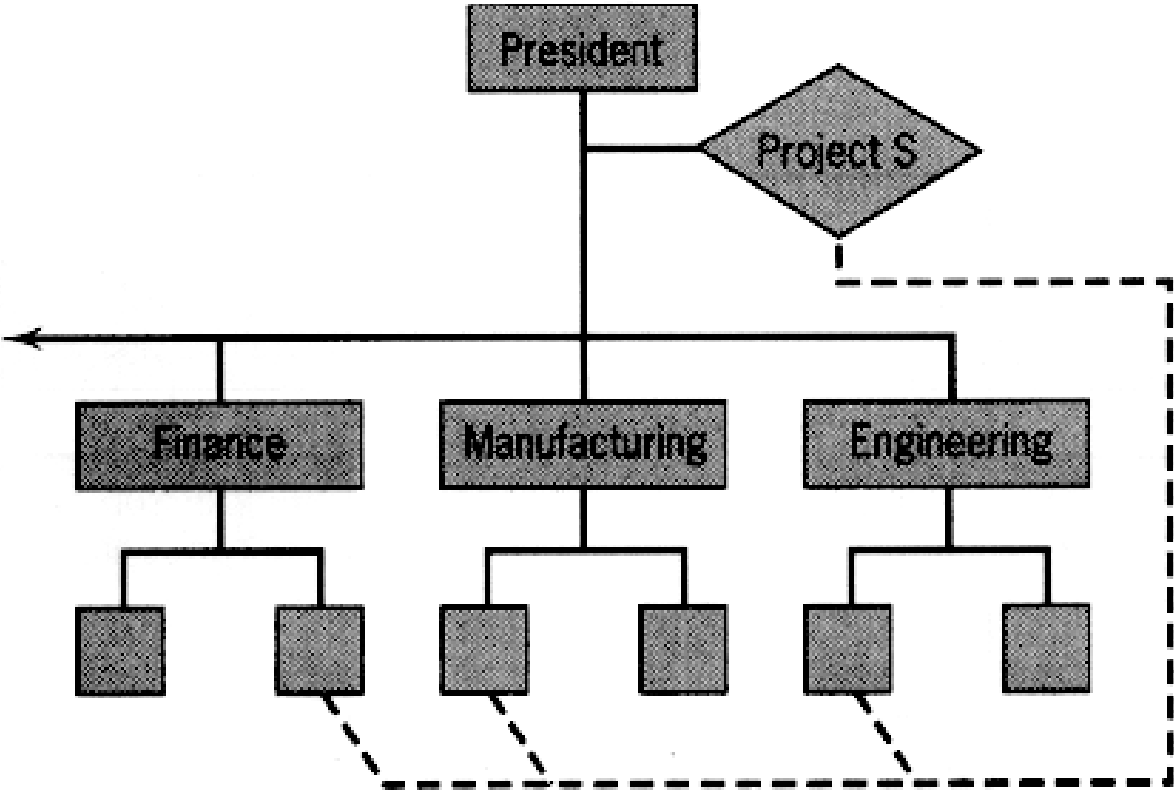


# MODULE 6: Building Management Tools

Building Management Tools

Project Management Tools

Emergency Management Tools



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Writing the Project Objective

- OBJECT-ive--should be physical (object)
- Specific & clear
- Measurable
- Achievable
- Buy-in from stakeholders



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Let's Practice Writing the Project Objective

- New Chicago skyscraper
- Alternative fuel vehicle
- Your projects



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Work Breakdown Structure

- Group tasks logically into activities
- Identify subtasks
- Develop identifiers for tasks
- Develop tree diagram or outline format





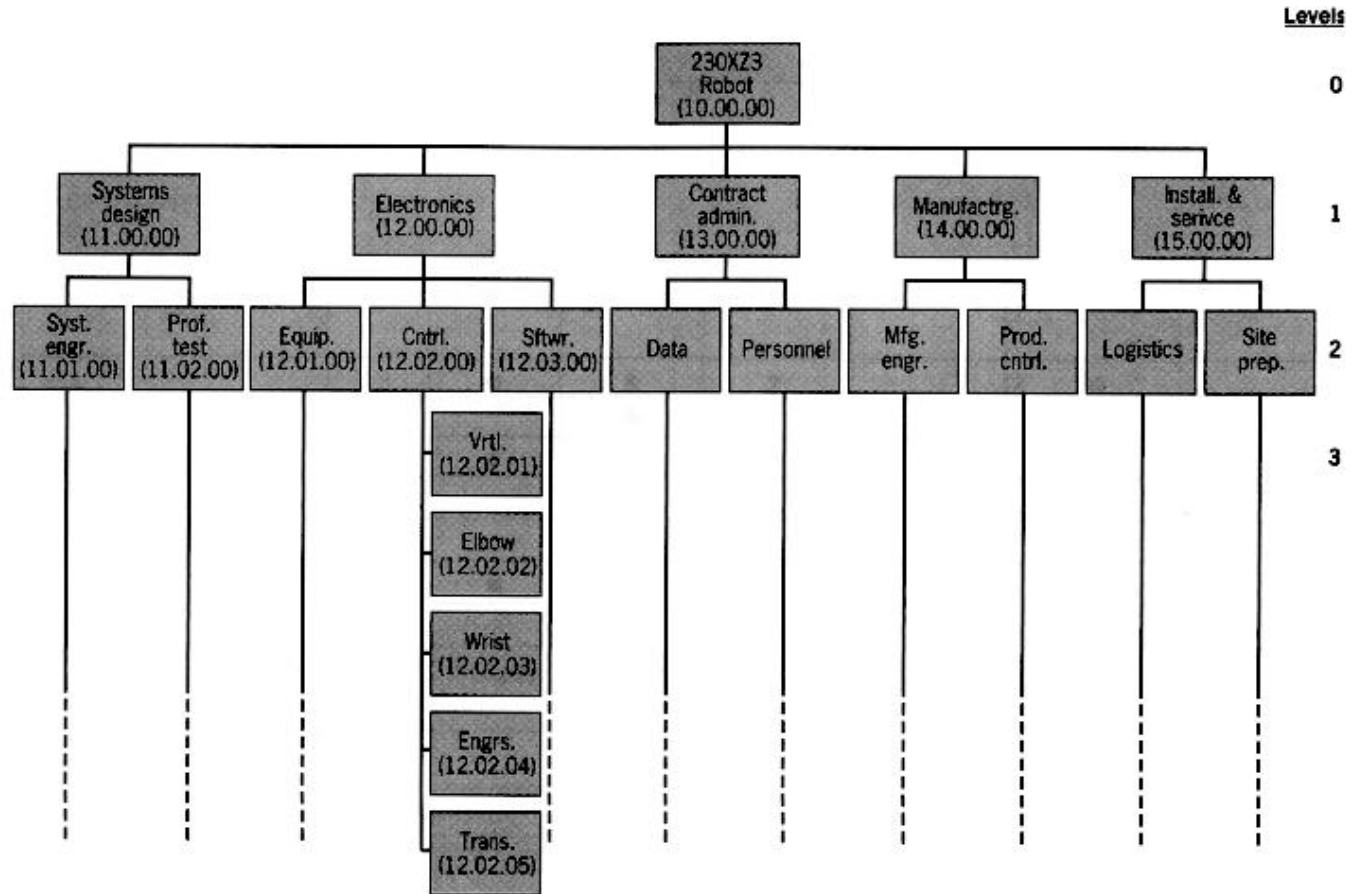
# MODULE 6: Building Management Tools

Building Management Tools

Project Management Tools

Emergency Management Tools

## Work Breakdown Structure



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Responsibility Matrix

- Identify task responsibility
- Identify participation level
- Identify required approvals



# MODULE 6: Building Management Tools

Building Management Tools

Project Management Tools

Emergency Management Tools

## Linear Responsibility Chart

WBS		Responsibility					
		Project Office				Field Oper.	
Subproject	Task	Project Manager	Contract Admin.	Project Eng.	Industrial Eng.	Field Manager	
Determine Need	A1	○		●	▲		
	A2	■	○	▲	●		
Solicit Quotations	B1	○	■	▲		●	
Write Approp. Request	C1	■	▲	○	●		
	C2		●	○	▲		
	C3	●	■	▲		■	
"	"						
"	"						
"	"						

Legend:

- ▲ Responsible
- Support
- Notification
- Approval



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Resources used in a Project

- Time
- Labor
- Equipment and facilities
- Money/cash flow



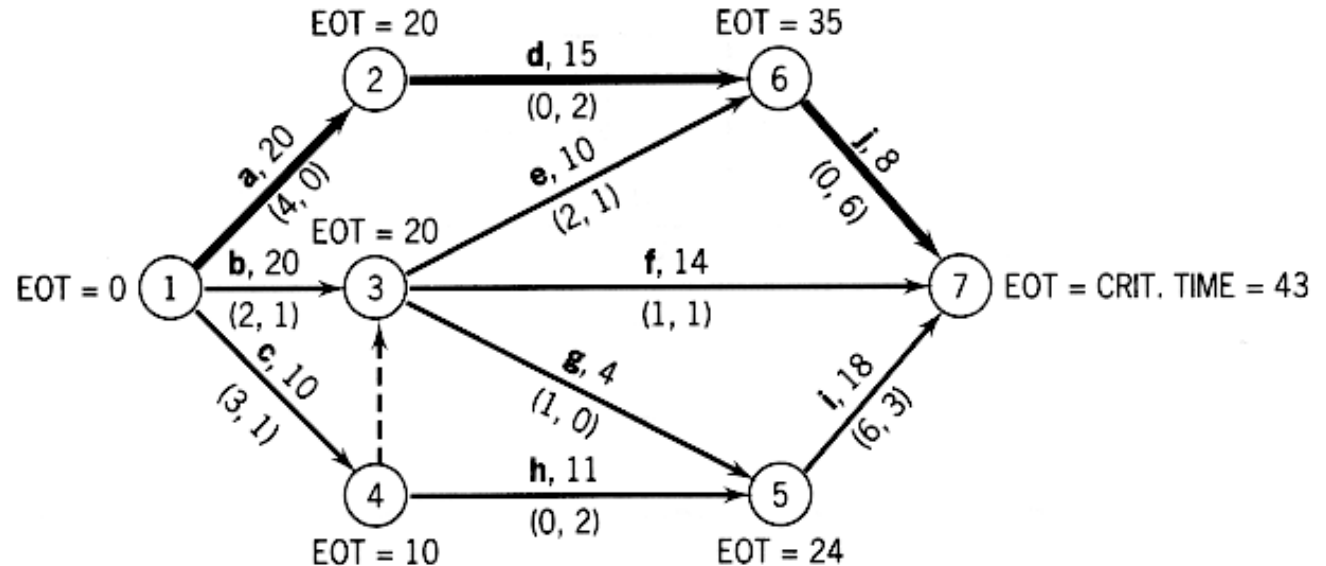
# MODULE 6: Building Management Tools

Building Management Tools

Project Management Tools

Emergency Management Tools

## Network Diagram



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Critical Path Method

**Table 9-1** An Example of CPM

Activity	Precedence	Duration, Periods (normal, crash)	Cost (normal, crash)
a	–	3,2	\$ 40,80
b	a	2,1	20,80
c	a	2,2	20,20
d	a	4,1	30,120
e	b	3,1	10,80



# MODULE 6: Building Management Tools

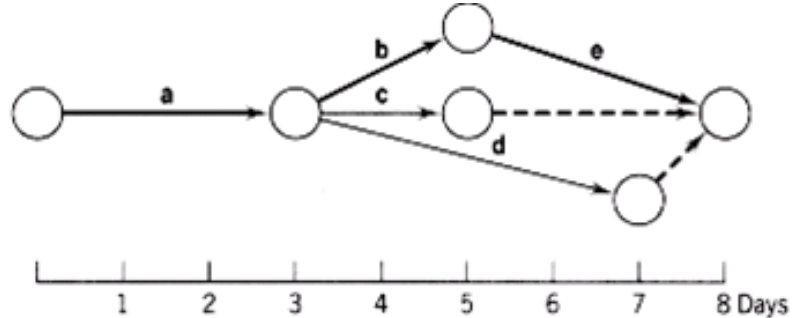
## Critical Path Examples

Building Management Tools

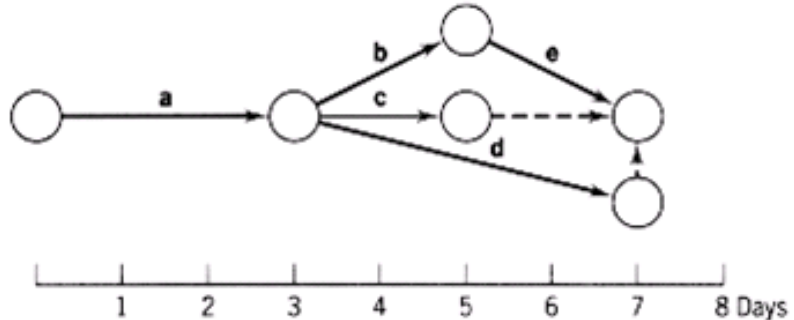
Project Management Tools

Emergency Management Tools

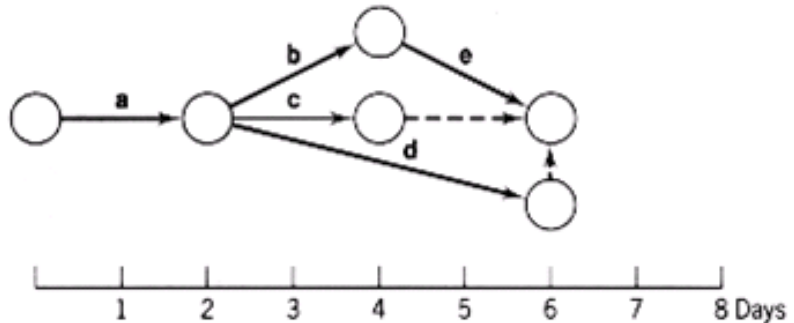
a. Normal Schedule  
8 Days, \$120



b. 7-Day Schedule,  
\$155



c. 6-Day Schedule,  
\$195



# MODULE 6: Building Management Tools

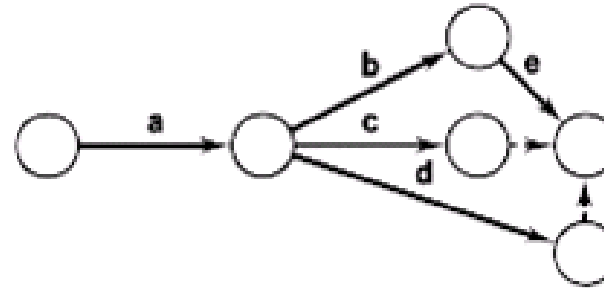
## Critical Path Examples

Building Management Tools

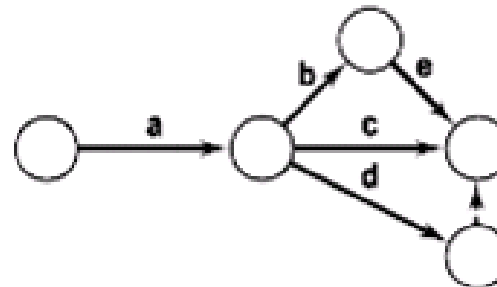
Project Management Tools

Emergency Management Tools

d. 5-Day Schedule,  
\$260



e. 4-Day Schedule,  
\$350





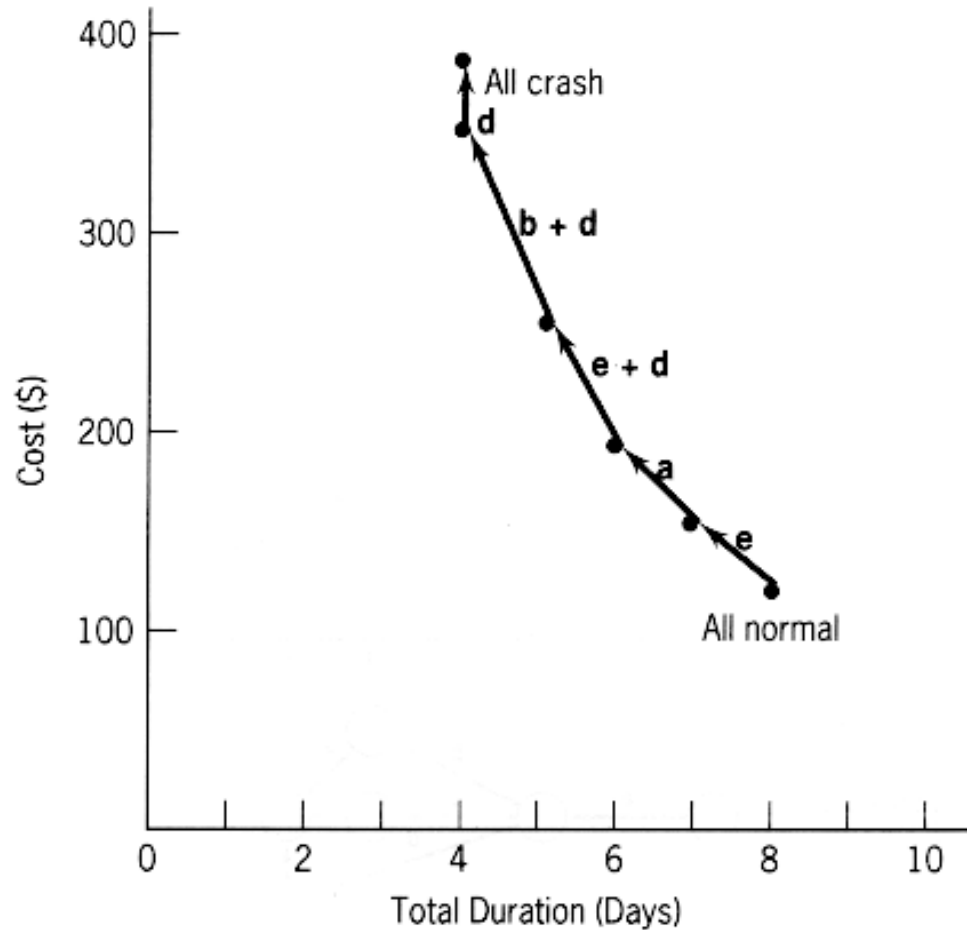
# MODULE 6: Building Management Tools

## Critical Path Examples

Building Management Tools

Project Management Tools

Emergency Management Tools



# MODULE 6: Building Management Tools

## Summary of Tool Outputs

- Tools
  - Risk analysis
  - Contingency plan
  - Logic charts
  - Tabletops
- Outputs
  - Id risks
  - Steps to take based on identified risks
  - Specific steps to take in a crisis
  - Rehearse, discuss, and solidify a specific emergency response

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools



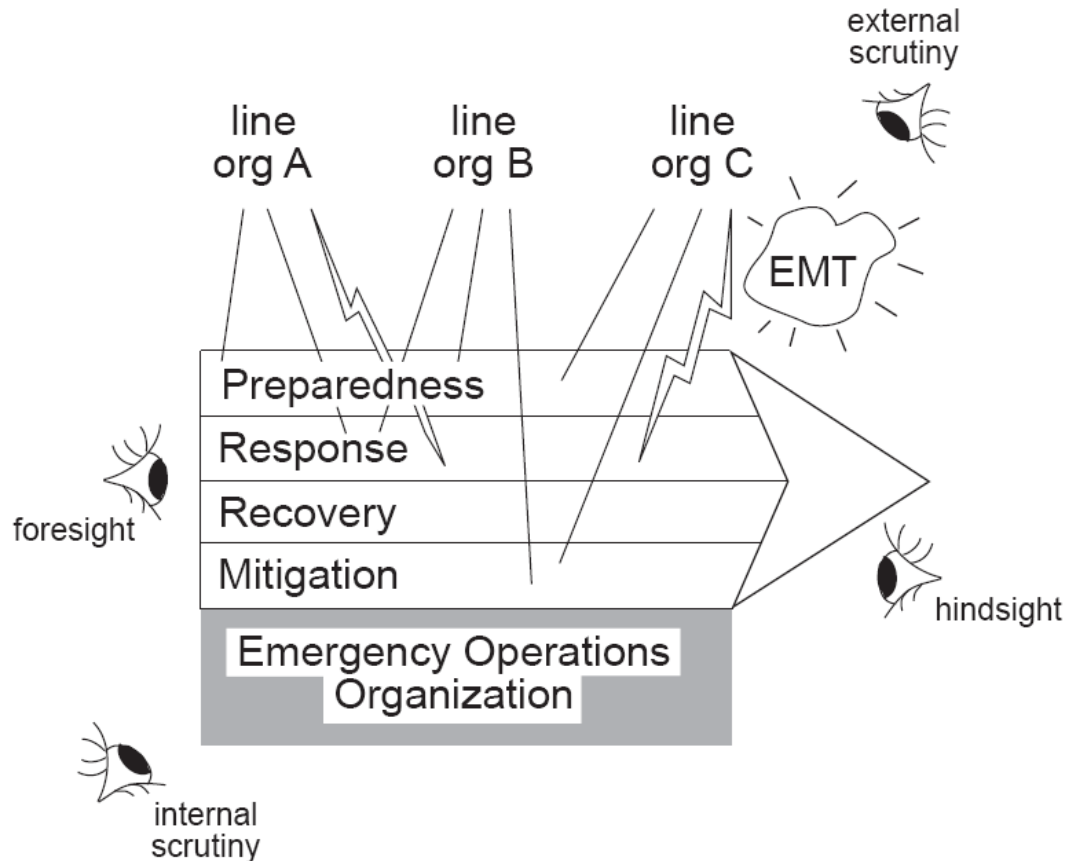
# MODULE 6: Building Management Tools

## Emergency Management

Building Management Tools

Project Management Tools

Emergency Management Tools



# MODULE 6: Building Management Tools

## Tools Aimed at Perplexities

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools



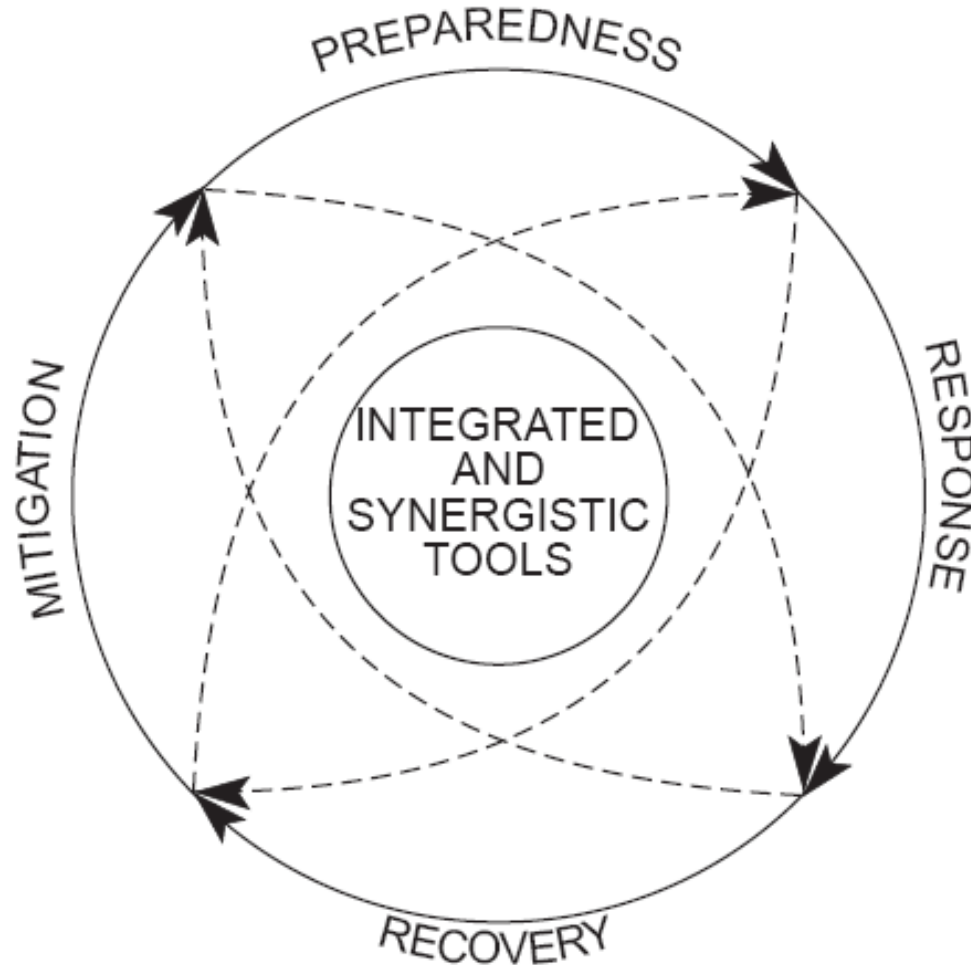
# MODULE 6: Building Management Tools

## Four Activities of Emergency Management

Building Management Tools

Project Management Tools

Emergency Management Tools



# MODULE 6: Building Management Tools

## Pursuits Framework

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools



# MODULE 6: Building Management Tools

Building Management  
Tools

Project Management Tools

Emergency Management  
Tools

## Management of Risks

- How should we do this?
- J&J lost their way
- Toyota
- BP oil spill
- Wall St. & Main St.

