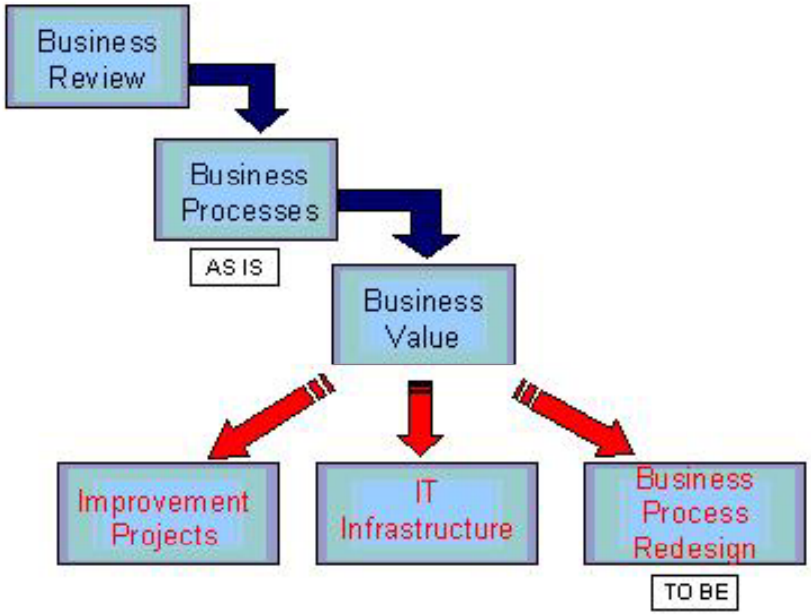
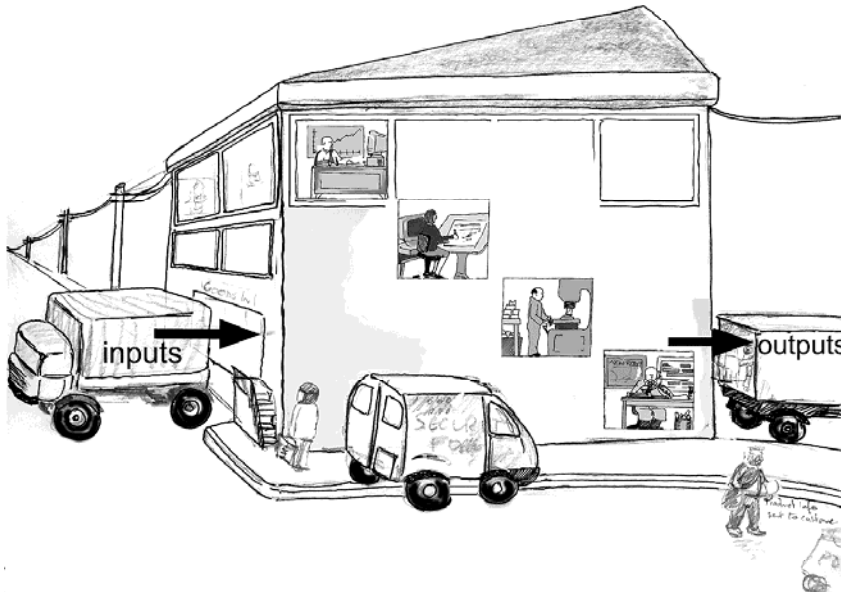
Business Process Reengineering





Dr. Lotfi K. Gaafar

The American University in Cairo

Course Objective

The objective of this course is to provide attendees with technical knowledge and practical training on the methodology and tools used for process reengineering. Attendees will gain an appreciation of the wide benefits of reengineering and learn how to achieve them through practical training and discussions of real case studies.

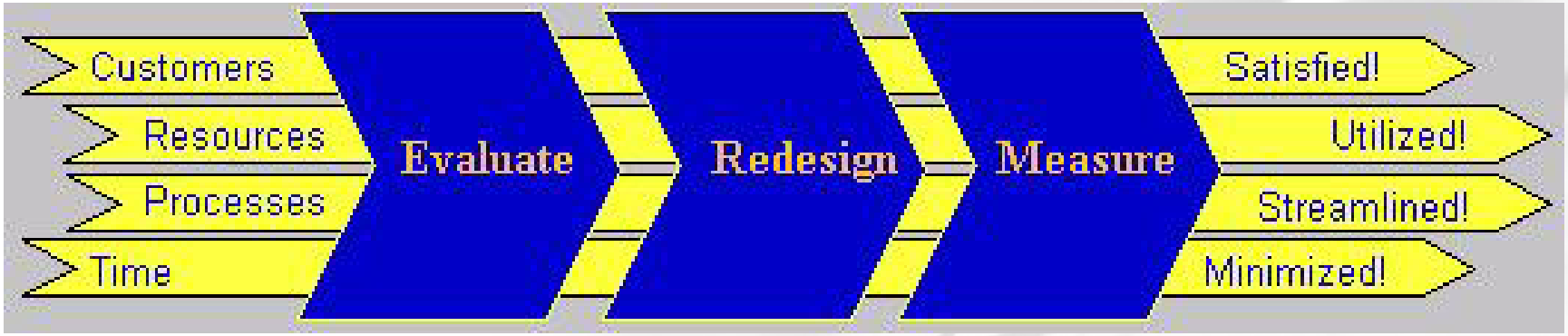
Course Outline

- Overview of BPR
- Process Engineering: The Origin
- Evolution to BPR
- BPR Basics
- Methodology
- Case Studies
- Success Factors

BPR Defined

Business Process Reengineering (BPR) is the fundamental rethinking and **radical** redesign of business **processes** to achieve dramatic performance improvements

The key emphasis is on the ***radical*** redesign of business processes



BPR - The Language

Radical: Break away from out-dated, patched, obsolete arrangements and practices of work.

Fundamental Re-design: generate new, deeply penetrating, best-way methods. Changing the way work is done.

Process: Re-design core activities cross-functionally, break-down departmentalism. Departments are structures which after all - merely solutions to past organizational problems. They are not fixed for ever.

Dramatic: Don’t just make incremental or marginal improvements. Find breakthroughs in performance in terms of cost, quality, service, and time-compression.

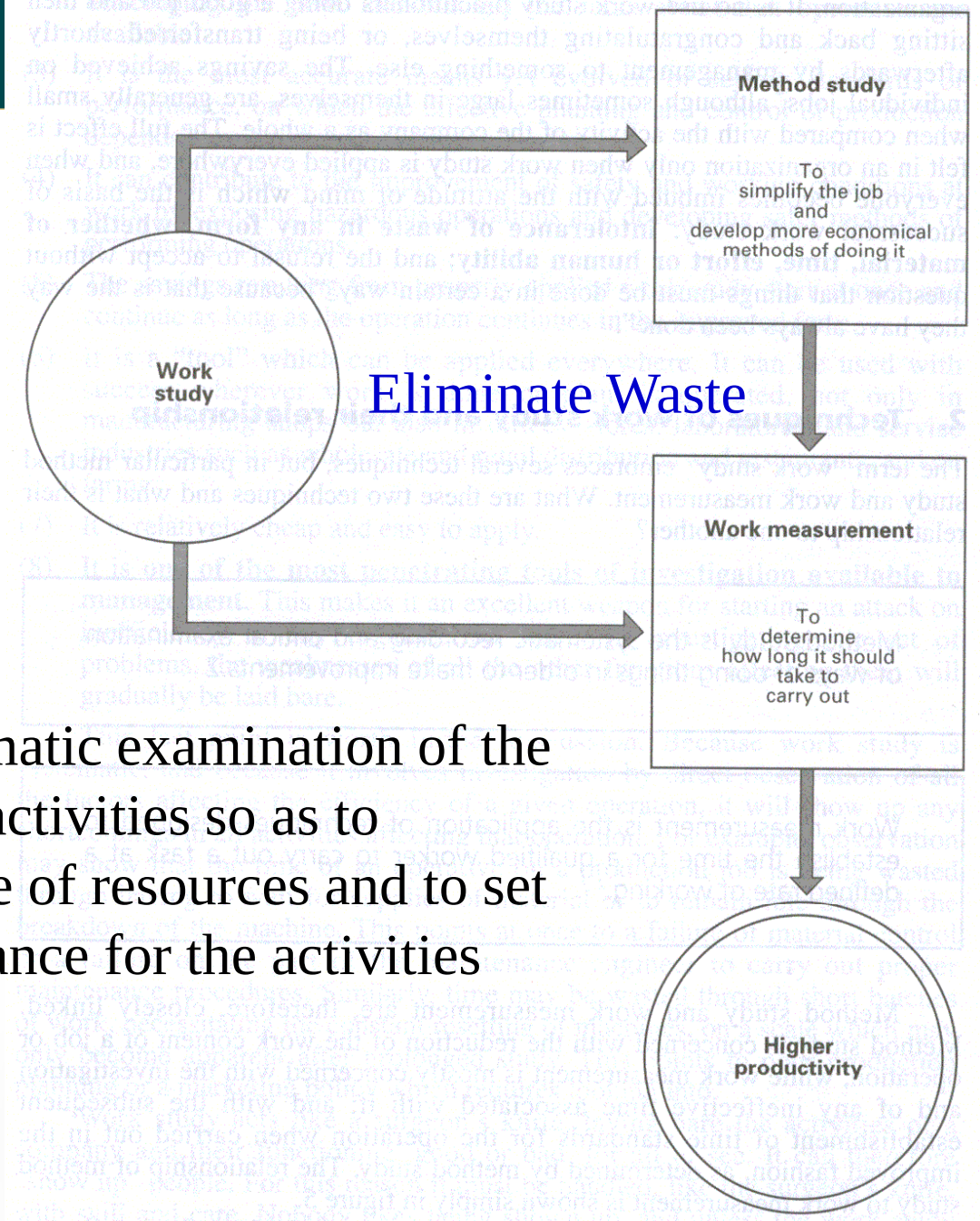
What is a business process?

- Hammer and Champy: ‘a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer’
- Davenport and Short: ‘a set of logically related tasks performed to achieve a defined business outcome’.
- Example: Order fulfilment is a business process. It takes an order as its input and results in the delivery of goods to a customer. The delivery of goods into a customers hands is the value that this process creates.

Process Engineering: The Origin

Work Study

Work Study



Work Study is the systematic examination of the methods of carrying on activities so as to improve the effective use of resources and to set up standards of performance for the activities being carried out.

Method Study

Method study examines the way a task (changing the clutch on a car, preparing a flower bed for planting, cleaning a hotel room) is done. The industrial engineer has an eye on operational efficiencies and costs, quality of processes, service reliability, staff safety etc. Method study techniques are applicable from factory/workshop manufacturing to cabin crew activities on an international flight and office clerical work.

A collection of techniques used to examine work - what is done and how it is done - so that there is systematic analysis of all the elements, factors, resources and relationships affecting the efficiency and effectiveness of the work being studied.

Work Measurement

Work measurement provides management with a means of measuring the time taken in the performance of an operation or a series of operations in such a way that ineffective time is shown up and can be separated from effective time.

Work measurement is the application of techniques designed to establish the time for a qualified worker to carry out a task at a defined rate of working.

Method Study: Early Applications

Taylor's Shoveling Experiment

Tons handled on piecework during the year ended 30 April 1901				924,040
Cost of handling these materials				$30,798
Former cost per year				$67,215
Net saving				$36,417
Average cost per ton	Now	$0.033	Formerly	$0.072
Average earnings per man per day		$1.88		$1.15
Average tons handled per man per day		57		16
Number of men		140		400–600

Method Study: Early Applications

Gilbreth's Bricklaying Improvement

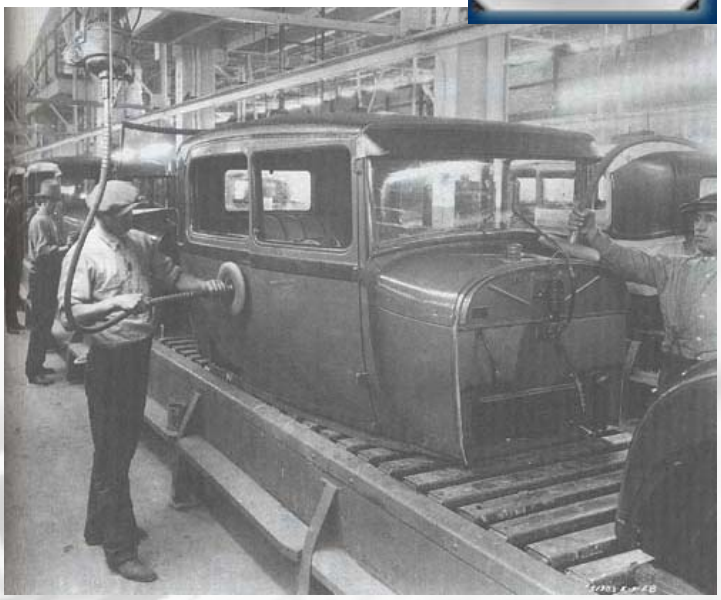
Frank Gilbreth designed a special scaffold and a new brick laying procedure that reduced the movements needed from 18 to 5 and in one case to 2. The worker's productivity increased from laying 120 bricks per hour to laying 350 bricks per hour.

Method Study: Early Applications

Ford’s Assembly Line

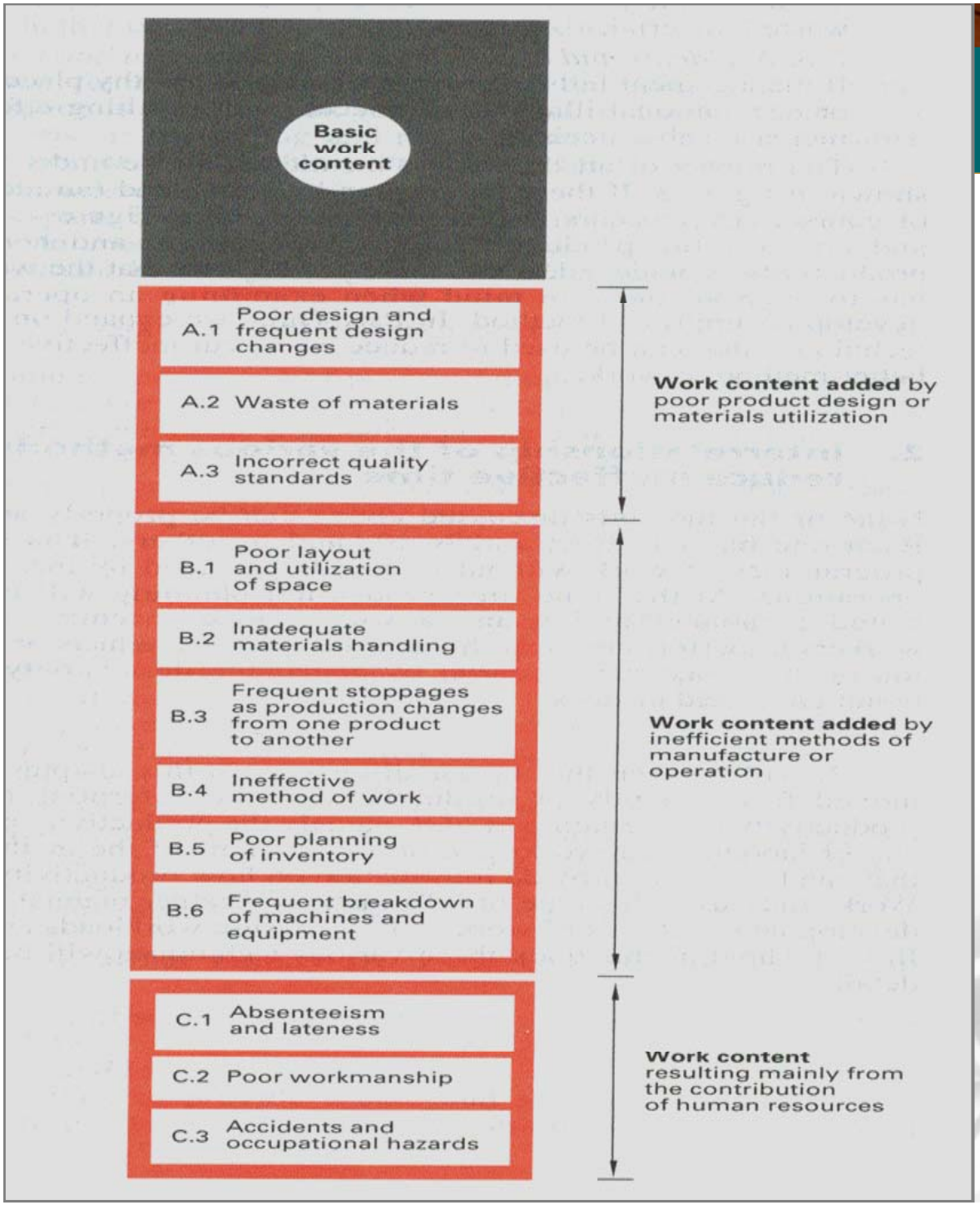
In 1907, Henry Ford announced his goal for the Ford Motor Company: to create "a motor car for the great multitude." At that time, automobiles were expensive, custom-made machines.

Ford's engineers took the first step towards this goal by designing the Model T, a simple, sturdy car, offering no factory options -- not even a choice of color. The Model T, first produced in 1908, kept the same design until the last one -- number 15,000,000 -- rolled off the line in 1927.



The Human Factor in Work Study

Waste Examples



Problem Solving

- Problem definition
  - statement of purpose, goal, objective
  - criteria of judging successful solution
  - output requirements
  - completion date
- Analysis of problem
  - constraints or specifications
  - description of the present method
  - review problem definition and criteria

Problem Solving

- Search for possible solutions
  - identify the basic cause that creates problem;
  - eliminate all unnecessary work
  - combine operations or elements
  - change sequence of operations
  - simplify the necessary operations
- Evaluation of alternatives
  - in terms of criteria and original specification

Problem Solving

- Recommendation for action
  - written reports to senior managers
  - presentations to senior managers and shop floor employees
  - development of soft skills, listening, negotiating,
- Marketing recommendations
  - target relevant groups

How do we measure performance?

- Profit
- Financial measures
- Productivity – output/input ratios
- Cycle time

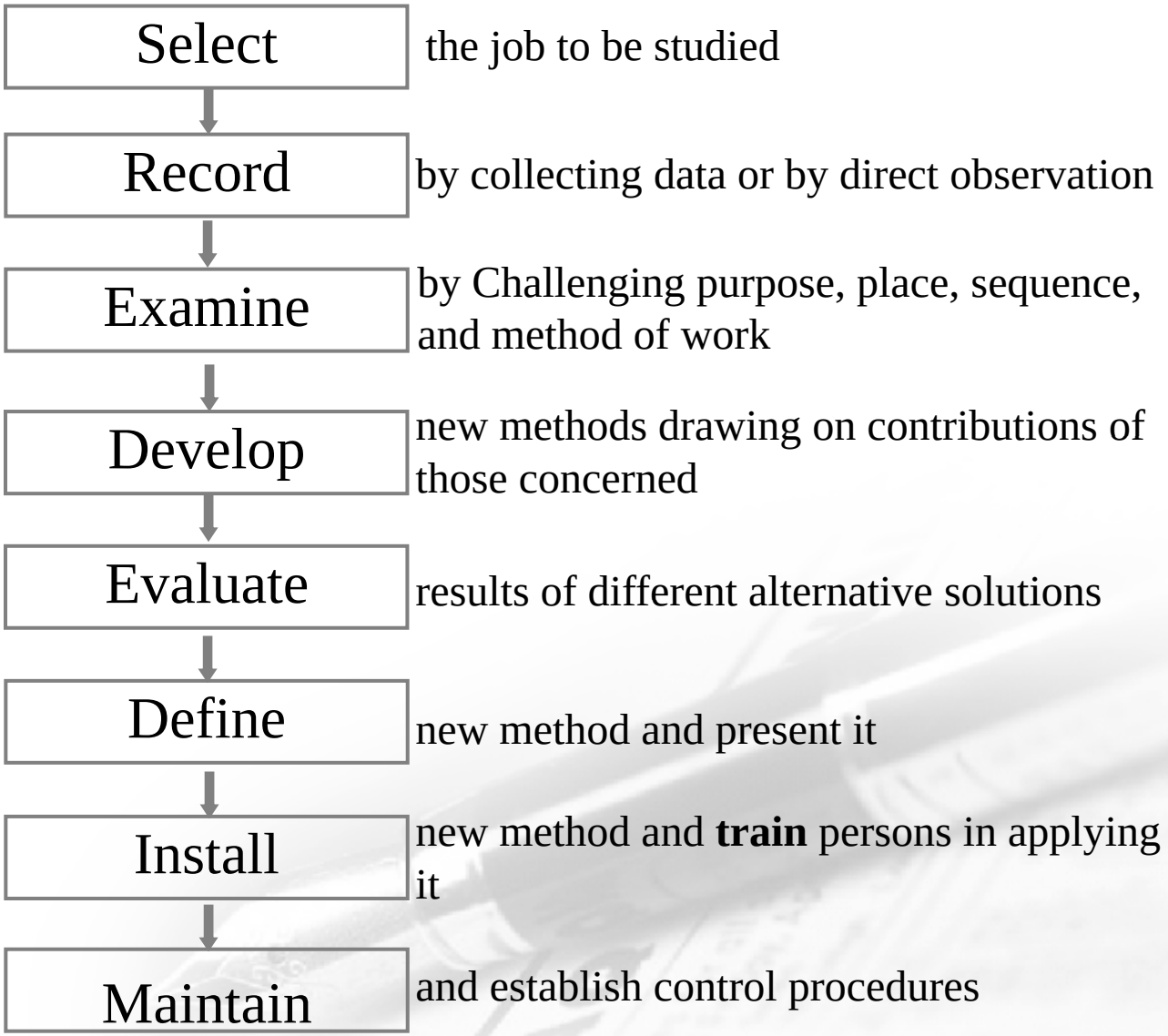
Possible Performance Measures

- **Quality** expressed as % scrap value, % returns, % downtime
- **Costs** expressed as inventory turnover, value added to incoming material
- **Delivery** expressed as % on time delivery, cycle time
- **Flexibility** as Average number of setups /day, % of common parts/product
- **Innovation** as % sales from products introduced in last 3 years

The Methodology

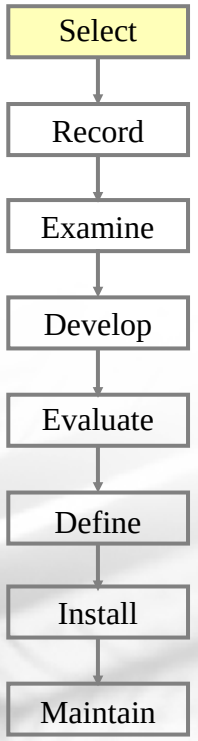
Method Study

To Simplify the job and develop more economical methods of doing it



Select – Where to Look

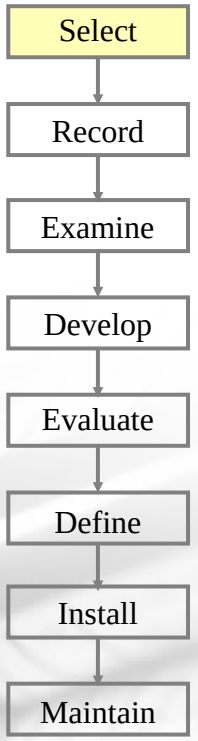
- Poor use of resources
- Bad layout
- Bottlenecks
- Inconsistent quality
- High fatiguing work
- Excessive overtime
- Employee's complaints



Select – Economic Considerations

Will it pay to begin, or continue, a method study of this job?

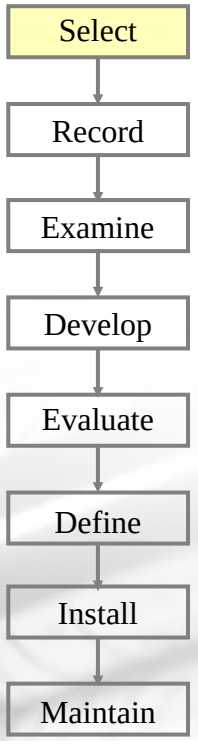
- Key profit- generating operations
- Key costly operations
- Repetitive work
- Long travels
- Excessive overtime



Select – Technical Considerations

Desire to acquire more advanced technology

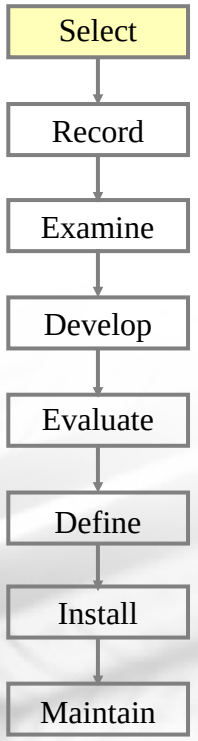
- Extensive paperwork
- Repetitive work (automation)
- Hazardous work
- Inconsistent quality



Select – Human Considerations

Workers satisfaction/resentment

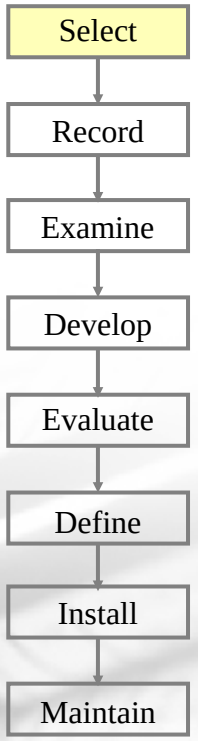
- Satisfaction level
- Start with non-controversial jobs
- HSE



Select – Limiting the Scope

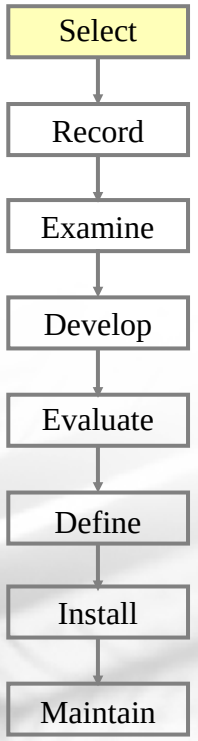
Setting boundaries and determining content

- One operation or a sequence
- The whole operation or part
- Which aspect: worker, materials, equipment, … etc.

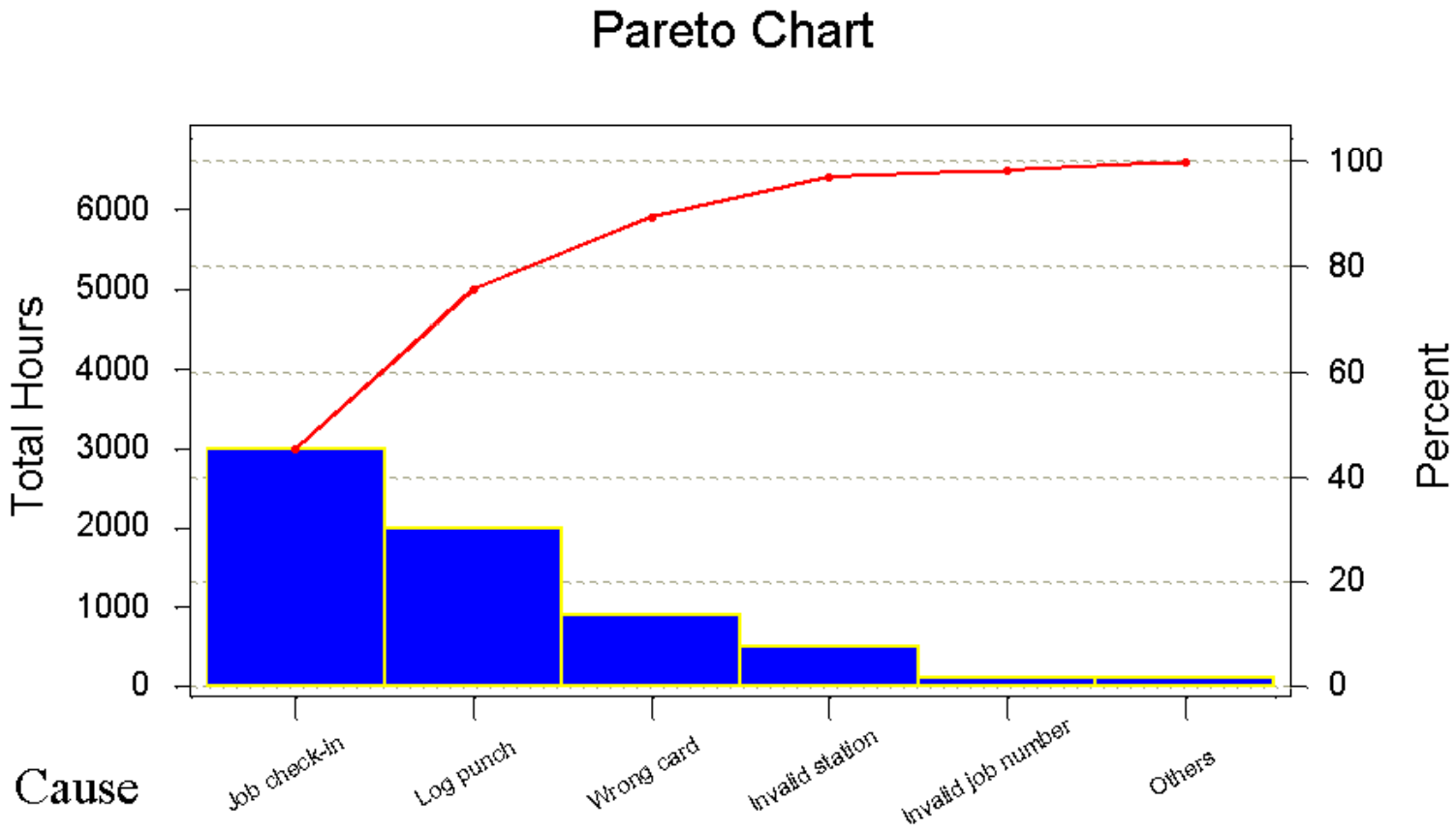


Select – Possible Results

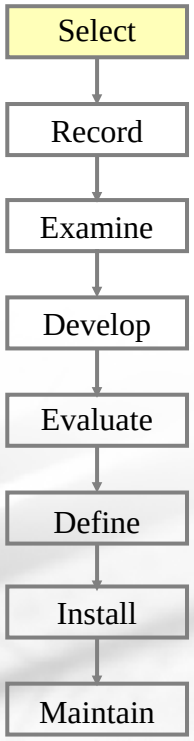
- Increased production rate
- Reduced cost
- Less labor, materials, or equipment
- Improved quality
- Improved safety
- Reduced scrap
- Improved standards of cleanliness



Select – Pareto Analysis



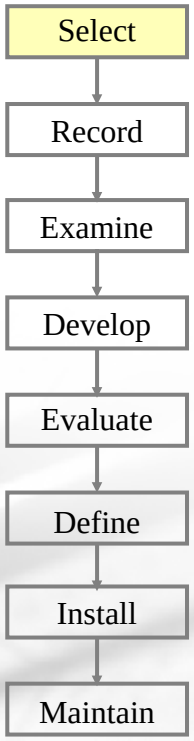
Cause	Job check-in	Log punch	Wrong card	Invalid station	Invalid job number	Others
Total Hours	3000	2000	900	500	100	101
Percent	45.4	30.3	13.6	7.6	1.5	1.5
Cum %	45.4	75.7	89.4	97.0	98.5	100.0



Select – Exercise

Considering the project alternatives below and assuming that you have $20 million in each of years 1, 2, and 3, determine the best project combination to maximize your return.

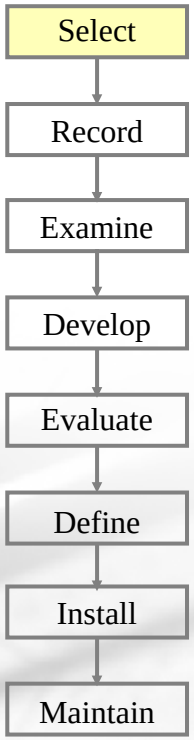
Project	Cost (in Millions)			Expected Return
	1	2	3	
A	4	4	4	16
B	5	6	5	18
C	7	5	7	19
D	5	4	5	17



Select – Exercise *(time value of money)*

The table below shows the cash flows associated with 6 mutually exclusive investment opportunities. If the MARR is 10%, identify the feasible alternatives and choose the best one. All alternatives have a useful life of 10 years.

	Alternative					
	A	B	C	D	E	F
Capital Investment (P)	-$900	-$1,500	-$2,500	-$4,000	-$5,000	-$7,000
Annual Revenue (A)	$150	$276	$400	$925	$1,125	$1,425



Record- Symbols

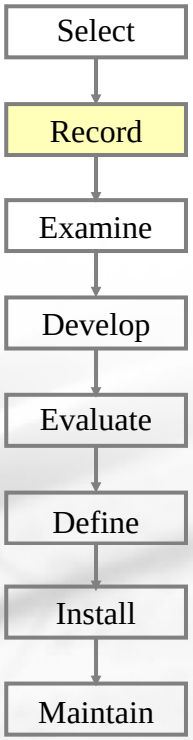
Operation (Make ready, Do, Put away)

Inspection

Transport

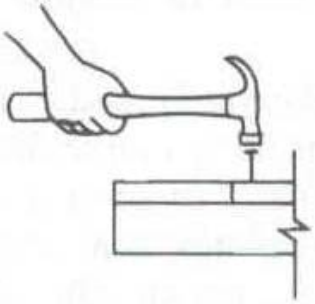
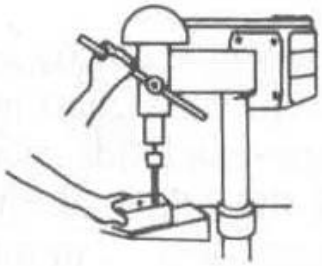
Delay

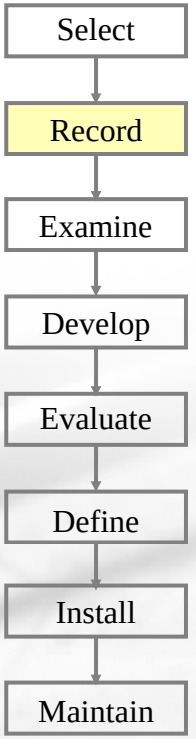
Storage



Record- Symbols

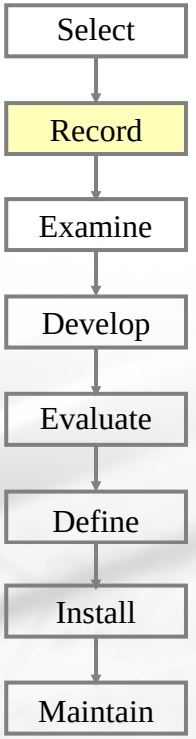
Operation (Make ready, Do, Put away)

OPERATION			
A large circle indicates an operation, such as	 Drive nail	 Drill hole	 Type letter

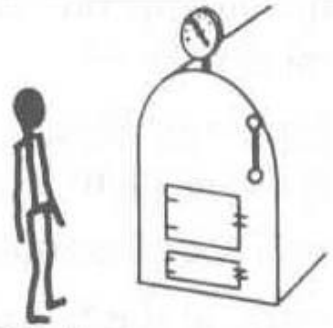
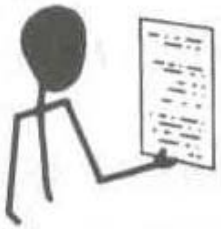


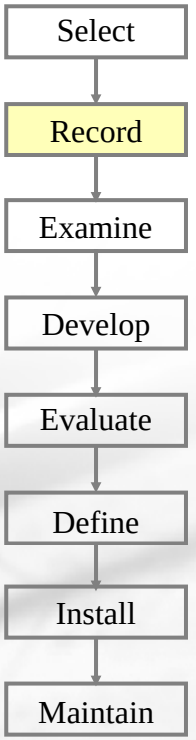
Record- Symbols

TRANSPORT			
An arrow indicates transport, such as	 Move material by truck	 Move material by hoist or elevator	 Move material by carrying (messenger)

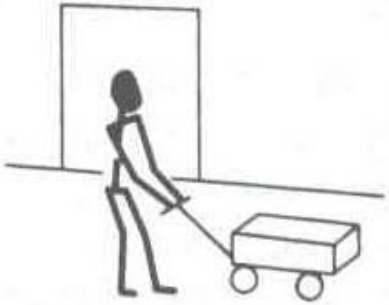


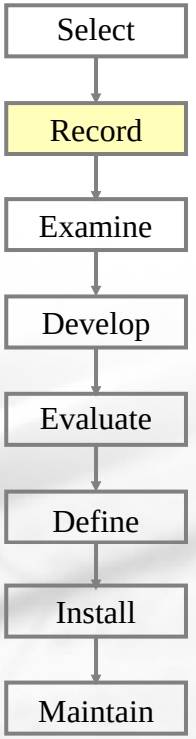
Record- Symbols

INSPECTION			
A square indicates an inspection, such as	 Examine material for quality or quantity	 Read steam gauge on boiler	 Examine printed form for information

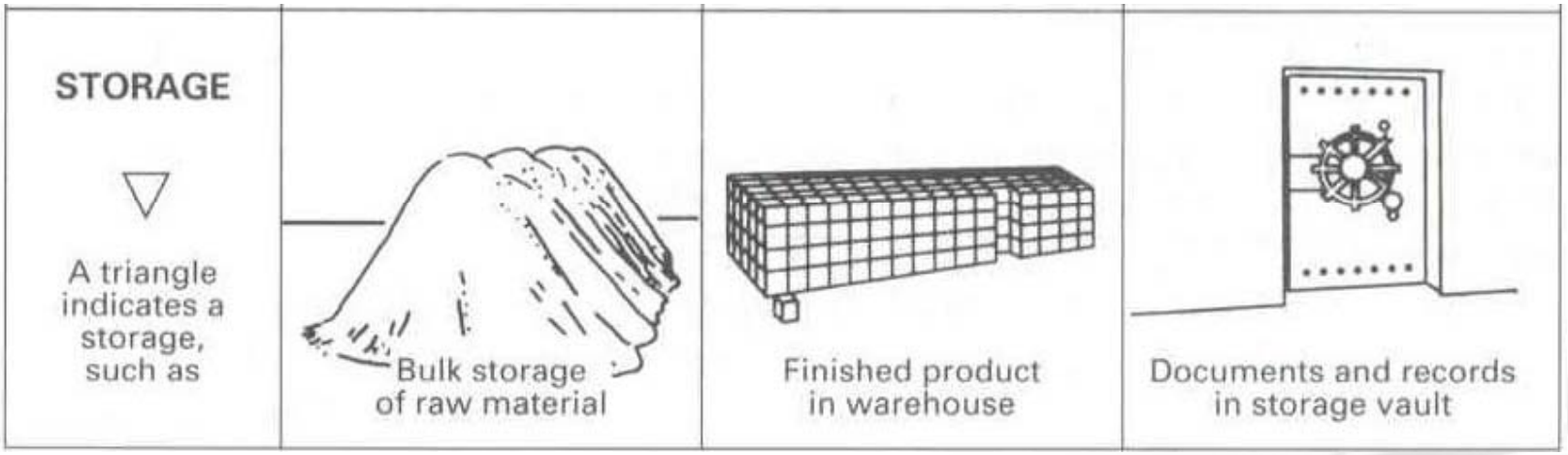


Record- Symbols

DELAY			
D The letter D indicates a delay, such as	 Material in truck or on floor at bench waiting to be processed	 Employee waiting for elevator	 Papers waiting to be filed



Record- Symbols



- Select
- Record
- Examine
- Develop
- Evaluate
- Define
- Install
- Maintain

Record- Charts and Diagrams

Outline Process Chart

Flow Process Chart (Worker, Material, Equipment)

Two-Handed Process Chart

Procedure Chart

Simultaneous motion Cycle Chart

Multiple Activity Chart

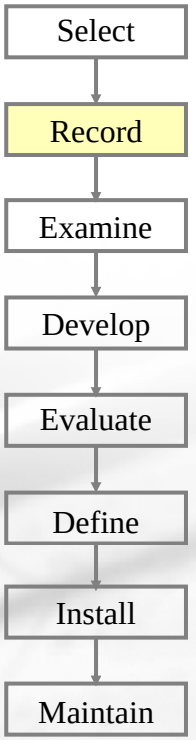
Flow Diagram

String Diagram

Cyclegraph

Chronocyclegraph

Travel Chart



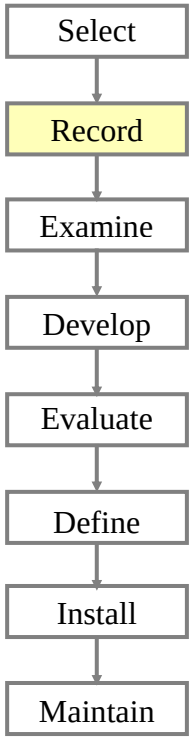
Record- Example Flow Chart

Chart begins: Typist in own office awaiting dictation.

Chart ends: Typist puts letter in "out" tray.

Man
(Typist)

- To author's office
- 1 Take dictation
- To own office
- 2 Prepare typing set
- 3 Typist types letter and copy
- 4 From m/c and separate copies
- 1 Check
- 5 Place in book for signature
- To author's office
- 1 During checking and signing
- To own office
- 6 Type envelope
- 7 Letter to envelope
- 8 Letter and copy aside to "out" tray



Record- Example Flow Chart

FLOW PROCESS CHART (AMPLIFIED)—
"MAN" TYPE

Job: Writing a letter using a shorthand-typist (present method).

Chart begins: Typist in own office awaiting dictation.

Chart ends: Typist puts letter and copy in out tray.

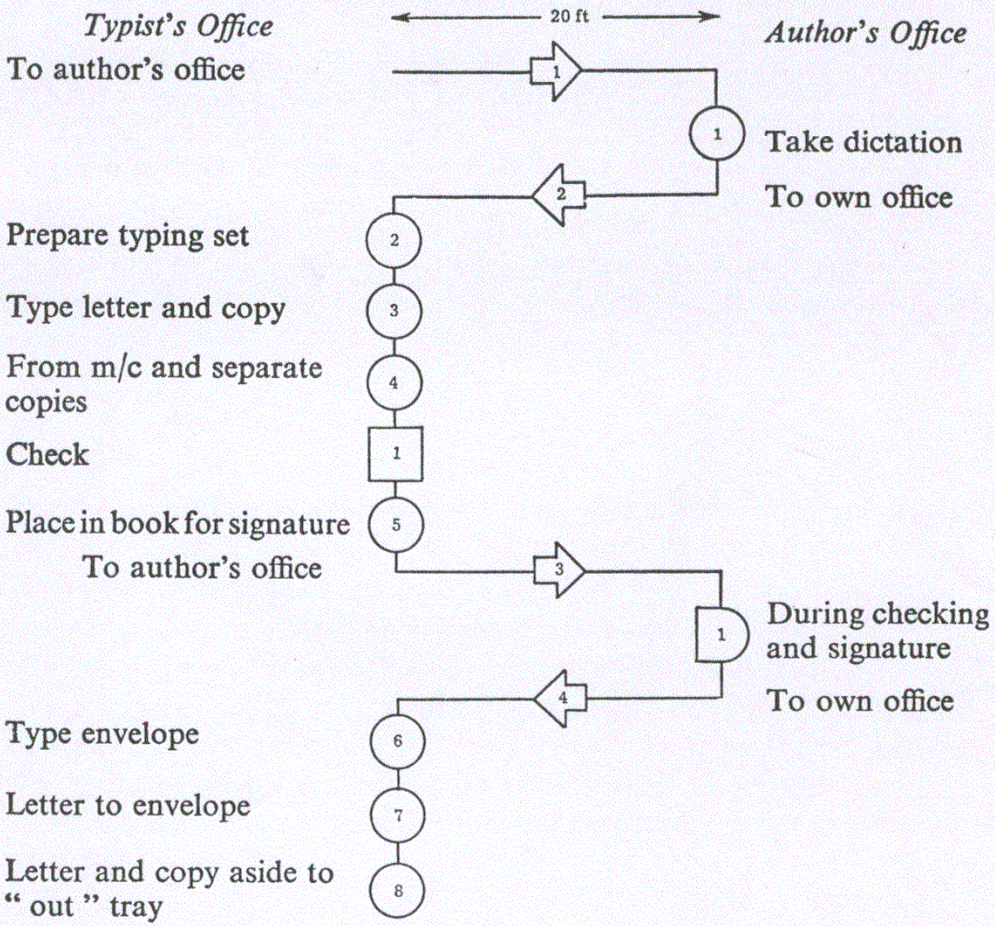


Fig. 8.11 'Man' Type Flow Process Chart from Fig. 8.10, amplified to Emphasize Distances Travelled.

- Select
- Record
- Examine
- Develop
- Evaluate
- Define
- Install
- Maintain

Record- Example Flow Chart

- Select
- **Record**
- Examine
- Develop
- Evaluate
- Define
- Install
- Maintain

Chart begins: Contents awaiting dictation by author.

Chart ends: Contents of letter to "out" tray.

Material
(Contents of Letter)

1	Wait arrival of typist	
1	Taken down in shorthand	
1	To typist's office	
2	Typist prepares to type	
2	Typed in letter form	
3	Typist separates copies	
1	Checked	
3	Placed in book for signature	
2	To author's office	
2	Checked	
4	Signed	
3	To typist's office	
4	Delay while envelope typed	
5	Inserted in envelope	
6	Aside to "out" tray	

Record- Example Flow Chart

- Select
- Record
- Examine
- Develop
- Evaluate
- Define
- Install
- Maintain

FLOW PROCESS CHARTS—"MAN" TYPE AND "MATERIAL" TYPE

Job: Writing a letter using a shorthand-typist (present method).

Man (Typist)	*Material* (Contents of Letter)
Chart begins: Typist in own office awaiting dictation.	*Chart begins:* Contents awaiting dictation by author.
Chart ends: Typist puts letter in "out" tray.	*Chart ends:* Contents of letter to "out" tray.
To author's office	Wait arrival of typist
Take dictation	Taken down in shorthand
To own office	To typist's office
Prepare typing set	Typist prepares to type
Typist types letter and copy	Typed in letter form
From m/c and separate copies	Typist separates copies
Check	Checked
Place in book for signature	Placed in book for signature
To author's office	To author's office
During checking and signing	Checked
To own office	Signed
Type envelope	To typist's office
Letter to envelope	Delay while envelope typed
Letter and copy aside to "out" tray	Inserted in envelope
	Aside to "out" tray

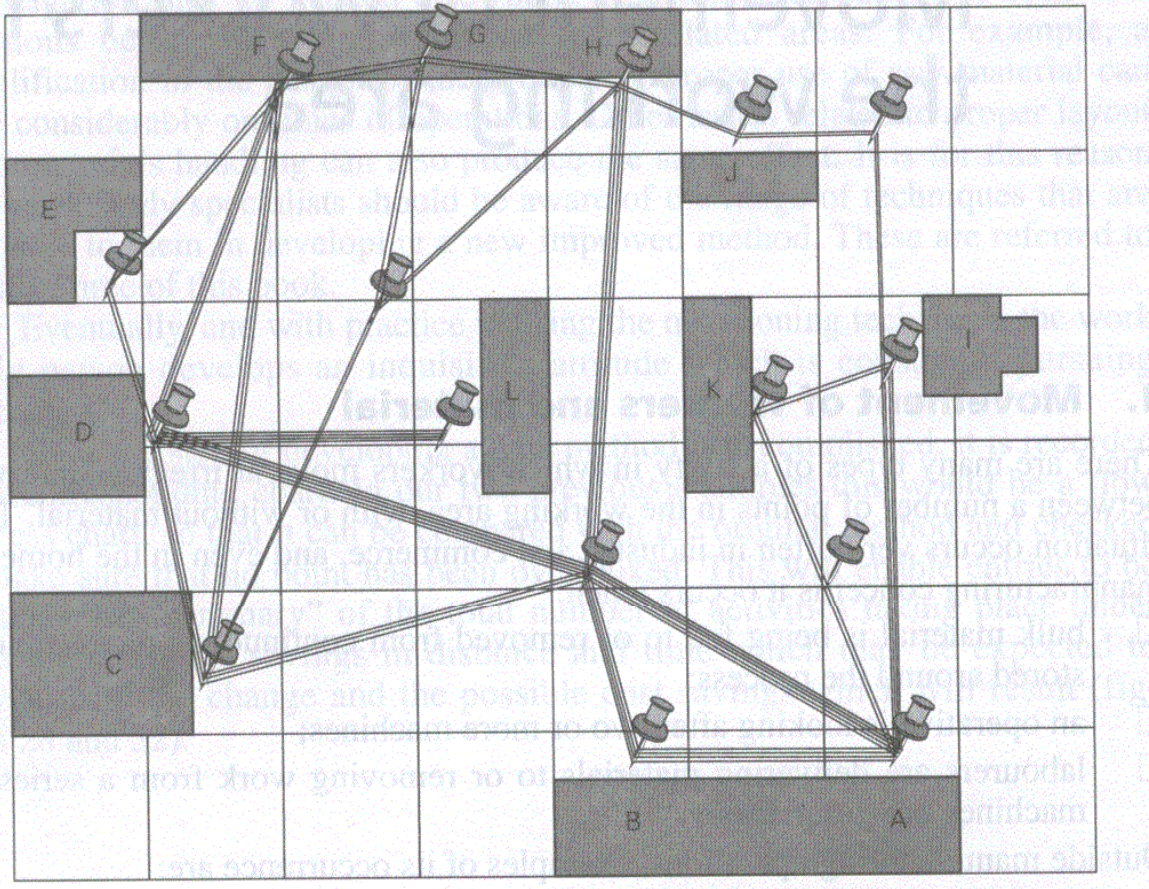
Fig. 8.10 Flow Process Charts, 'Man and Material' for the same job.

Record- Example

String Diagram

- Select
- Record
- Examine
- Develop
- Evaluate
- Define
- Install
- Maintain

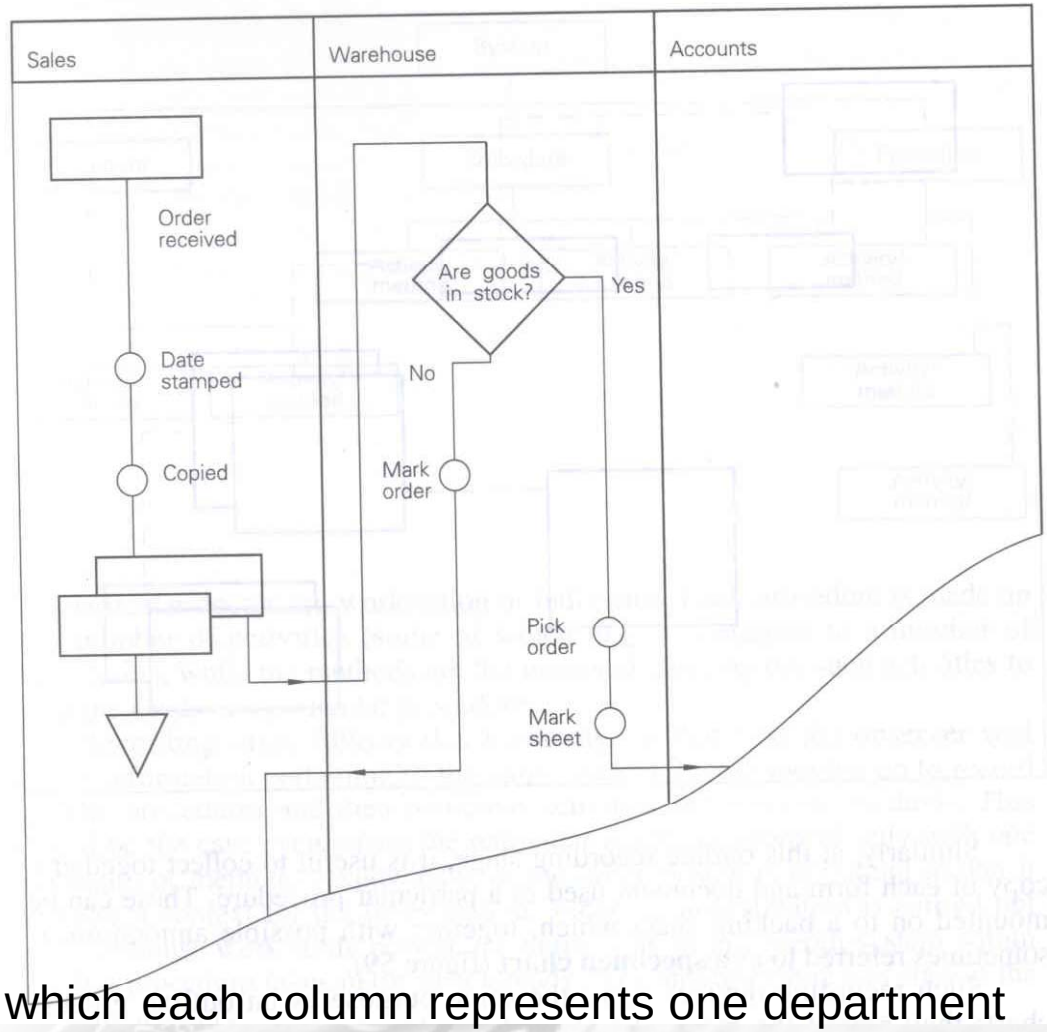
Figure 33. A string diagram



Record- Example

- Select
- Record
- Examine
- Develop
- Evaluate
- Define
- Install
- Maintain

Figure 60. A procedure flowchart



Use the columnar chart form in which each column represents one department or section of the organization.

Examine- The Questions

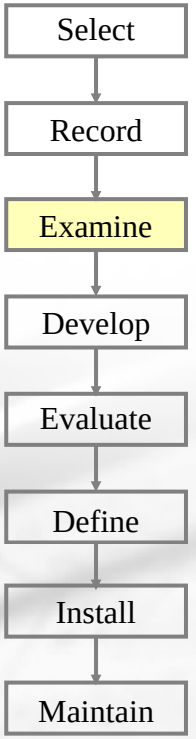
Purpose:	What is actually done?
	Why is it necessary?
Place:	Where? Why?
Sequence:	When? Why?
Person:	Who? Why?
Means:	How? Why?

With a view to:

Eliminate

Combine or Rearrange

Simplify



Examine- Secondary Questions

Purpose: **What** is done?

Why is it done?

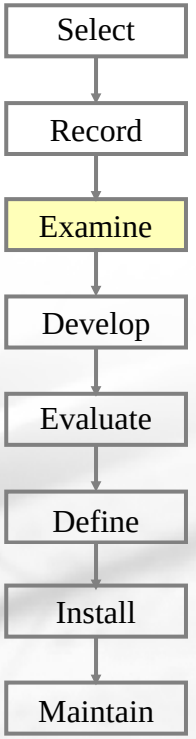
What **else** might be done?

What **should** be done?

With a view to:

Eliminate

Simplify



Examine- Secondary Questions

Place: **Where** is it done?

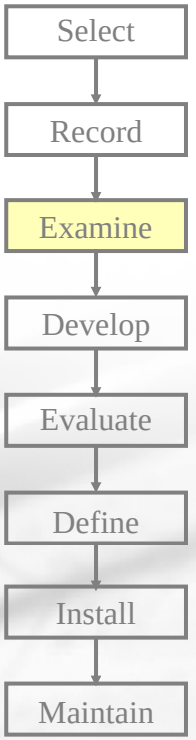
Why is it done **there**?

where **else** might it be done?

Where **should** it be done?

With a view to:

Combine or Rearrange



Examine- Secondary Questions

Sequence: **When** is it done?

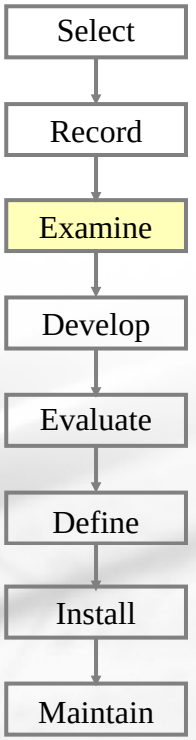
Why is it done **then**?

when **might** it be done?

When **should** it be done?

With a view to:

Combine or Rearrange



Examine- Secondary Questions

Person: **Who** does it?

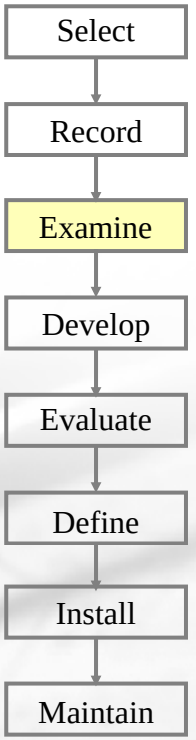
Why does **that** person do it?

Who **else** might do it?

Who **should** do it?

With a view to:

Combine or Rearrange



Examine- Secondary Questions

Means: **How** is it done?

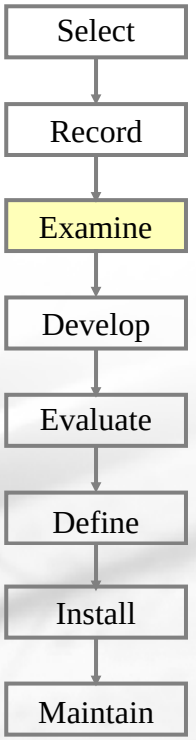
Why is it done **that** way?

How **else** might it be done?

How **should** it be done?

With a view to:

Simplify



Develop

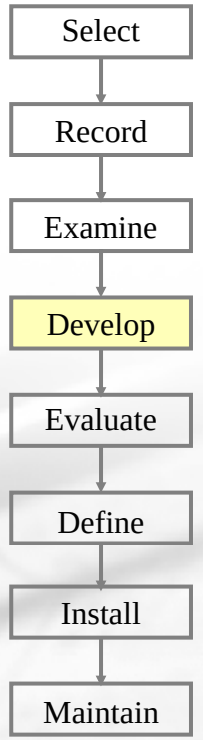
New Designs

Multidisciplinary Teams

Worker Involvement

Quality Circles

Simple Ideas



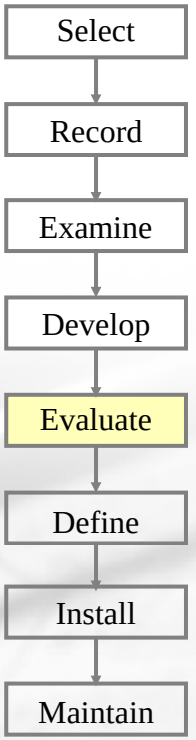
Evaluate

Multiple Improvement Ideas

Consider costs, benefits, and drawbacks

Report (ABC, Accurate, Brief, and Clear)

Example



Decision Making Conditions

- **State of Certainty:** A condition in which the decision maker knows with reasonable certainty what the alternatives are and what conditions are associated with each alternative.
- **State of Risk:** A condition in which the availability of each alternative and its potential payoffs and costs are all associated with probability estimates.
- **State of Uncertainty:** A condition in which the decision maker does not know all the alternatives, the risks associated with each, or the consequences each alternative is likely to have.

Decision Making Terminology

- **Certainty:** Environment in which relevant parameters have known values.
-
- **Risk:** Environment in which certain parameters have Probable outcomes.
- **Uncertainty:** Environment in which it is impossible to assess the likelihood of various future events.
- **Payoff Table:** Table showing the expected payoffs for each alternative in every possible state of nature.
- **States of Nature:** A set of possible future conditions that will have a bearing on the results of the decision. (e.g. demand will be low, moderate or high; the number of contracts awarded will be 1, 2 or 3; competitor will or will not introduce a new product, etc. ...).

Decision Making Under Certainty

I. Which of the following tractors would you choose based on the information given in the table below?

Factor	Importance (Weight)	Alternatives and Scores			
		Units	Tractor A	Tractor B	Tractor C
Reliability	0.4	1:10, 10 is best	9	6	10
Economics	0.3		8	10	5
Productivity	0.3		10	8	10

Factor	Importance (Weight)	Alternatives Ratings		
		Tractor A	Tractor B	Tractor C
Reliability	0.4	3.6	2.4	4
Economics	0.3	2.4	3	1.5
Productivity	0.3	3	2.4	3
Total rating		**9**	**7.8**	**8.5**

Decision Making- weights

Determining weights:

- Rank sum
- Rank reciprocal
- Digital logic

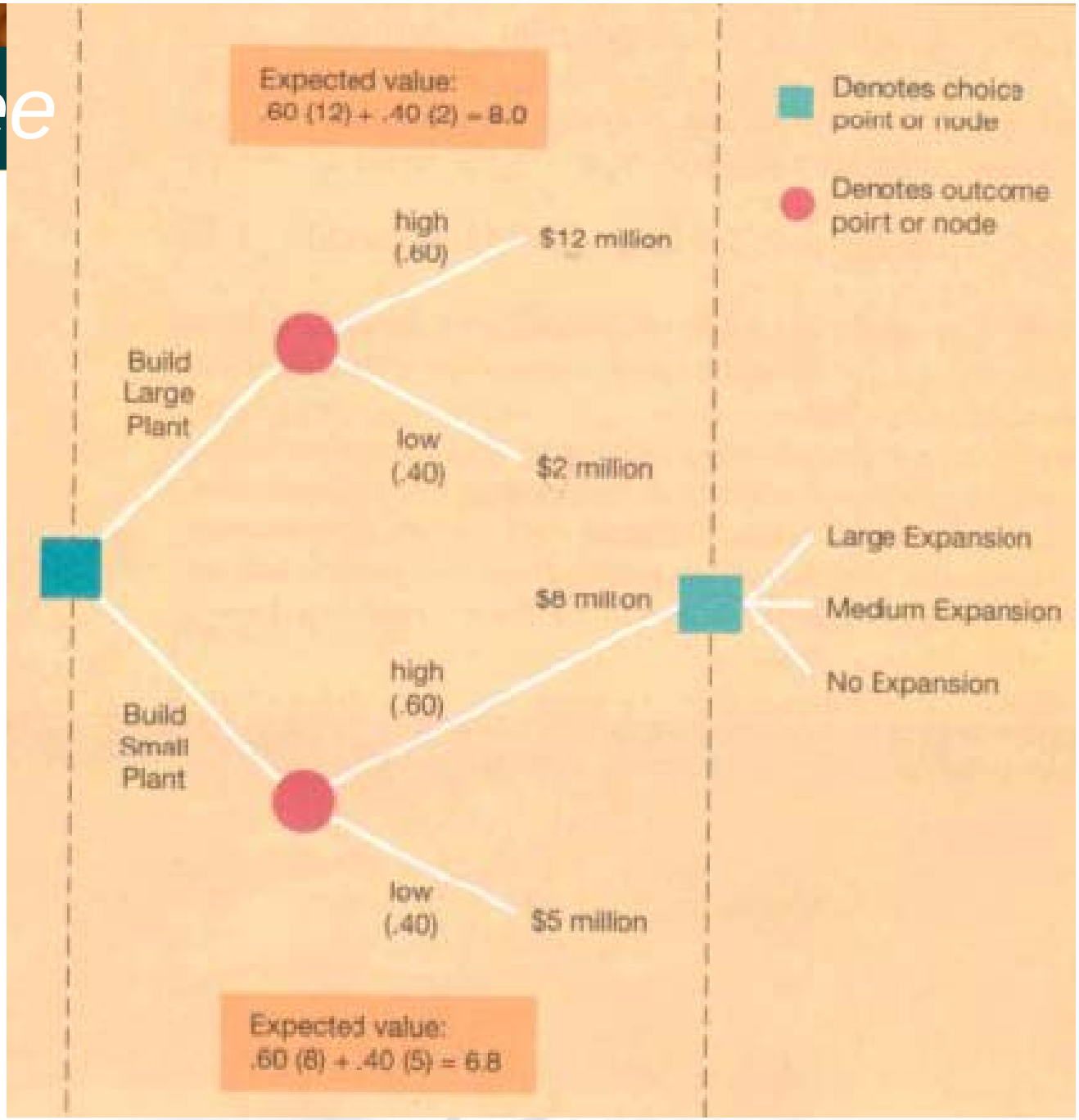
Excel Demo

Decision Making Under Risk

A company is considering building a new plant to satisfy additional demand. There is a 60% probability that demand will be high in which case building a large factory would result in $12 million in profits. If, however, the additional demands is low, the large plant will only yield a profit of $2 million. On the other hand, the company may choose to build a small plant which will yield a profit of $8 million if the demand is high, or $5 million if the demand is low. Which alternative of the **three** should the company choose?

Sensitivity Analysis

Decision Tree



Decision Making Under Risk

Expected Monetary Value (EMV)

	State of nature (Possible future demand)		
	Low(**0.3**)	Moderate(**0.5**)	High(**0.2**)
Alt. I (small facility)	10	10	10
Alt. II (medium facility)	7	12	12
Alt. III (large facility)	(4)	2	16

E(Alternative I) = 10(0.3) + 10(0.5) + 10(0.2) = 10
E(Alternative II) = 7(0.3) + 12(0.5) + 12(0.2) = **10.5**
E(Alternative III) = -4 (0.3) + 2(0.5) + 16(0.2) = 3

Choose **Alternative II** as it gives highest **EMV**.

Decision Making Under Risk

Expected Value of perfect Information EVPI

EVPI is the difference between the expected payoff under certainty and the expected payoff under risk.
The question is: Why not wait until we know the demand and then solve under certainty?

Back to our example:
The result we got under **risk** was **Alt. II Payoff = 10.5.**
If we wait until we are sure of the demand, we will have:

Demand:	Low	Moderate	High
Max. Payoff:	10	12	16

E(Return) = 10(0.3) + 12(0.5) + 16(0.2) = 12.2
EVPI = E(Payoff under certainty) - E(Payoff under Risk)
= 12.2 - 10.5 = **1.7**

Decision Making Under Risk

Expected Value of perfect Information EVPI

A Second approach for calculating EVPI is by using the regret table:
Find expected regret for each alternative. The min. expected regret = EVPI

Regret Table for previous ex.

	State of nature (Possible future demand)			
	Low	Moderate	High	**Exp. regret**
Alt. I (small facility)	**0**	**2**	**6**	**2.2**
Alt. II (medium facility)	**3**	**0**	**4**	**1.7**
Alt. III (large facility)	**14**	**10**	**0**	**9.2**

E(regret I) = 0(0.3) + 2(0.5) + 6(0.2) = 2.2
Similarly calculate expected regret for II & III.

Decision Making Under Uncertainty

Decision making under uncertainty:

Consider the following example (payoff table):

	State of nature (Possible future demand)		
	Low	Moderate	High
Alt. I (small facility)	10	10	10
Alt. II (medium facility)	7	12	12
Alt. III (large facility)	(4)	2	16

When no information is available on how likely the various states of nature are, there are 4 possible decision criteria: Maximin, Maximax, Laplace (average), and Minimax regret.

Decision Making Under Uncertainty

1. Maximin:

Determine the worst possible payoff for each alternative & then determine the alternative has the "best worst" payoff (Pessimistic Approach).

	State of nature (Possible future demand)			
	Low	Moderate	High	**Min.**
Alt. I (small facility)	10	10	10	**10**
Alt. II (medium facility)	7	12	12	**7**
Alt. III (large facility)	(4)	2	16	**(4)**

Choose **Alternative I , Payoff = 10,** best of the worst (Maximin).

Decision Making Under Uncertainty

2. Maximax:

Determine the best possible payoff & choose the alternative with that payoff.

In our example:

	State of nature (Possible future demand)			
	Low	Moderate	High	**Max.**
Alt. I (small facility)	10	10	10	**10**
Alt. II (medium facility)	7	12	12	**12**
Alt. III (large facility)	(4)	2	16	**16**

Choose **alternative III,** Highest payoff (Maximax).

Decision Making Under Uncertainty

3. Laplace:

Determine the average payoff for each alternative & choose the alternative with the best average.

Used for repeated decisions.

	State of nature (Possible future demand)			
	Low	Moderate	High	**Laplace**
Alt. I (small facility)	10	10	10	**10**
Alt. II (medium facility)	7	12	12	**10.33**
Alt. III (large facility)	(4)	2	16	**4.67**

Choose **alternative II,** highest payoff.

Decision Making Under Uncertainty

4. Minimax Regret:

Determine the worst regret for each alternative and choose the alternative with the "best worst". This method makes a comprehensive comparison between alternatives.

In our example:

	State of nature (Possible future demand)			
	Low	Moderate	High	**Max. regret**
Alt. I (small facility)	**0** ~~10~~	**2** ~~10~~	**6** ~~10~~	**6**
Alt. II (medium facility)	**3** ~~7~~	**0** ~~12~~	**4** ~~12~~	**4**
Alt. III (large facility)	**14** ~~(4)~~	**10** ~~2~~	**0** ~~16~~	**14**

Choose **Alternative II, the one with min. regret.**

Assignment Models

John, Karen, and Terri may do any of the three tasks mow, paint, or wash at the costs indicated in the table to the right. What is the most economical assignment?

	Mow	Paint	Wash
John	$15	$10	$9
Karen	$9	$15	$10
Terri	$10	$12	$8

Assignment Models

	Mow	Paint	Wash	Row minimum
John	15	10	**9**	$p_1 = 9$
Karen	**9**	15	10	$p_2 = 9$
Terri	10	12	**8**	$p_3 = 8$

	Mow	Paint	Wash
John	6	**1**	**0**
Karen	**0**	6	1
Terri	2	4	**0**
Column minimum	$q_1 = 0$	$q_2 = 1$	$q_3 = 0$

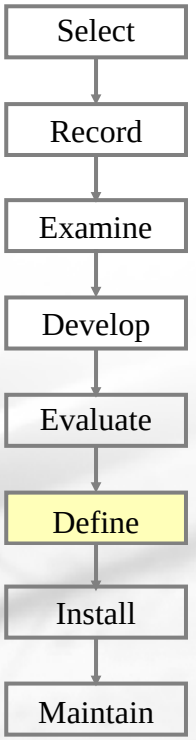
	Mow	Paint	Wash
John	6	**0**	0
Karen	**0**	5	1
Terri	2	3	**0**

Define

The written standard practice

Prepare a written standard practice, also known as an "operative instruction sheet". This serves several purposes

1. It records the improved method for future reference.
2. It can be used to explain the new method to management, supervisors and operatives. It also advises all concerned, including the works engineers, of any new equipment required or of changes needed in the layout of machines or workplaces.
3. It is an aid to training or retraining operatives.
4. It forms the basis on which time studies.



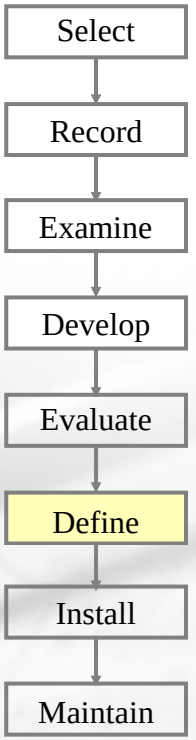
Define

The written standard practice outlines in simple terms the methods to be used by the operative. Three sorts of information will normally be required:

(1) The tools and equipment to be used and the general operating conditions.

(2) A description of the method. The amount of detail required will depend on the nature of the job and the probable volume of production. For a job which will occupy several operatives for several months, the written standard practice may have to be very detailed, going into finger movements.

(3) A diagram of the workplace layout and, possibly, sketches of special tools, jigs or fixtures.



Install

Installation can be divided into five stages, namely:

(1) Gaining acceptance of the change by management.

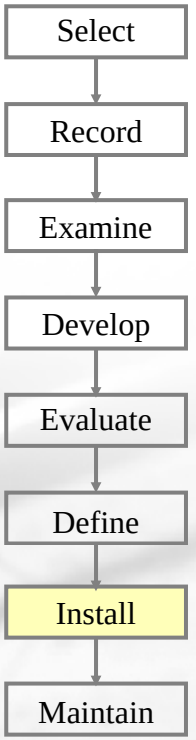
(2) Gaining acceptance of the change by the departmental supervision.

There is no point in trying to go any further if this approval and acceptance have not been obtained.

(3) Gaining acceptance of the change by the workers and their representatives.

(4) Preparing to make the changes.

(5) Controlling the changeover.



Install

Training

May use films to demonstrate the old and the new methods.

Films are particularly valuable when retraining.

Develop **the habit** of doing the job in the correct way.

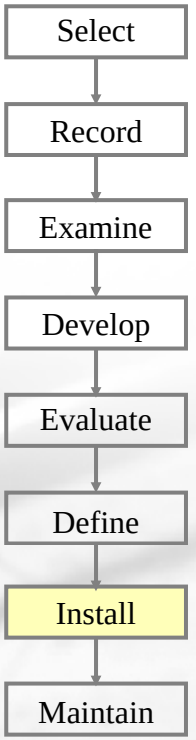
Train to follow a numbered sequence illustrated on a chart.

Learning curves

In the first stages of learning, rests between periods of practice should be longer than the periods of practice themselves.

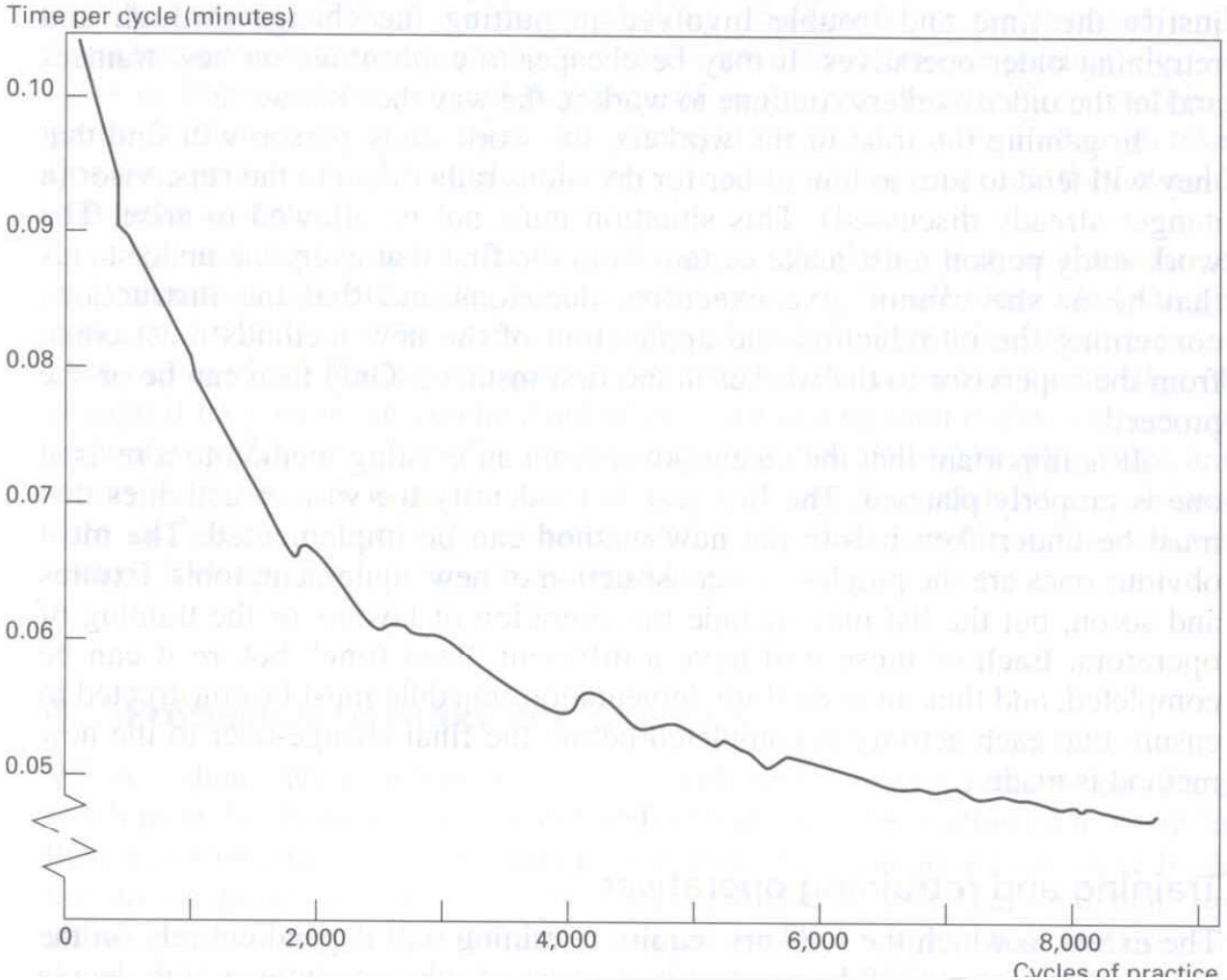
When the operative has begun to grasp the new method and to pick up speed, rest periods can be very much shorter.

Nursing the new method.



Install

Figure 57. A typical learning curve



- Select
- Record
- Examine
- Develop
- Evaluate
- Define
- **Install**
- Maintain

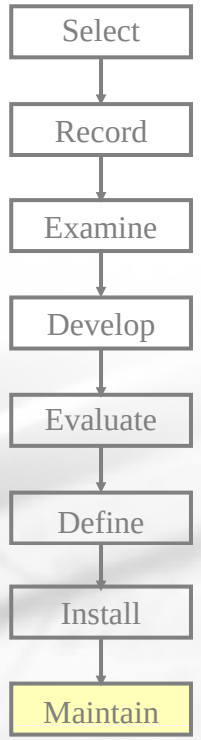
Maintain

workers should not be permitted to slip back into old methods, or introduce elements not allowed for, unless there is very good reason for doing so.

To be maintained, a method must first be very clearly defined and specified.

Assign a specialists permanently.

Formal review.



Value Stream Mapping

What is a Value Stream?

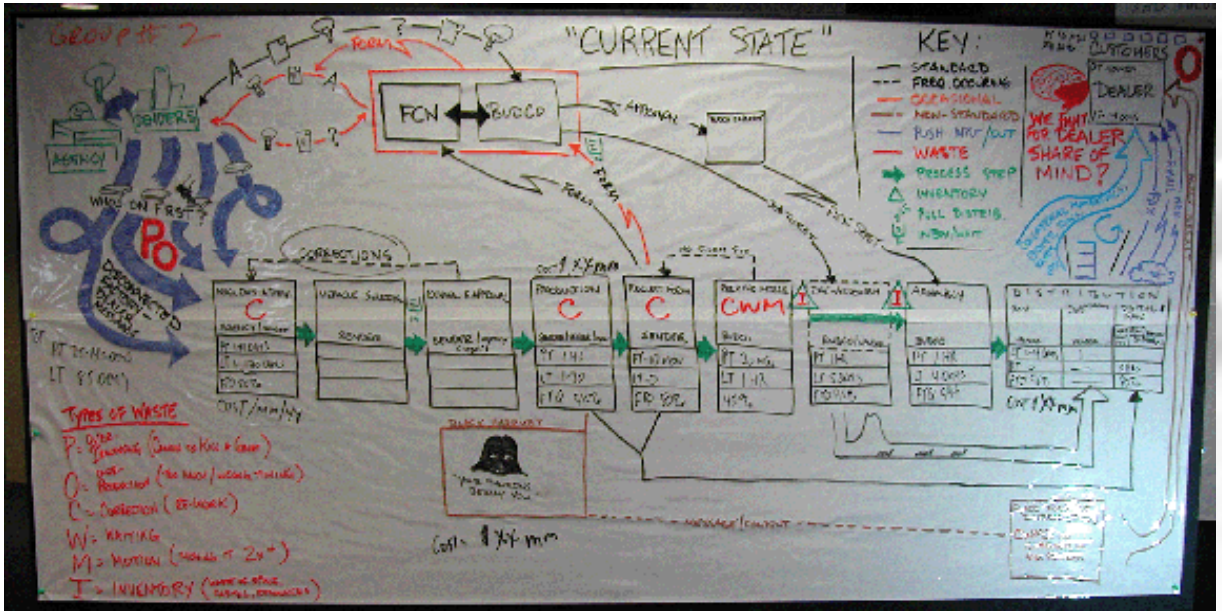
A value stream involves **all the steps**, both value added and non value added, required to complete a **product or service** from **beginning to end.**

What is a Value Stream Map?

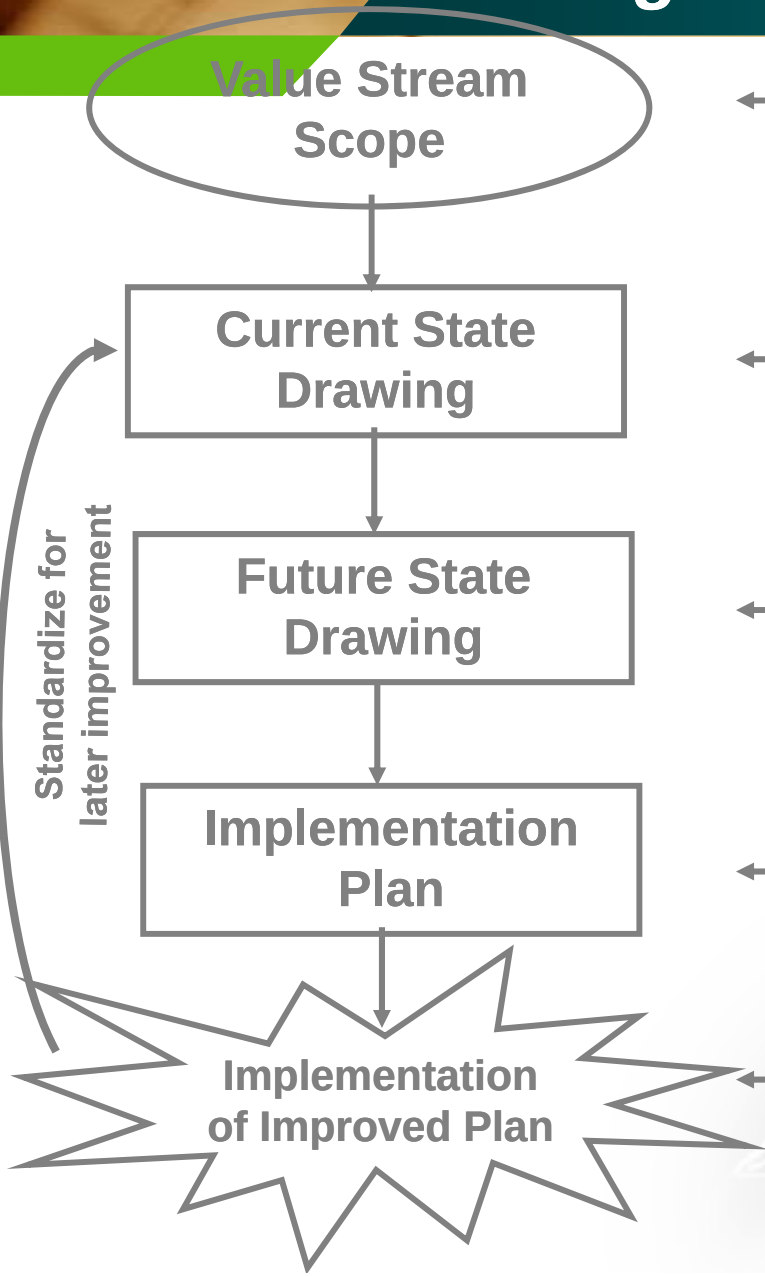
- **Visual Representation of a Value Stream**
- **Pencil & Paper Tool**
- **Helps Reveal Waste & Problems with Flow**
- **Establishes a common language to document processes**
- **Provides a blueprint for improvement**

Value Stream Maps

- Visualizes the process flow from a Systems Perspective
- Includes Information Flow and links it to process flow
- Documents Performance of the process
  - End results in meeting customer requirements
  - Metrics (Process time, Wait time, Lead time, First time quality) to highlight waste
  - Progress and quality become visible



Using the Value Stream Mapping Tool



Determine the Value Stream to be improved

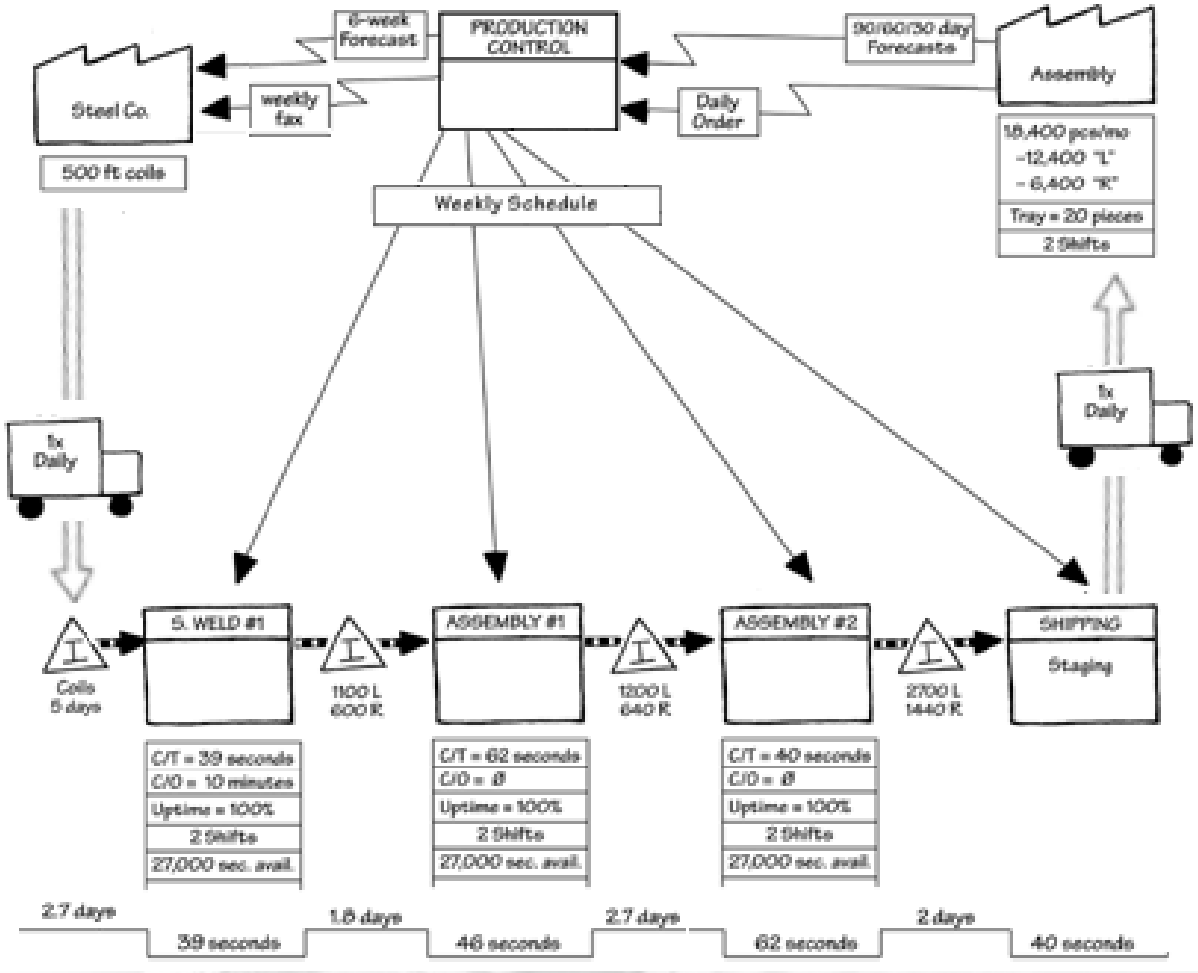
Understanding how things currently operate. This is the foundation for the future state

Designing a lean flow

Developing a detailed plan of implementation to support objectives (what, who, when)

The goal of mapping!

Value Stream Mapping



Rother, Mike and Shook, John (1999) Learning to See, Brookline, MA: Lean Enterprises Institute Inc.

Tapping, Don, Shuker, Tom and Luyster, Tom (2002) Value Stream Management Productivity Press.

Source: John R. Grout, Berry College, Campbell School of Business, Mount Berry, Georgia 30149-5024, jgrout@campbell.berry.edu

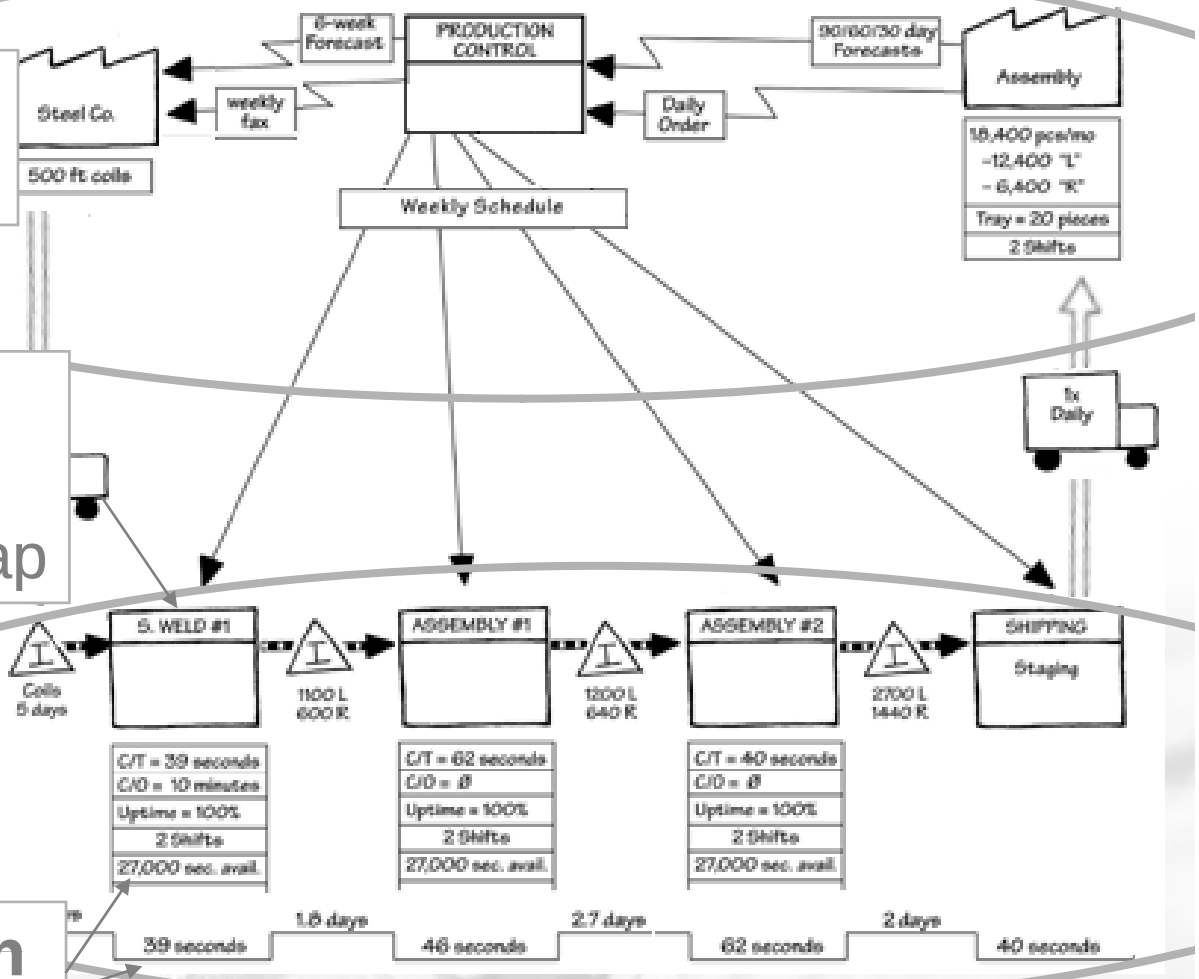
Value Stream Mapping

Ordering and Scheduling info

As tasks are linked into "one-piece flow" they are combined on the map

Production task & Inventory info

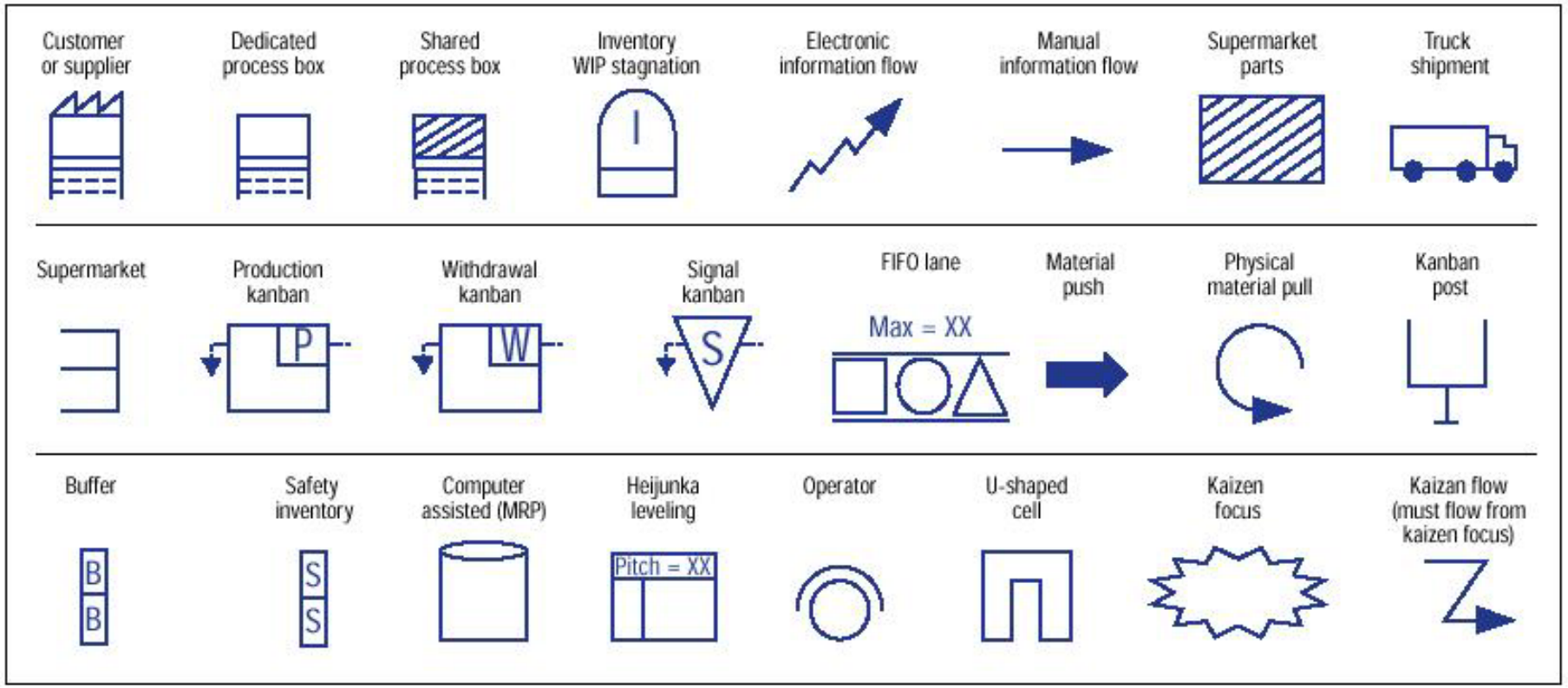
Includes information On elapsed time



Source: John R. Grout, Berry College, Campbell School of Business, Mount Berry, Georgia 30149-5024, jgrout@campbell.berry.edu

Value Stream Mapping

- 24 icon set for lean manufacturing



Source: John R. Grout, Berry College, Campbell School of Business, Mount Berry, Georgia 30149-5024, jgrout@campbell.berry.edu

Future State Questions

- What are the customer requirements?
  - How can we ensure that the customer gets what they need, when they need it?
  - Can the timing of the customer requirements be used to establish a pace of work (takt time) for the value stream?
- How will you make work flow smoothly?
  - How can we get information to the customer with few/no handoffs?
  - How can we get information to the customer with no correction or rework required?
  - How will multiple or parallel flows be synchronized?
  - Is there backflow (repeat or rework) loops that can be eliminated?
  - Can a person complete the activity in one sitting?
  - Can you touch each piece of paper only once, or go to each screen only once, for each activity?
  - What steps could be combined or eliminated to simplify flow?
- Where and how will you trigger or sequence work?
  - Can you have one trigger point with uninterrupted process flow?
- How will you establish rhythm or milestones to pace the work and surface problems?
  - How will you use milestones to create an internal pull to establish cadence / rhythm?
  - What can be done to level the workload and eliminate the frustrating "peaks" and "valleys"?
- How will you make work progress and delays visible?
  - What visual management tools will you use to make progress & delays visible?
  - How will you be sure you know the progress of the work?
- What process improvements are necessary to achieve your Value Stream vision?
  - How will you ensure adequate and available resources to improve First Time Quality at each process step in the value stream?

Characteristics of business processes

- Has external customers
- Has quantifiable measures
- Frequently cuts across functional organisational boundaries

Examples:
Supplying a service to a customer
Developing a new product
Ordering goods from a supplier

Background to BPR

- Traditional approaches to organisational structure (Hammer and Champy, 1993):
  - organisations structured on the basis of clear, hierarchical and departmental units,
  - work based on the idea of fragmentation of tasks, control exercised centrally.
- This form of organisational structure was well suited to a mass market environment with delineated, local forms of competition and slow rates of technological change. It is held to be unsuitable to the modern market environment characterised by customised markets, intense and diverse global competition, and rapid rates of technological change.

Case 1: Ford's accounts payable

Hammer (1990) describes an accounts payable process at the Ford Motor Company that was re-engineered. The accounts payable department employed 500 people. A competitor's accounts payable department had 5 people. Ford set out to reduce workforce by hundreds.

Purchasing department wrote an order, sent a copy to accounts payable. Later, when materials control department received goods, it sent a copy of the receiving document to accounts payable. Meanwhile the vendor sent an invoice to accounts payable. The accounts payable department were involved in matching fourteen data items between the receipt order, the purchase order and the invoice before it could issue payment to the vendor. In fact, the department spent most of its time trying to sort out mismatches between these three documents.

Case 2: IBM credit

- Problem - Entire process consumed six days on average; customers lost in the intervening period.
- New organisation - replaced specialists with generalists.
  - One person called a deal structurer deals with one straightforward order.
  - Computer system developed to support the deal structurer.
- Slashed turnaround time from six days to 4 hours.
    - (Hammer and Champy, 1993)

Case 3: Kodak

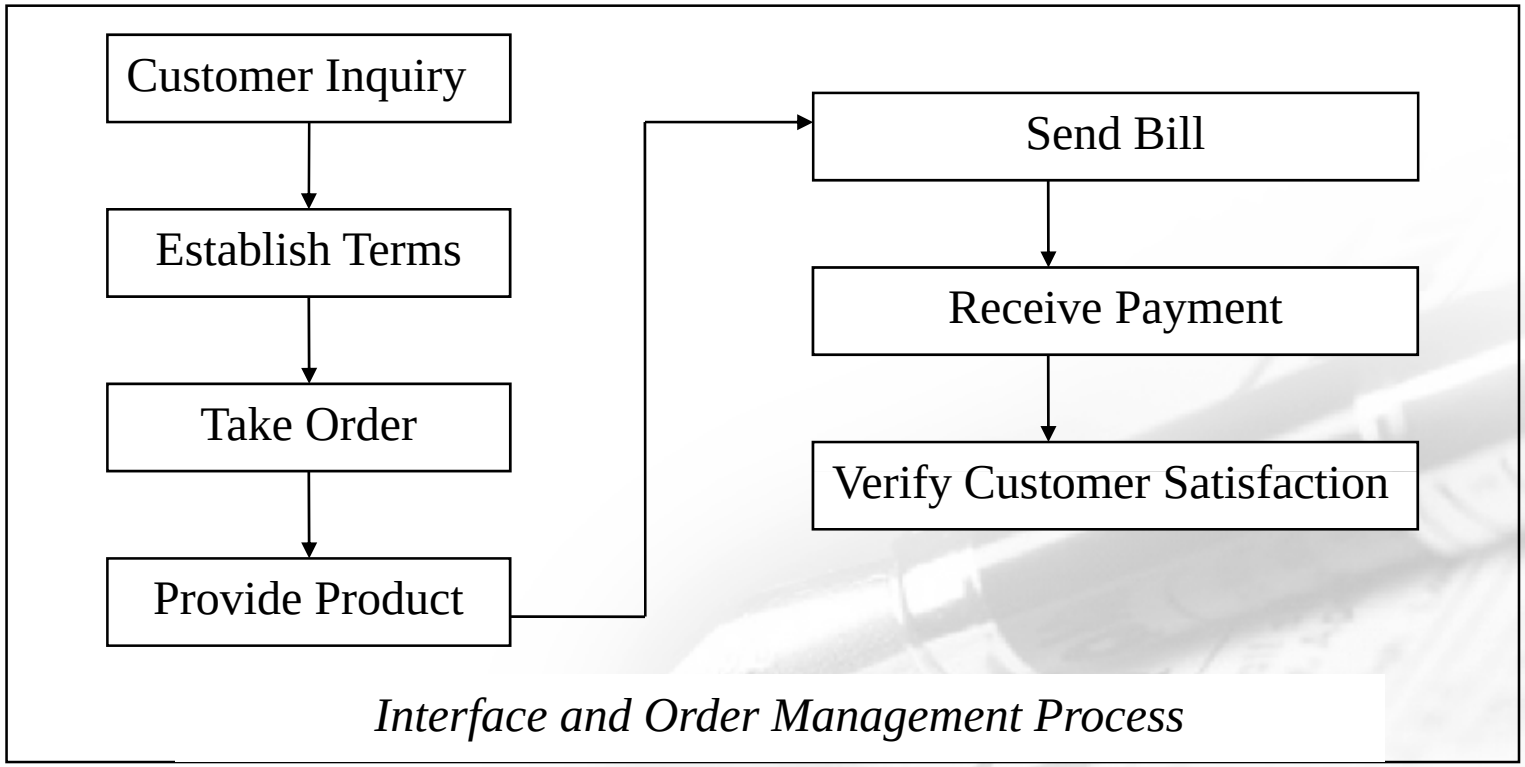
- Even before business process reengineering (BPR) was described in 1990, Eastman Kodak Company was achieving significant improvements:
  - in cost, cycle time and quality.
- However, the improvements were simply not dramatic

  ⇒ an approach was needed to bring about these dramatic improvements in a systematic, repeatable manner

  ⇒ BPR methodology is selected

Case 3: Kodak

- One of reengineering projects called Customer Interface and Order Management in the Large Commercial Graphics Market (CI&OM LCGM) is selected to deliver the concepts.



Interface and Order Management Process

Case 3: Kodak

- ✓ customer requirements must be processed completely with a single contact,
- ✓ customers will have immediate access to product and service information and
- ✓ sales representatives will be able to spend their time growing the business, rather than resolving CI&OM issues.

BPR Basic Principles

- Organize around processes and outcomes, not tasks. IBM
- Centralize and Disperse data. HP
- Capture data Once, at its source. Sun Mircosystems
- Information producers process information. Ford Motor
- Output Users Perform the Process. Phoenix Designs Inc.
- Empower Workers. Mutual Benefit Life
- Integrate parallel activities. Chrysler

BPR: common themes (1)

- Several jobs are combined into one. Jobs evolve from narrow and task-oriented to multidimensional.
- Workers make decisions. Work units change from functional departments to process teams. Processes cross traditional departmental boundaries.
- The steps in a process are performed in a natural order.
- Processes have multiple versions tailored to specific inputs.
- Work is performed where it makes the most sense.
- Checks and controls are reduced. People's roles change from controlled to empowered. Focus on performance measures; compensation shifts from activity to results.

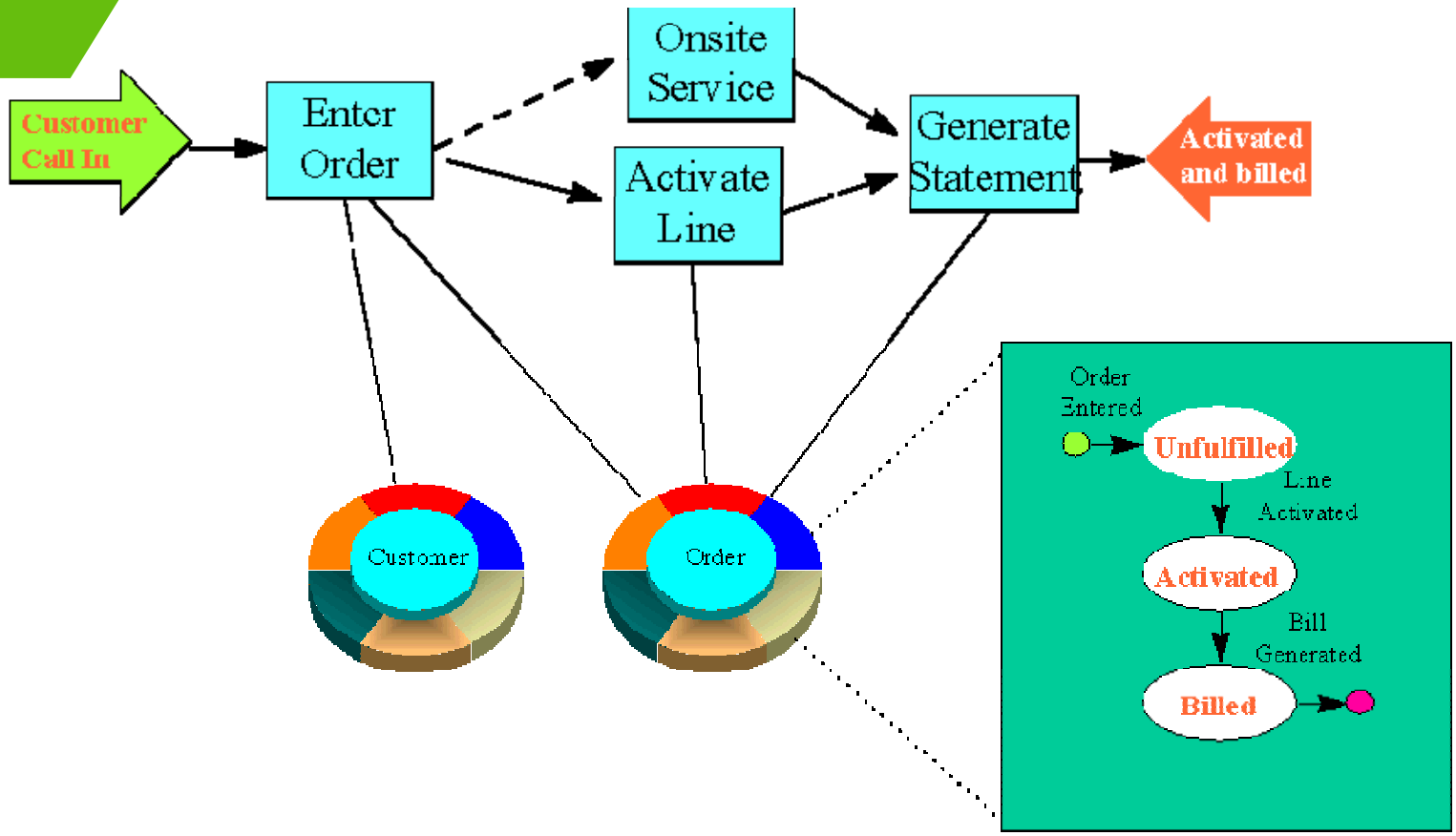
BPR: common themes (2)

- A case manager provides a single point of contact for a customer.
- Hybrid centralised/decentralised operations are prevalent.
- Advancement criteria change - from performance to ability.
- Organisational structures change - from hierarchical to flat.
- Information technology is a key enabler in process reengineering. Particularly enables traditionally fragmented activities to be stitched back together.

Classification of Business Reengineering Projects

Project Type	Process Improvement Cost-Reduction	Achieving Best-In-Class Competitive Parity	Break-Point Rewriting the Rules
Intrafunctional Projects are aimed at single and isolated tasks, activities or single function.	Example 1.1.: Eliminate costly paper work by introducing an e-mail system to internal communication.	Example 1.2.: Reengineer the sourcing process to ensure that the lowest cost suppliers are being selected.	Example 1.3.: A company uses a digital voice recording system to streamline its acquisition process, and to improve communications.
Interfunctional Projects target cross functional business processes, but are contained within a businessunit.	Example: 2.1.: A bank has created a simplified, one page form for loan applications for those customers, seeking up to US$ 60k.	Example 2.2.: Introduce self-directed work teams to the order management process in a manufacturing company.	Example 2.3.: A bank dissolves all existing 120 branches, and introduces an extremely user-friendly direct banking system on the Internet.
Interorganizational Projects bridge between two or more business units, such as the company and its customers and suppliers	Example 3.1.: Link up with one particular vendor for cost saving purposes in product design and parts delivery (single source concept).	Example 3.2.: Reengineering the delivery process between a German machine manufacturer and all its European automotive parts suppliers (just-in-time processes).	Example 3.3.: An automotive company externalizes all employees, except a staff of thirty people. Former employees turn into entrepreneurs and form a network of suppliers together with other vendors

BPR Methodologies



BPR methodology: Hammer/Champy

Project Steps	Objectives
Introduction into Business Reengineering	The CEO initiates the project. She describes briefly and pragmatically the current business situation to start actions. She introduces her vision to the employees of the company.
Identification of Business Processes	This step looks at the broad picture, of how processes interact within the company and in relation to the outside world. One deliverable is a graphical display of all processes.
Selection of Business Processes	The third step serves to select such processes , which - once reengineered - will lead to high value for the company's customers. Also processes, that lend themselves to easy reengineering are being selected.
Understanding the Selected Business Processes	This step does not dwell on a detailed analysis of the functioning of the selected business processes, rather concentrates on the performance of the current processes as opposed to what is expected from them in the future.
Redesign of the Selected Business Processes	The fifth step is according to Hammer/Champy the most creative of all. It is characterized by imagination, lateral thinking and some sort of craziness.
Implementation of Redesigned Business Processes	The last step covers the implementation phase of the Business Reengineering project. Hammer/Champy do not talk about implementation as much as about project planning. They believe in the success of the implementation, once the five preliminary steps have been properly performed.

BPR methodology: Davenport

Project Steps	Objectives
Visioning and Goalsetting	The first step is needed to focus all subsequent actions on company visions and process goals. Cost reduction is considered an important goal, yet Davenport warns against concentrating too much on cost-cutting, because other goals, such as worker satisfaction, reduction of time requirements, and improvement of process performance might be discriminated against.
Identification of Business Processes	This step identifies the business processes, which should be reengineered. Davenport advises Business Reengineering teams to concentrate on a few important, not more than 15 core processes.
Understand and Measure Processes	The third step studies the exact functioning and performance of the selected Business Processes. This differentiates Davenport from the Hammer/Champy approach. Davenport in particular wants to make sure, that during the process redesign old practices are not being "reinvented" and performance benchmarks for the redesigned processes are being set up.
Information Technology	The fourth step serves to study the applicability of Information Technology tools and applications for the newly designed work processes.
Process Prototype	This step covers the design of a functioning prototype of the new Business Process. People in the company study this prototype, develop ideas for enhancements and make themselves comfortable with the redesign of their work processes.
Implementation	The last step serves to implement the tested prototype on a company-wide basis. Davenport considers this step crucial to the success of the overall effort, since implementation takes roughly double as long (minimum one year) as the foregoing steps.

BPR methodology: Manganelli/Klein

Project Steps	Objectives
Preparation	**The first step asks all directly involved persons to define goals and to prepare for the Business Reengineering project.**
Identification	**This step defines a customer oriented process model of the organization, as well as select key business processes for redesign.**
Vision	**The third step serves to define at which performance level the processes currently delivers, and which higher level is required for the future.**
Re-Design **4.1. Technical Design** **4.2. Social Design**	**This step breaks into two parallel sub-steps The Technical Design deals with Information Technology Design to support the new processes. The Social Design step serves to design new work environments for the people, including organizational and personnel development plans.**
Transformation	**The fifth step is meant to implement the redesigned processes and work environments within the organization.**

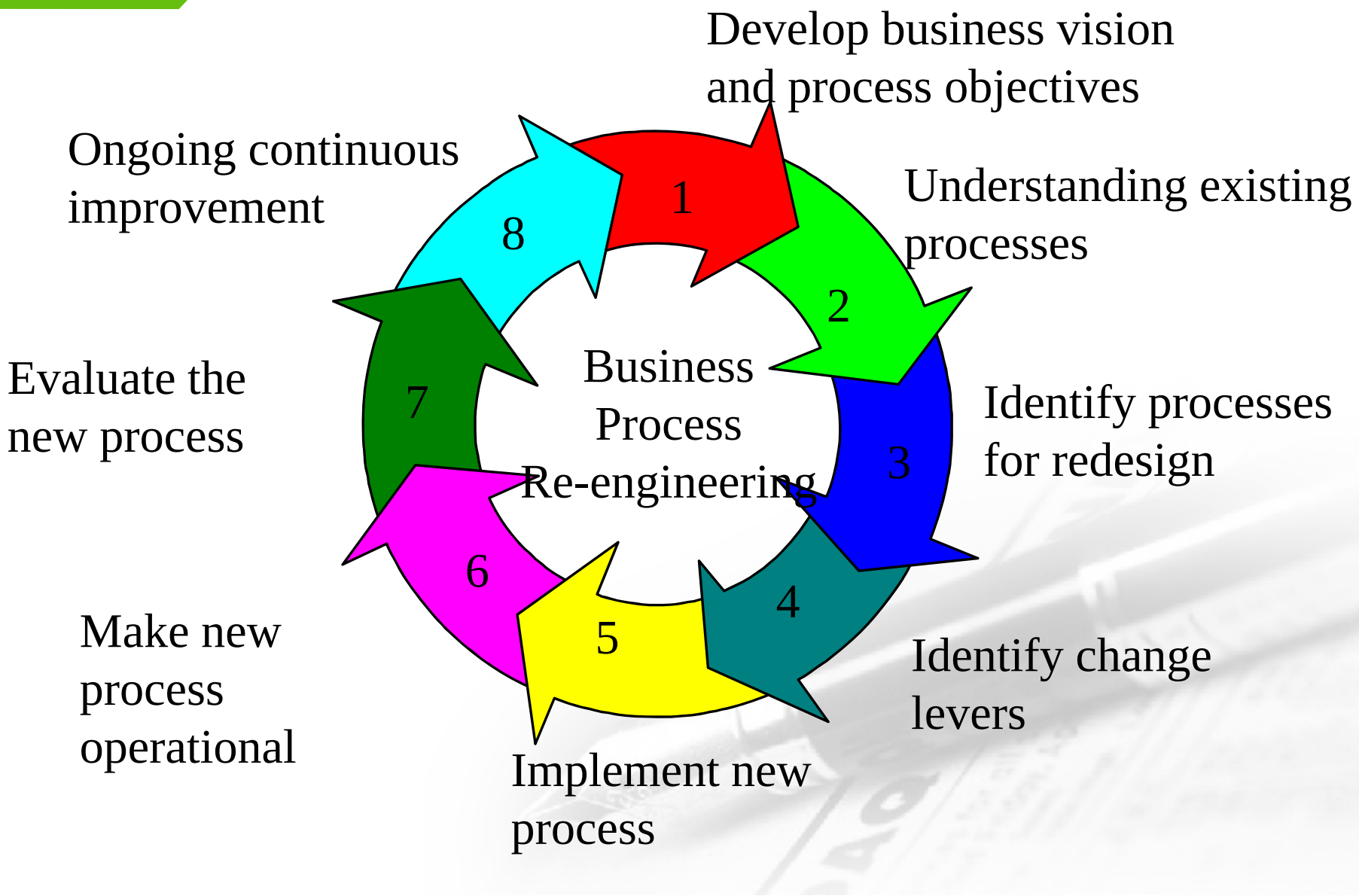
BPR methodology: Kodak

Project Steps	Objectives
Project Initiation	The first step is considered key. It covers project planning and definition of all project administration rules and procedures.
Process Understanding	This step sets the project team up, designs a comprehensive process model for the organization and assigns process managers, who will be responsible for the redesigned process after implementation.
New Process Design	The third step covers the redesign of selected Business Processes, taking into account the potentials of Information Technology. This step ends with the planning of a Pilot Implementation of the redesigned processes.
Business Transition	The fourth step is focused towards the implementation of the newly designed processes within the organization. Part of this step is the adaptation of the organization's infrastructure to the requirements of the newly designed processes.
Change Management	The last step is being performed parallel to the first four steps. The project team handles barriers, which crop up during the course of the Business Reengineering project.

BPR Methodologies: Summary

	Step 1: Project Preparation	Step 2: Redesign of Processes	Step 3: Implementation
Hammer/Champy (Consultants / Academics)	1. Introduction 2. Identification 3. Selection	4. Understanding 5. Redesign	6. Implementation
Davenport (Academic)	1. Visioning and Goalsetting 2. Identification	3. Understand and measure 4. Information Technology	5. Prototyping 6. Implementation
Manganelli/Klein (Consultants)	1. Preparation 2. Identification	3. Process Vision 4a. Technical Design 4b. Social Design	5. Transformation
Kodak (Users)	1. Project Initiation 5. Change Management	2. Understanding 3. New Process Design 5. Change Management	4. Business Transition 5. Change Management

CONDOR BPR methodology



Early BPR Principles

- Process obliteration
- Strong top-down leadership
- Information Technology Enablement
- Employee Empowerment
- This led to alternative paths that were more incremental in nature
- Consultants tended to tailor their services to unique situations

Early BPR Principles

- The “absoluteness” of these principles were dispelled as myths
- This led to alternative paths that were more incremental in nature
- Consultants tended to tailor their services to unique situations to satisfy their clients

BPR Evolution

- More emphasis was placed on strategic linkage, bottom up active participation, smaller projects, and faster cycles
- Rather than a “quick fix”, it is recognized as a form of organizational change
- In essence, it takes time

The Project Stage-Activity Framework

- Developed by Kettinger, Teng, and Guha, 1997
- A customizable, methodological framework
- Guidelines for selecting from a lengthy list of tools and techniques

The Project Stage-Activity Framework

- Envision
- Initiate
- Diagnose
- Redesign
- Reconstruct
- Evaluate

Project Stages

- Envision
  - Involves a project champion that has the support of top management
  - Involves a task force that is knowledgeable about the business processes and how they can be improved

Project Stages

- Initiate
  - Encompasses the assignment of a reengineering team, setting of performance goals, and project planning
  - Develops a business case for reengineering and benchmarking
  - Identifies external customer needs and cost-benefit analysis

Project Stages

- Diagnose
  - Documentation of current processes and sub-processes in terms of process attributes such as activities, resources and communication
  - Identify process requirements and assign customer values

Project Stages

- Redesign
  - Devise process design alternatives through brainstorming and creativity techniques
  - Document and prototype the new process
  - The new design should meet strategic objectives and fit with human resources and IT architectures

Project Stages

- Reconstruct
  - Relies heavily on change management techniques to ensure migration to new processes
  - The platforms and systems are implemented
  - The users go through training and transition

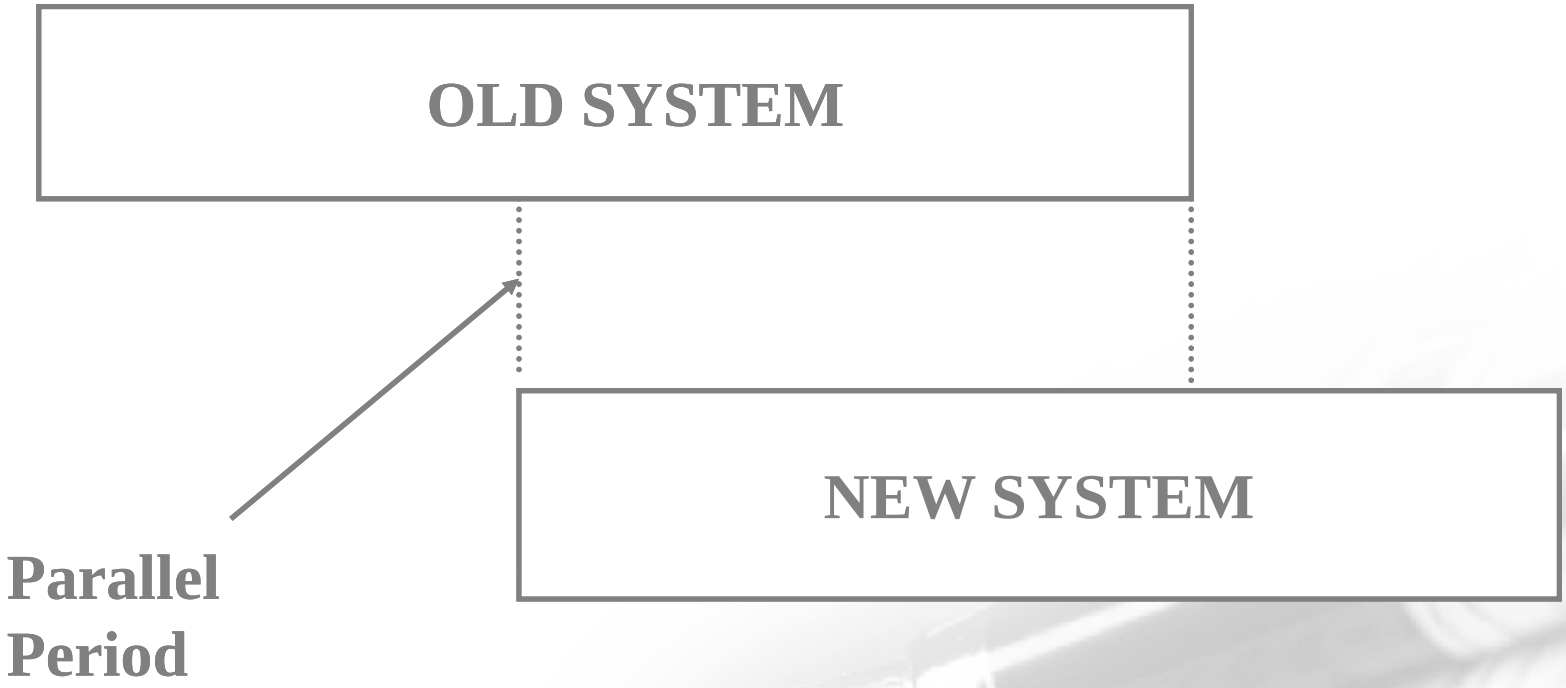
Project Stages

- Evaluate
  - Requires monitoring the new processes to determine if they meet the specified goals
  - Involves linkage to a firm's total quality programs

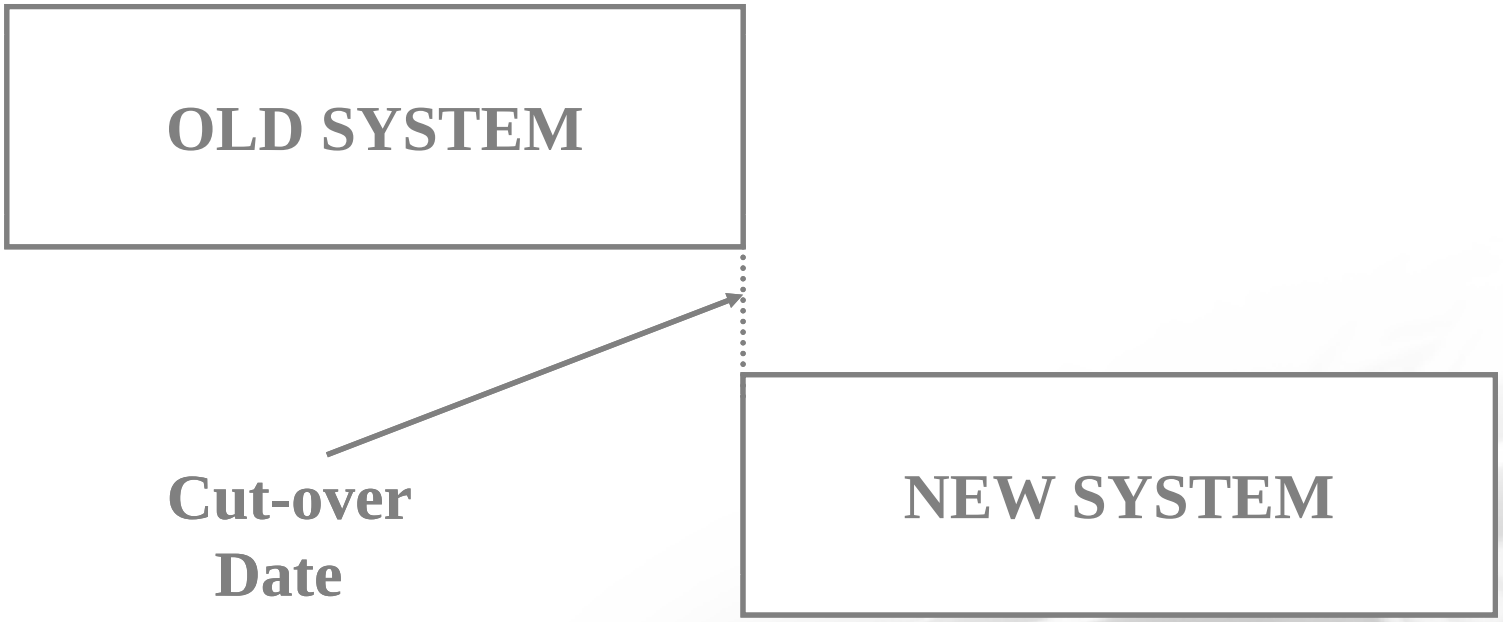
New System Implementation

- If your BPR efforts involve implementing a new information system how to you convert?
  - Types of conversion tactics
    - Parallel
    - Crash
    - Staged

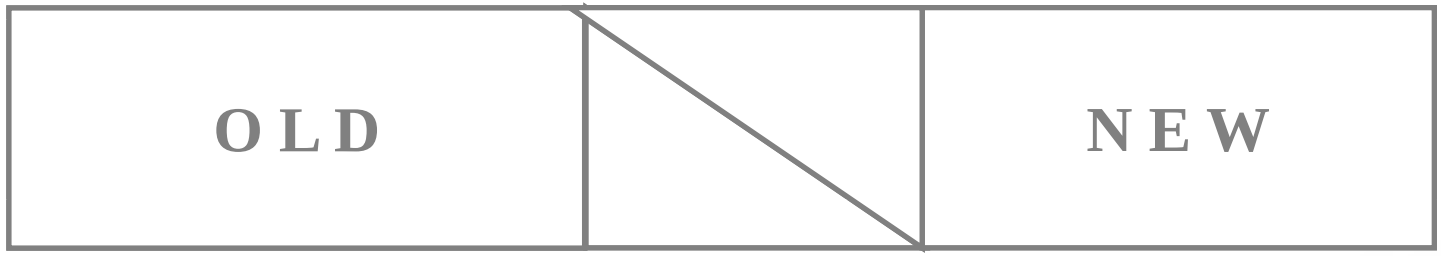
Parallel



Crash



Staged



Conversion Factors

- Costs
- System criticality
- User computer experience
- System complexity
- User resistance

Crucial Aspect

- Persuade your organization to embrace the prospect of major change
- Must develop a clear message about the need to reengineer and why it is essential for survival
- It is a selling job from the beginning to the end

Case for Action

- This states why the company must reengineer
- The argument must be persuasive and supported by evidence
- But it must not be exaggerated
- The document should be brief, 5 – 10 pages, but blunt

Case for Action cont.

- Business Context
  - Summarize what is happening and changing in the environment
- Business Problem
  - Source of organization's concern
- Marketplace Demands
  - How the contextual conditions have led to new performance requirements that cannot be met

Case for Action cont.

- Diagnostics
  - Makes clear why company cannot meet the performance requirements
  - Explain why the usual fix-up techniques of incremental improvements won’t do
- Costs of Inaction
  - What will happen if nothing is done

Vision Statement

- Creating the vision requires “artistry”
- Serves as a “flag to rally the troops”
- Reminds the organization of what they are trying to change
- Provides a yardstick for measuring the progress
- Prevents the organization from becoming distracted

Vision Statement cont.

- It does not need to be long, but it must be powerful
- A lot of visions are vague and simplistic
  - We want to be number one in the industry
  - We will be the preferred supplier for our customers
  - We want to be the premier manufacturer of widgets

These are devoid of real meaning

Powerful Vision

- It should:
  - Focus on operations
  - Include measurable objectives
  - Change the basis for competition in the industry

Sample: Wal-Mart

- Key Market
  - To offer all of the fine customers in our territories
- Contribution
  - All of their household needs
- Distinction
  - In a manner in which they continue to think of us fondly

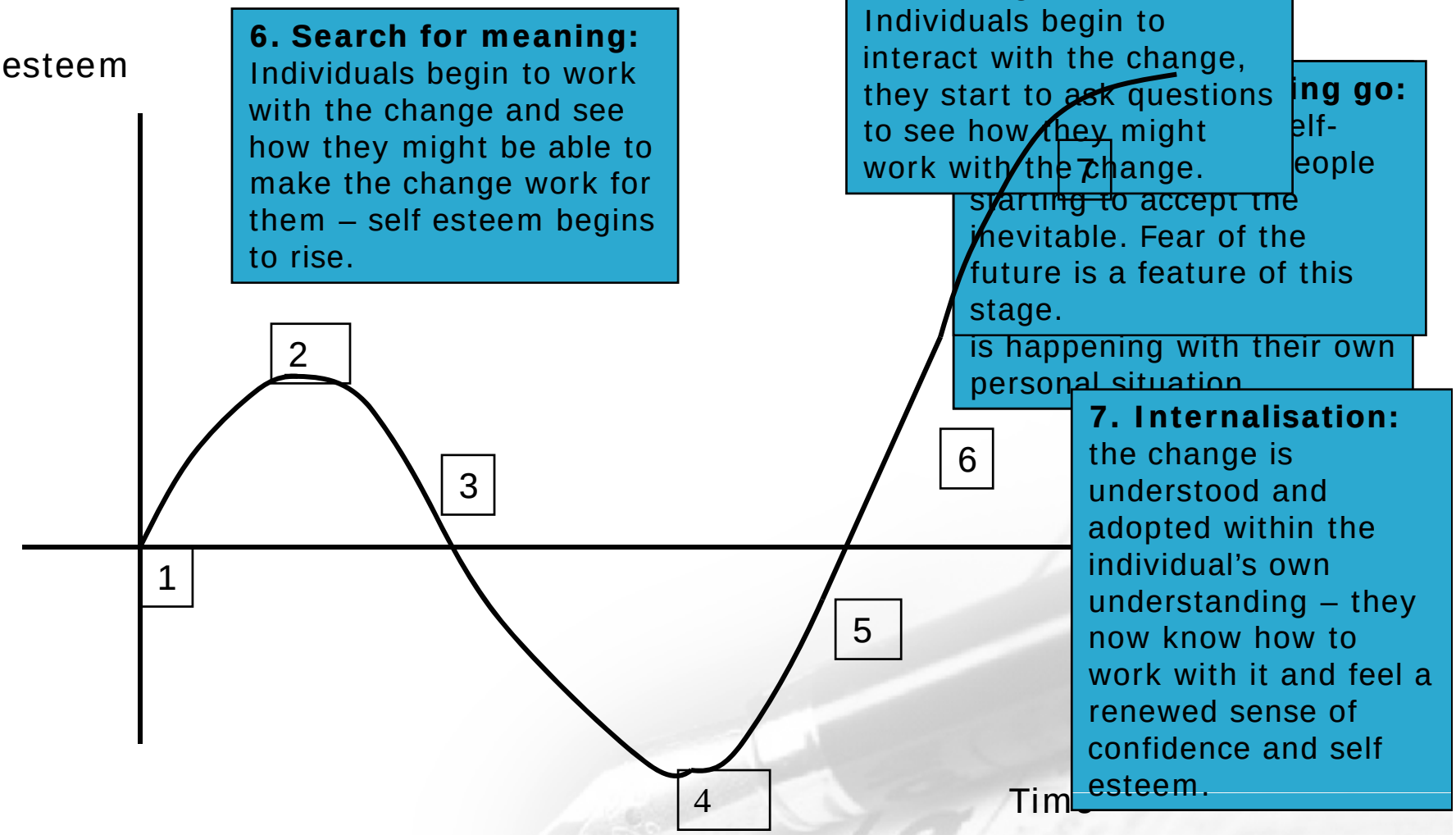
Change Leadership

- The most challenging aspect of business is leading and managing change
- The business environment is subject to fast-paced economic and social change
- Modern business must adapt and be flexible to survive
- Problems in leading change stem mainly from human resource management

Change Leadership

- Leaders need to be aware of how change impacts on workers:
- Series of self-esteem states identified by Adams et al and cited by Garrett
  - Adams, J. Hayes, J. and Hopson, B.(eds) (1976) Transition: understanding and managing change personal change London, Martin Robertson
  - Garrett, V. (1997) Managing Change in School leadership for the 21st century Brett Davies and Linda Ellison, London, Routledge

Change Leadership



5. Testing out:
Individuals begin to interact with the change, they start to ask questions to see how they might work with the change.

6. Search for meaning:
Individuals begin to work with the change and see how they might be able to make the change work for them – self esteem begins to rise.

ing go:
elf-
eople
starting to accept the inevitable. Fear of the future is a feature of this stage.
is happening with their own personal situation

7. Internalisation:
the change is understood and adopted within the individual's own understanding – they now know how to work with it and feel a renewed sense of confidence and self esteem.

Common Errors

- Assigning someone who doesn't understand reengineering to lead the effort
- Attempting to reengineer when the CEO is two years from retirement
- Attempting to successfully reengineer without making anybody unhappy
- The focus is not on the business process
- Trying to fix a process, instead of changing it
- Neglecting individuals' value and beliefs
- Quitting the process too early

(Hammer and Champy, 1993)

Common Problem Categories

1. **Management support problems**: top management's commitment and leadership

2. **Technological competence problems**: IT expertise and infrastructure

3. **Process delineation problems**: defining attributes and requirements of process reengineering
4. **Project planning problems**: planning for reengineering

5. **Change management problems**: getting people to respond positively to change

6. **Project management problems**: managing the reengineering team and project

(Grover, Jeong, & Teng, 1998)

Top 5 Problems (out of 64)

1. Need for managing change is not recognized
2. Top management's quick-fix mentality
3. Rigid hierarchical structures in the organization
4. Line Managers unreceptive to innovation
5. Failure to anticipate and plan for the organizational resistance to change

Top 5 Problems cont.

- 4 out of 5 are **change management** problems

  - People tend to fear changes:

  “Will I be successful under the new regime?”
  “What if my expertise will no longer be valued?”

  - Reengineering is a political process and each stakeholder tries to pursue their own self-interest

- Thus, **careful change management is required**

Obstacles to BPR

- Resistance to Change
- Job Losses
- Tradition and Culture
- Lack of Management Support
- Unrealistic Expectation
- Inadequate Team Skills

BPR Success Factors

- Business Case
- Leadership
- Availability of Resources
- Vision
- Organizational Awareness
- Methodology and Project Management
- Business Process Orientation
- Information Technology
- New Management Style
- Total System Approach

Bibliography

Hammer M. and Champy J. (1993). *Reengineering the Corporation: a manifesto for business revolution.* Nicholas Brearley

Davenport T.H. (1993). *Process innovation: reengineering work through information technology.* Harvard Business School Press

Hammer M. (1996) Beyond Re-engineering. Harper Collins

Earl M.J. (1994). *The New and the Old of Business Process Redesign.* Journal of Strategic Information Systems. 3(1). 5-22.

Chrysler

Integrate parallel activities.

- When Chrysler designed a new car, they had different teams designing the body, the interior, the engine, the transmission. and other elements. When they began assembling the cars, they often found that the components did not fit together properly and had to be redesigned.
- The product development process was reengineered, and Chrysler organized its teams differently. A new team was created for each new car and people from each design area were placed on the team. Chrysler not only reduced the number of costly redesigns but was also able to reduce its product development time significantly.

Mutual Benefit Life

Empower Workers

- Mutual Benefit Life reengineered a thirty-step insurance approval process performed by 19 people in five different departments. Approvals took from five to 25 days. A case manager now has the power to grant approval and performs the entire approval process. MBL eliminated several layers of supervision and control, and the supervisors who remain are responsible for facilitating the work of case managers.
- Case managers are also supported by an expert system and by specialists who help them with particularly difficult applications. Turnaround time improved dramatically since there is no need to pass applications from one person to another. There are fewer errors, and costs decreased substantially. Case managers handle twice the volume of new applications, allowing the company to eliminate one hundred field positions.

Phoenix Designs Inc.

Output Users Perform the Process

- Before reengineering, Phoenix Designs Inc. had its salespersons call on customers to determine what they desired in the way of furniture. The salesmen submitted the ideas to a team that produced a design that the salesperson took back to the customer. Customers made changes and the salesperson took the changes back to the designers. When the salesman took the new design back to the customers, they would again evaluate the design and request more changes. It took up to six weeks to satisfy customers and present them with a final design.
- Phoenix replaced the old system with one in which salespersons, using a PC and a special software package, designed the furniture themselves in less than a week. This system was later improved so that a salesperson could use a portable computer to design the furniture right in the customer's office. The system, which cost Phoenix $1 million, has increased dealer sales by up to 1,000 percent and has boosted after-tax income by 27 percent.

Sun Micro Systems

Capture data Once, at its source

A few years ago management at Sun Micro systems became alarmed that its information systems could not easily communicate with each other. Some data had to be entered as many as ten times into different incompatible systems. The system was reengineered, and now data that is entered into any system anywhere in the world is entered only once and becomes available to whoever needs it.

HP

Centralize and disperse data

Each of Hewlett-Packard's 50 manufacturing units had its own decentralized purchasing system. Although the systems served the needs of the individual units very well, HP was unable to negotiate quantity discounts based on its purchasing power. As part of its reengineering efforts, HP organized a corporate purchasing department that created a data base of approved vendors. HP now has the best elements of centralization and decentralization: each plant meets its needs by purchasing from the approved vendors, and the corporate office tracks purchases and negotiates quantity discounts; wins other concessions from vendors; and resolves problems with vendors. The result was a 75 percent reduction in failure rates, a 150 percent improvement in ontime deliveries, a significantly lower cost of goods purchased, and a 50 percent reduction in lead times.