



centro de educación continua  
división de estudios de posgrado  
facultad de ingeniería unam



CONTINUING EDUCATION SEMINAR  
ON  
EFFECTIVE PRODUCTIVITY ANALYSIS

Prepared for

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**IMPROVING YOUR PRODUCTIVITY**

**THE FIRST STEP**

**The Productivity Payoff**

## **The Objectives**

The objectives of this training program are to:

- **Develop workable definitions of the terms productivity and quality of work life.**
- **Examine the relationship between productivity and quality of work life.**
- **Identify opportunities to improve the productivity and quality of work life in your organization.**
- **Develop an Action Plan which addresses a specific opportunity to improve the productivity and quality of work life in your organization.**

## **The Training Process**

The session you are attending has been designed to be educational as well as practical. You will be working in small groups under the direction of an instructor. The videotape and this workbook will provide the information you need in order to understand and apply the material covered in this program.

Your group will provide the experience and judgment needed to supplement and broaden your thoughts and opinions.

Your instructor will help you relate this training to your organization and your job, ... but what you get from this training and how you apply it is up to you.

## YOUR OPPORTUNITIES

If you're like most managers, you probably can identify several opportunities for improvement. As you go through this program, try to become aware of techniques which you could use to address them.

### Task

Make sure that the opportunities you identify are both within your authority to address and are specific. To help you get started, we have developed an Opportunity Inventory. Check (✓) the ones that are of key importance to you. At the end of this inventory are some lines for you to write in any opportunities which were not listed.

# OPPORTUNITY INVENTORY

## WORK SHEET

Communicating departmental or company goals to your people.	
Planning assignments and projects thoroughly and comprehensively.	
Maintaining high but realistic performance standards.	
Monitoring and assessing performance on a regular basis.	
Reviewing, revising, and updating established systems and procedures.	
Explaining thoroughly to people what is expected of them.	
Communicating effectively with the people who work for you and with you.	
Motivating and leading your people effectively to be successful now and in the future.	
Training your people properly to perform their jobs.	
Assuring that the work environment is conducive to productivity and good Quality of Work Life.	
Involving your people personally in the job by permitting them to participate in departmental problem solving.	
Establishing and maintaining a positive attitude in your department.	

# OPPORTUNITY INVENTORY

## WORK SHEET

Being sensitive to the attitudes and Quality of Work Life of your people.	
Being generally receptive to change, and taking steps to encourage such receptivity in your people.	
Encouraging free and open expression in your department.	
Engaging in self-examination of your individual contribution to productivity and Quality of Work Life.	
Utilizing the special talents and abilities of your subordinates.	
Developing your people by permitting them to make pertinent decisions on their own—with your guidance and help where required.	
Encouraging and fostering the team work approach in your department.	
Taking a personal interest in your people, in their problems and needs.	
Monitoring the way you and your people utilize time.	
Providing a good orientation for new employees.	
Encouraging your people to come up with ideas and better ways to do the job.	
Providing full attention, interest, and support when people come to you with suggestions.	

# OPPORTUNITY INVENTORY

## WORK SHEET

Making sure your people have what they need to do the job.	
Providing positive and constructive criticism and assistance when needed.	
Maintaining a constructive attitude that discourages the concealing of mistakes.	
Focusing on attitudes and action related to preventing problems before they occur.	
Taking appropriate action to minimize avoidable absences and tardiness.	
Complimenting your people for a job well done.	
Maintaining a standard of high ethical conduct plus a hard-line approach toward theft — petty or otherwise — in your operation.	
Preventing material and energy waste to the best of your ability.	
Maintaining a strong personal commitment to improving the productivity of your operation.	
Maintaining a strong personal commitment to improving the Quality of Work Life of your operation.	
Setting a good professional example for those around you.	
Continuing your personal and professional development in your job and in your career.	

# PEOPLE AND WORK

## Exercise 1

In the television commercials you just watched, the employees expressed their personal feelings and opinions about themselves, their jobs, and their company. What are your opinions about people and work?

• Write your answer to the following questions in the space provided below.

• Be prepared to discuss your answers.

WHY DO THESE PEOPLE FEEL THE WAY THEY DO ABOUT THEIR JOBS?

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DO MOST PEOPLE FEEL THIS WAY ABOUT THEIR JOBS?

If yes, why: \_\_\_\_\_

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If no, why: \_\_\_\_\_

---

SHOULD MOST PEOPLE FEEL THIS WAY ABOUT THEIR JOBS?

If yes, why: \_\_\_\_\_

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If no, why: \_\_\_\_\_

---

DO MOST PEOPLE WANT TO DO A GOOD JOB?

If yes, why: \_\_\_\_\_

---

If no, why: \_\_\_\_\_

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**STOP**

Do not proceed  
until instructed to  
do so.



# CHARACTERISTICS OF ORGANIZATIONS

## Exercise 3

"It's our responsibility to create an organizational climate in which our people can contribute and perform most effectively."

We all know from our experience what characteristics make an organization effective and can describe the characteristics of ineffective organizations.

### Task 1

As an individual, think of the WORST organization with which you have been associated. It can be a club, team, or department. In the space provided on the next page, list those characteristics which made it the worst in your opinion. You have 5 minutes for this task.

### Task 2

As an individual, think of the BEST organization you have been associated with. In the space provided on the next page, list those characteristics which made it the best. You have 5 minutes for this task.

### Task 3

Compare your individual work with the others in your group. They may bring up ideas that you would want to add to your list. You have 5 minutes for this task.

### Task 4

Discuss the questions on the next page with the other people in your group.

# CHARACTERISTICS OF ORGANIZATIONS WORK SHEET

## Exercise 3 Continued

<b>Worst Organization</b>
<ul style="list-style-type: none"><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li></ul>
<b>Best Organization</b>
<ul style="list-style-type: none"><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li><li>•</li></ul>

### DISCUSSION QUESTIONS

Did group members generally agree about the characteristics of a good and bad organization? Were individual lists similar?

Can you draw any conclusions about organizations from this exercise?

**STOP**

**Do not proceed  
until instructed to  
do so.**

# CONFIRMATION SHEET

## CHARACTERISTICS OF ORGANIZATIONS

### Exercise 3

Continued

The characteristics of organizations listed below are examples of typical responses developed by groups like yours who have worked this exercise.

#### Task 5

Compare your work sheet with the examples below; notice any similarities and major differences with the characteristics developed by your group.

Worst Organization
<ul style="list-style-type: none"><li>• Poor communications</li><li>• Very close supervision</li><li>• Inefficient operation</li><li>• Poor interpersonal relationships</li><li>• Bad work environment</li><li>• Went from crisis to crisis</li><li>• No sense of purpose</li><li>• Poor leadership</li><li>• Worked seemed meaningless</li></ul>
Best Organization
<ul style="list-style-type: none"><li>• Personal pride in accomplishments</li><li>• Fair and equitable treatment</li><li>• Mutual loyalty and respect</li><li>• Open communications and cooperation</li><li>• Sense of excitement</li><li>• Innovation and experimentation</li><li>• Sense of purpose</li><li>• Shared objectives</li><li>• Opportunity to participate and contribute</li><li>• A successful organization</li></ul>

These lists are representative of the opinions of many people. This is not the "right" answer. Your list is the "right" answer for you.

# WHAT IS PRODUCTIVITY?

## Exercise 4

Productivity is a word with which we're all somewhat familiar. We hear about it in the news; we talk about it on the job. But what is this thing called productivity?

### Task 1

Review the statements below and place a (✓) check in the box(es) which best represent your definition of productivity.

- Productivity means producing high quality goods and services
- Productivity means working faster and harder.
- Productivity means increasing the workforce to provide more products or services.
- Productivity means increasing the use of machines to provide more products or services.
- Productivity is getting more out of what you put in.

### Task 2

Use the space provided below to write your own definition or add to the ideas listed above.

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### Task 3

Be prepared to discuss your answer.

**STOP**  
Do not proceed  
until instructed to  
do so.

# INTERNATIONAL PRODUCTIVITY

## Exercise 5

Which nations of the free world are the productivity leaders? How does our country compare? To answer these questions, complete this exercise.

### Task 1

Review the nations listed in Column A.

### Task 2

In Column B review the ranking of the nations in order of total Productivity. Total productivity refers to Gross Domestic Product which is defined as the total output per civilian employed.

### Task 3

In Column C rank the nations in order of Rate of Productivity Growth, that is growth over time from 1950 through 1977. Use number "1" to indicate your opinion of the nation with the highest productivity growth rate, "2" for next highest, etc.

### Task 4

As a table group, discuss your rankings and agree on a common list.

### Task 5

Your instructor will provide the actual rankings based on information provided by the U.S. Department of Labor.

Enter the actual ranking in Column D.

# INTERNATIONAL PRODUCTIVITY

1950-1977

Exercise 5

## WORK SHEET

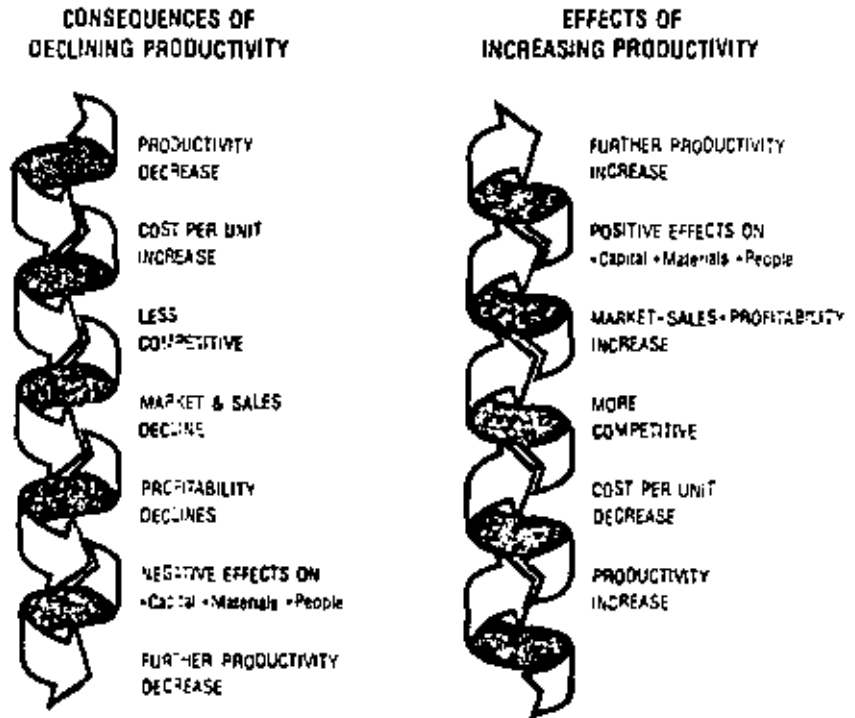
Column A	Column B	Column C	Column D
Countries	Total Productivity (Gross Domestic Product/Capita) 1977	Your Ranking of Rate of Productivity Growth	Actual Ranking of Rate of Productivity Growth
USA	1		
Belgium	2		
Norway	3		
Sweden	4		
Canada	5		
Denmark	6		
France	7		
W. Germany	8		
Japan	9		
United Kingdom	10		
Italy	11		

**STOP**

**Do not proceed  
until instructed to  
do so.**

## PRODUCTIVITY BENEFITS/CONSEQUENCES

Below is a graphic illustration of the benefits of increasing productivity and the consequences of decreasing productivity. Look over this illustration for a few minutes, then Bill Norris will explain it in more detail.



**STOP**  
Do not proceed  
until instructed to  
do so.

# YOUR PRODUCTIVITY EQUATION

## Exercise 7

Consider the productivity equation ... productivity equals outputs over inputs. To improve productivity we must look at a job, department or company in terms of both output and input. As Dr. Grayson stated, this can be a complicated and involved process. This exercise is not designed to provide you with a complete productivity equation. However, by thinking through the outputs and inputs of your department you will be taking the first step in productivity improvement.

### Task 1

Identify the primary outputs of your workgroup by listing the products or services of your workgroup on the productivity equation worksheet on the next page.

### Task 2

Identify the primary inputs of your workgroup by briefly reviewing the capital, material, energy and labor aspects and then listing the primary inputs on the productivity equation worksheet on the next page.



# YOUR PRODUCTIVITY EQUATION WORK SHEET

$$\text{PRODUCTIVITY} = \frac{\text{OUTPUT}}{\text{INPUT}}$$

## OUTPUTS

### Products/Services

What does your workgroup contribute?

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## INPUTS

### Labor

List the numbers of people and the skills directly or indirectly involved in producing the products or services of your workgroup.

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### Capital

Your facility and all machines, tools, and equipment should be considered in this listing.

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### Material

Items considered should include all materials directly or indirectly involved in providing products and services as well as all operating supplies, e.g. raw materials.

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### Energy

List sources of energy such as electricity, natural gas, oil, coal.

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**STOP**

**Do not proceed  
until instructed to  
do so.**

# PRODUCTIVITY IMPROVEMENT

## Exercise 8

Can you identify ways to improve the productivity of your workgroup? The professional supervisor is always looking for ways to make improvements. As you complete this exercise, keep in mind Doctor Grayson's key points.

**Focus on areas in which you have control or influence.**

**Consider the little things... they count up.**

**Concentrate on the major items... they really make the difference.**

### Task

Review the items you listed on your productivity equation in Exercise 7. They are good thought-starters.

Think of at least five specific ways you can improve the products and services of your group.

Think of specific ways you can improve the effectiveness of the capital, material, energy, and human resources of your group.

List the specific productivity improvements that you can make. Use the worksheet on the opposite page to list your ideas.

Do your best because the ideas you list here will be used in formulating your personal Action Plan at the end of the session.

# PRODUCTIVITY IMPROVEMENTS

## Exercise 8

### WORK SHEET

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

**STOP**

**Do not proceed  
until instructed to  
do so.**

# WHAT IS GOOD QUALITY OF WORK LIFE?

## Exercise 9

Dr. Landen stated that in some ways Quality of Work Life can mean different things to each of us because it's really the way we personally feel about our organizations and our jobs. However, he went on to say that there are common factors which shape the Quality of Work Life for most of us:

**Knowing we make a difference to the organization.**

**Contributing to the effectiveness of the organization.**

**Seeing the results so we can take pride in our contribution.**

But these factors are still a bit vague. On a practical level, what does quality of work life mean to you?

### Task 1

On the following page are some statements about work. Review them and place a ( ) in the box(es) which seem to be aspects of good quality of work life.

### Task 2

Write your own definition of quality of work life. Think a few minutes before you write and be as specific as you can.

# WHAT IS GOOD QUALITY OF WORK LIFE?

## WORK SHEET

### Exercise 9

Good Quality of Work Life means:

1. \_\_\_\_\_ Feeling good about coming to work.
2. \_\_\_\_\_ Feeling that what I do doesn't matter.
3. \_\_\_\_\_ Feeling like a little person in a big system.
4. \_\_\_\_\_ Being recognized for what I do.
5. \_\_\_\_\_ Feeling irritated sometimes.
6. \_\_\_\_\_ Feeling I didn't have time to get things done.
7. \_\_\_\_\_ Feeling a sense of achievement.
8. \_\_\_\_\_ Feeling I was growing personally and professionally.
9. \_\_\_\_\_ Feeling a sense of pride in my work and organization.

My definition of good quality of work life is:

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**STOP**

**Do not proceed  
until instructed to  
do so.**

# QUALITY OF WORK LIFE IMPROVEMENTS

## Exercise 10

Improving quality of work life is more than a one-time task. Quality of work life encompasses all aspects of the job and the organization, and maintaining a good quality of work life is an on-going responsibility of each manager. This exercise will give you the opportunity to consider the quality of work life in your workgroup today and identify specific actions you can take to make improvements.

As you complete this exercise, keep in mind these key points:

Focus on areas in which you have control or influence.

Consider things you can do to make your workgroup like the best organization which you described in Exercise 3 (p. 17).

Concentrate on any situations and conditions that have a negative effect on the attitudes of the people in your workgroup, and then determine appropriate corrective action.

### Task

Review the items you listed to describe the best organization in Exercise 3, page 17. They are good thought-starters.

Think of any specific situations or conditions that have a negative effect on the attitudes of the people in your workgroup.

List at least five specific quality of work life improvements you can make. Use the work sheet on the next page to list your ideas.

Do your best because the ideas you list here will be used in preparing your Action Plan at the end of this module.

# QUALITY OF WORK LIFE IMPROVEMENTS

## WORK SHEET

### Exercise 10

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

**STOP**

Do not proceed  
until instructed to  
do so.

# ACTION PLAN

Specific Opportunity: \_\_\_\_\_

Objective(s): \_\_\_\_\_

Available Resources: \_\_\_\_\_

Anticipated Obstacles: \_\_\_\_\_

Projected Benefits: \_\_\_\_\_

Timetable: \_\_\_\_\_

Cost: \_\_\_\_\_



PRODUCTIVITY

MEASUREMENT

# I. INTRODUCTION TO PRODUCTIVITY MEASUREMENT

## A. Historical Background

U.S. productivity improvement (output per man-hour) trend is dropping from 3.2% per year historical rate.

1. Private sector output per man-hour has gone from 4.1% in 1948-53 period to 1.8% in 1973-77 period.

2. 1978 was 0.4%. 1979 began negative.

3. Average annual output per man-hour growth for the following countries during the period 1967-77

Japan - 7.1%	Canada - 3.9%
W. Germany - 5.4%	USA - 2.4%
France - 5.6%	U.K. - 2.4%
Italy - 5.3%	

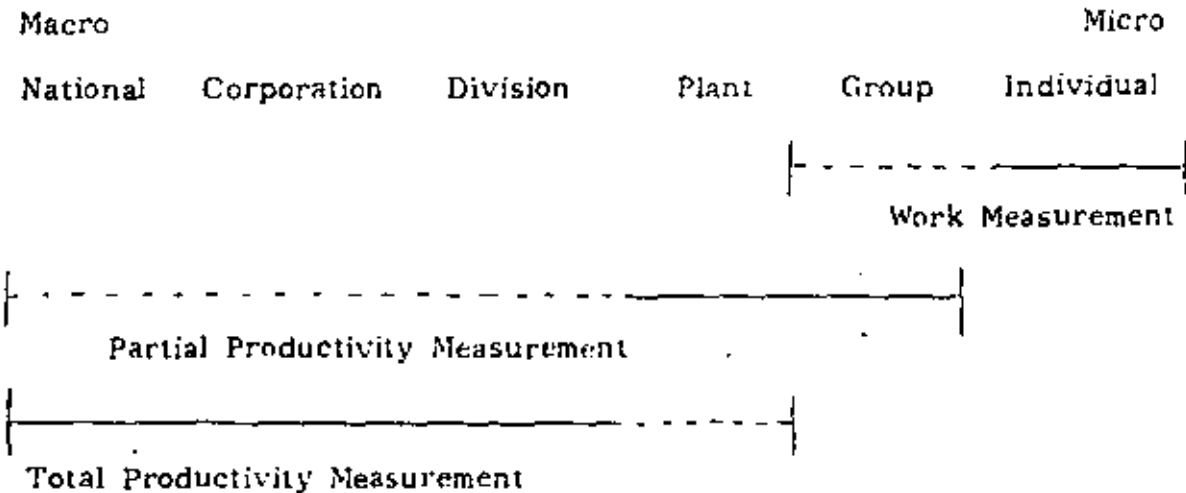
## B. Reasons for falling productivity

1. Reduced industrial investment
2. Government regulations and taxing policies
3. Lower R&D investment
4. Shifts in employment groups
5. Energy crisis

C. Definitions

1. Productivity is defined as ratio of output to input,  $\frac{\text{Output}}{\text{Input}}$ 
  - Expressed in physical units or their equivalent
  - Specifically relates quantities of output to quantities of input
  
2. Partial Factor Productivity
  - Total output related to single input,  $\frac{\text{Total Output}}{\text{Labor Input}}$
  - The BLS output per man-hour is a partial productivity measure
  
3. Total Productivity
  - Ratio of total output to total input
  - $$\frac{\text{Output}}{\text{Labor} + \text{Materials} + \text{Capital} + \text{Energy}}$$
  - This ratio addresses tradeoffs between factors

D. Where to Measure

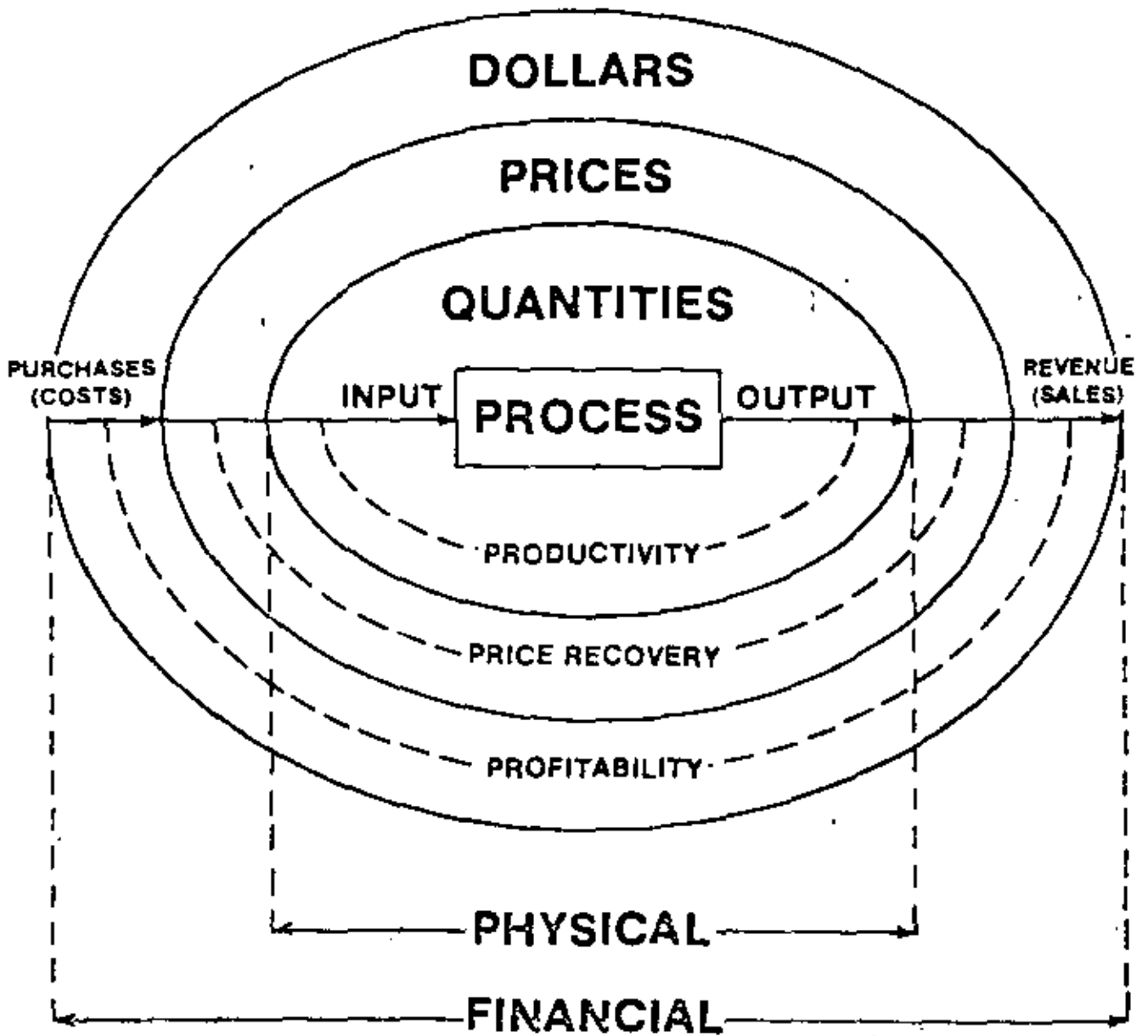


E. Performance Measures

$$\frac{\text{Sales}}{\text{Costs}} = \frac{(\text{Quantities})(\text{Prices})}{(\text{Quantities})(\text{Prices})}$$

- o  $\frac{\text{Sales}}{\text{Costs}}$  = Profitability ratio
- o  $\frac{\text{Quantities}}{\text{Quantities}}$  = Productivity ratio
- o  $\frac{\text{Prices}}{\text{Prices}}$  = Price recovery

# BUSINESS ENVIRONMENT



G. Productivity Measurement Program

1. Provides a second level of analysis to evaluate business performance
2. Provides framework to measure true health of your business over long run
3. Removes the effects of inflation
4. Creates awareness of productivity which causes it to be improved
5. Provides a mechanism for evaluating trade-offs between input resources, i.e. capital for labor.
6. Assures integration of operating and financial data.

## II. PARTIAL PRODUCTIVITY MEASURES

### A. Examples

$$\begin{aligned} \circ \quad \frac{\text{Total Output}}{\text{Partial Input}} &= \frac{\text{Total Output}}{\text{Labor Input}} = \frac{\text{Tons}}{\text{Man-hour}} ; \frac{\text{Tons}}{\text{Employee}} \\ &\frac{\text{Total Output}}{\text{Material Input}} = \frac{\text{Tons}}{\text{Tons}} ; \frac{\text{Tons}}{\text{Ton}} \\ &\frac{\text{Total Output}}{\text{Energy Input}} = \frac{\text{Tons}}{\text{BTU}} ; \frac{\text{Tons}}{\text{BTU}} \\ &\frac{\text{Total Output}}{\text{Capital Input}} = \frac{\text{Items}}{\text{Machine-Hr}} ; \frac{\text{Bushels}}{\text{Acre}} \end{aligned}$$

### B. Characteristics

- o Most meaningful when one input factor is clearly dominant
- o Does not recognize substitution of other input factors

Example:

Sheep shearer: 25/day - manual clipper

75/day - electric clipper

The labor productivity tripled, but the additional capital input is not recognized

- o Difficult to correlate with profitability
- o Subject to misinterpretation and misuse

### C. Types of Partial Productivity Measures

- o Unweighted
- o Weighted
- o Mixed
- o Standard Cost

#### D. Unweighted Measures

- o Multiple inputs and outputs added regardless of differences
  - Janitor hours added to manager hours
  - Barrels of gasoline added to barrels of asphalt
  - Thunderbirds are added with Pintos
  
- o Measure cannot be used when items within a category cannot be counted or added together
  - Adding pencils to typing paper and cassette tapes for office supplies input
  
- o Differences in quality of different inputs and outputs are not recognized
  
- o Period-to-period shifts in product mix are not treated.
  
- o Convenience may outweigh accuracy in many applications.

$$\frac{\text{Barrels of refined oil output}}{\text{Barrels of crude oil input}} = \text{Material productivity}$$

#### E. Weighted Measures

- o Illustration: Student Grades

<u>Course</u>	<u>Grade</u>	<u>Credit Hour</u>	<u>GPA</u>
Phys Ed	A=4	1	4
Math	B=3	3	9
Chemistry	D=1	5	5
	$\frac{8}{8}$	$\frac{9}{9}$	$\frac{18}{18}$

$$\frac{8}{3} = 2.7 \quad \text{GPA} = \frac{18}{9} = 2.0$$

B-

C



- o Aggregate outputs/inputs according to their relative importance.
- o Deals with the effect of changing product mix over time.
- o Possible weighting mechanisms for productivity calculations
  - Unit price
  - Relative margin/unit
  - Value added/unit
  - BTU/unit
- o Results are no better than the weighting system selected

F. Mixed Measures

- o Permits aggregation by use of \$ value or cost when output or input cannot be counted or added in physical units.
- o Weighting permits correction for product mix to give more comparable measure of performance.
- o Affected by inflation unless appropriate price deflators are used to express values in constant dollars.
- o Examples:

$$\frac{\text{Sales}}{\text{Man-hour}} , \quad \frac{\text{Sales}}{\text{Tons Raw Material}}$$

$$\frac{\text{Output}}{\$ \text{ Capital}} , \quad \frac{\text{Output}}{\$ \text{ Payroll}}$$

INFLATION IMPACT  
ON SELECTED ITEMS

<u>ITEM</u>	<u>PRICE</u>	
	<u>1978</u>	<u>2050</u>
HOME	\$55,000	\$3,400,000
AUTO	4,500	281,000
SOCIAL SECURITY	1,070	114,000
BREAD	.60	37.50
NEWSPAPER	.15	9.40

Assumes a 5.75% Annual Increase in the Price Level.

Estimates by Social Security Administration

GEORGIA INSTITUTE OF TECHNOLOGY  
 SCHOOL OF INDUSTRIAL AND SYSTEMS ENGINEERING  
 MATERIAL HANDLING CHECK SHEET  
 FOR RECEIVING

Plant \_\_\_\_\_ Location \_\_\_\_\_

Observer \_\_\_\_\_ Date \_\_\_\_\_

Indicators of Improvement Opportunities	Check		Remarks
	Yes	No	
<b>PLANNING AND DESIGN</b>			
1. Lack of space			
2. Loose items received			
3. Goods not received in loads			
4. Non-standard pallet patterns			
5. No planned pallet patterns			
6. Manual unloading			
7. Goods transferred from vendor pack			
8. No receiving schedule			
9. Inadequate labeling of receipts			
10. Unnecessary unpacking			
11. Unpacking required			
12. Goods over packed; under packed			
13. Receiving in wrong locations			
14. Need more than one location			
15. Heavy or bulky materials moved long distances			
16. No driver waiting area			
17. Poor layout of area			
18. Need analysis of records; data			
19. Need analysis of activities			
20. Carriers waiting too long			
21. No procedure for rush orders			
22. Aisles not marked			
23. Crooked aisles			
24. No expansion potential			
<b>MATERIAL FLOW AND HANDLING</b>			
1. Lift trucks traveling too far			
2. Unnecessary handling			

INSTRUCTIONS AND EXAMPLES FOR  
IMPLEMENTING THE P. I. P. PROGRAM

In situations where there are not enough persons to carry out the full Program, alternative methods are tabulated below:

Levels of implementation	Potential major key participants in PIP	Method of implementation
I.	"Boss" only	<p>A. Follow regular instructions, but scale them down to a one person process and <b>DO IT YOURSELF</b>, as follows:</p> <ol style="list-style-type: none"> <li>1. Tackle one month's theme at a time.</li> <li>2. Evaluate the function, select projects, and record on <i>Plan Book</i> the project for each week.</li> <li>3. Analyze each week's project theme, as your time permits. Solicit help from staff or line.</li> <li>4. Work Improve suggestions into your productivity improvements.</li> <li>5. Implement your improvements</li> </ol> <p>Try to allocate at least <b>ONE HOUR PER WEEK</b> to thinking and/or acting on each project selected.</p> <p>B. Use the PIP Memo concept—a plan for choosing individual Productivity Improvement Opportunities, and delegating them to selected individuals. Additional memo pads available from AIIE.</p>
II.	One Industrial Engineer, or Equivalent	<p>A. Follow regular instructions, but <b>DO IT YOURSELF</b>, with the aid of other staff or line personnel. Try to allocate at least <b>ONE HOUR PER DAY</b> to selected projects. See IA above for details.</p> <p>B. Make use of the PIP Memo concept in IB, above, for bringing ideas to the attention of selected individuals.</p>
III.	Intra-disciplinary Committee	Set up a working group of representatives of the various functions to be involved in the PIP Program and proceed to carry out the Program to as full an extent as possible. Use an Industrial Engineer, or equivalent, as the coordinator of the group.
IV.	Industrial Engineering Department or Equivalent	Carry out the full program, enlisting the help of persons from the several functions, and line supervision, as seems helpful or appropriate.
V.	Consultant	(Same as III, above.)

# GENERAL PROBLEM SOLVING PROCEDURE

## A. Identify the Problem(s)

- 1 May be already known
- 2 Make a plant tour
- 3 Problem identification techniques — PIP Program

## B. Determine Scope of Problem(s)

- 1 Breadth of problem
- 2 Scope of problem(s)

## C. Establish Objective(s)

- 1 Clearly stated
- 2 Basis for solution
- 3 Basis for evaluation

## D. Define Problem(s)

## E. Determine Data to be Collected

- 1 Review Basic Data Required form p. 27-29
- 2 Review general information such as organization chart, company objectives, company policies and long range plans

## F. Establish Work Plan and Schedule

- 1 Cultivate contacts with proper persons
  - 2 Group similar and/or related materials, problems, activity areas for treatment as a single problem
- OR—
- 3 Break overall problem into individual processes, departments, activity areas or functions to facilitate their analysis as separate problems
  - 4 Prepare plans for studying the problem
  - 5 Establish a detailed work schedule
  - 6 Distribute work schedule for comments, suggestions, revision if necessary
  - 7 Assign responsibilities for each portion or phase of the project

## G. Collect Data

- 1 Review sources of data
  - 2 Establish project relationships with other company functions
  - 3 Carefully observe the activity under analysis to be sure it is thoroughly understood
- OR—
- 4 Carefully plan the activity under "synthesis"
  - 5 Collect data
    - a Obtain full data
    - b Record in convenient form
  - 6 Use appropriate graphical techniques
    - i Product(s) component interrelationships
      - 1) Bills of Materials
      - 2) Assembly Charts
    - ii Product-process relationships
      - 1) Operation Process Chart
      - 2) Multi-Product Process Chart
    - iii Production flow patterns
      - 1) Process Chart
      - 2) Flow Process Chart
      - 3) Flow Diagram
      - 4) From-To Chart
      - 5) Activity Relationship Chart
      - 6) Activity Relationship Diagram
      - 7) String Diagram
      - 8) Memo-Motion Pictures
    - iv Information flow
      - 1) Procedure Chart
      - 2) Process Chart
      - 3) Flow Diagram
      - 4) String Diagram
  - 7 Visualize possible improvements
  - 8 Secure supplementary data such as
 

• Schedules	• Building Drawings
• Layouts	• Equipment details
• Flow patterns	• Etc.

- 8 Procure information on each item of equipment
- 9 Secure data on all personnel involved
- 10 Examine procedures and techniques of communications and control

## H. Develop, Weigh and Analyze Data

- 1 Sort and classify all data
- 2 Check all data for completeness and accuracy
- 3 Summarize data on each aspect of the problem
- 4 Determine practicable ranges of all data
- 5 Eliminate, for special examination, items that appear to be out of line
- 6 Average, weight, or otherwise treat data
- 7 Develop charts, graphs, tables
- 8 Check carefully for inconsistencies, omissions, errors, unnecessary activities, irrelevant data

## I. Develop Improvements (And/Or Design Proposed Solution)

- 1 Redefine problem
- 2 Investigate, evaluate and summarize effect of anticipated changes
- 3 Review sources of ideas
- 4 Select possible solution(s) from those suggested or conceived
- 5 Re-examine auxiliary activities
- 6 Make preliminary plans for proposed methods

## J. Prepare Justification

- 1 Set up cost comparisons
- 2 Summarize capital investment required
- 3 Establish rate of return
- 4 Review alternative methods for better rate of return
- 5 Evaluate benefits other than lower cost or better rate of return
- 6 Review solution in terms of problem definition
- 7 State justification clearly and explicitly

## K. Obtain Approvals

## L. Revise as Necessary

- 1 Make revisions
- 2 Obtain approval of revisions

## M. Work Out Procedure for Implementation

- 1 Organize for procurement
- 2 Procure equipment
- 3 Include note on purchase order on vendor followup at predetermined intervals

## N. Supervise the Installation

- 1 Determine construction work required
- 2 Establish manpower requirements
- 3 If possible, use PERT/CPM techniques
- 4 Oversee the installation
  - Assign personnel
  - Authorize any required changes
  - Approve installation
- 5 Plan for training of operators and managers
  - Develop preliminary operation procedures, discuss with appropriate personnel, and finalize all procedures
  - Establish training program for all potential operating personnel
- 6 Startup operations and debug

## O. Follow up

- 1 Equipment warranties
- 2 Watch closely for unforeseeable events (not known until operation)
- 3 Conditions changing after installation
- 4 Partly responsible
- 5 Follow up work
- 6 Periodic evaluation of accomplishment

For a more detailed discussion of the problem solving procedure, see Apple, James M., *Material Handling Systems Design*, Ronald Press Company, New York, NY, 1972, Chapters 5 and 6.

## MARKETING SALES DIVISION

### Personnel

1. Are any changes in the personnel staffing level needed? Are any changes planned?
2. Does the workload appear to be equitably distributed in all areas of Marketing?
3. Are there any regular cyclical patterns in the work flow that cause problems during peak work loads?
4. What kinds of employee training programs does this Division have? Are they adequate? What kind of training is needed?
5. How are employees communicated with about their job performance? How often? Is this adequate?
6. What motivational tools or techniques are used to encourage more effective and efficient performance?
7. Are you aware of any attitude or morale problems? If so, what do you think may be the cause(s)? How do you think they can best be solved?
8. What kinds of constraints (inside or outside the Department, or the Company) keep you and your subordinates from doing the most effective and efficient job? What can be done?

### Data and Communications

1. What kind of information do you use to carry out the objectives of your job? Is the data provided on a timely basis? Is it sufficient? Accurate? Well organized? Understandable? How could it be improved?
2. Are there any potential data processing applications that would aid you in your job?
3. What reports are generated in your area of responsibility? Who uses them?
4. Do you receive or generate any reports or other information that you feel aren't being used (wholly or in part)?
5. Are you aware of any areas where communications to, from, or within the Marketing Department present difficulties?

### Analysis

1. What criteria are used in judging the performance of your operations or your job?
2. What data are used to compare your operations with that of your competitors? What would be helpful?
3. What data are used in analyzing potential markets and market expansion? What is needed?

## Capital

1. What ways could the utilization of resources (people, equipment, facilities) be improved, especially where these resources may be underutilized?
2. What capital expansions are scheduled in the next 12 to 24 months?
3. What performance criteria are used for evaluating new investments? What benchmarks are used for project acceptance?
4. How do you determine if an operating unit is not meeting its operational (profitability) goals? Are there any units currently in this category? Does available accounting data present any problems in adequately evaluating an operating unit?
5. What kind of improved tools or equipment (for office and field locations) do you think would aid this Division in being more efficient, effective, and/or profitable?



General

1. Do you know of any policies and/or procedures that seem to limit rather than enhance performance?
  
2. Do you know of any areas or situations where well defined policies and/or procedures would enhance performance?
  
3. Are there any unusual scheduling problems (getting the right products, to the right place, at the right time)?
  
4. Keeping in mind that productivity is "getting more out of what you put in" and involves people, materials, capital, and energy, what have you seen in the past few years in this Division ...
  - (a) that might have increased productivity
  
  - (b) that might have decreased productivity
  
5. Are our competitors doing some things that we should be doing?
  
6. Where do you think we should concentrate our efforts in the productivity appraisal of this Division?

## APPROACHES TO AWARENESS/COMMITMENT (STEP 1)

1. Attend an overview seminar on how to plan and manage a successful productivity improvement program.
2. Formalize organizational objectives
3. Establish a focal point for productivity coordination:
  - a) Steering committee
  - b) Productivity coordinator
4. Examine managerial style to determine the appropriate appraisal system to use.
5. Investigate outside productivity related consulting services.
6. Conduct group informational meetings at various organizational levels.
7. Conduct training programs to increase productivity awareness of supervisors and subordinates.
8. Announce productivity objectives, approach, involvement desired, and time schedule.
9. Communicate productivity performance progress to individuals through a personal performance evaluation system.
10. Implement an employee suggestion system.
11. Appraisers attend seminars on productivity appraisal systems.
12. Meet with Union leaders and explain/discuss and increase understanding of productivity problems, solutions, and benefits of improved productivity.
13. Distribute literature and publicize productivity trends in company reports.
14. Publicize historical successes of productivity improvement in your company

## APPROACHES TO ESTABLISHING TARGET AREAS AND ASSESSING LEVERAGE POINTS (STEP 2)

1. Review current productivity measurement systems.
2. Attend a seminar on how to measure productivity.
3. Conduct an employee attitude survey.
4. Ask the "Experts" what the barriers are to productivity improvement and to identify specific productivity problems and opportunities.
5. Utilize "Nominal Group" and other brainstorming techniques to define problem areas as perceived by employees.
6. Forecast the future and anticipate productivity problems.
7. Review process performance records.
8. Review accounting data to determine performance trends and variances.
9. Identify practices (management, employee, systems, procedures) which restrict productivity.
10. Conduct employee interviews at all levels.
11. Review job descriptions to identify and clarify responsibility for productivity improvement.
12. Identify and associate job responsibility to asset responsibility in matrix analysis.
13. Review staffing trends by department, location, and company.

APPROACHES TO DEVELOPING STRATEGIC AND TACTICAL SUPPORT  
(STEP 3)

1. Compare measured past performance against organizational objectives.
2. Assess the dollar impact on problem and opportunity areas
3. Prioritize for an in-depth study of areas indicating the highest return for productivity improvement efforts.
4. Develop a work plan and establish completion dates.
5. Test work plan by reviewing it with persons who are "experts" as a result of experience, expertise, and hind-sight/fore-sight vision.
6. Assign responsibility for detailed appraisal effort.
7. Submit work plan for management approval.

APPROACHES TO IDENTIFYING PRODUCTIVITY IMPROVEMENT OPTIONS  
(STEP 4)

1. Initiate effect/cause analysis
2. Conduct interviews with personnel at all levels of the organization.
3. Use Nominal Group participation technique.
4. Organize a Quality Circles team effort.
5. Conduct a comparison of theoretical vs. actual performance.
6. Maximize the communication of employee ideas and suggestions.
7. Analyze variance from standards of expectancy.
8. Utilize work methods analysis.
9. Evaluate personal observations and intuitive judgement.
10. Review literature concerning management of improvement.
11. Determine what others are doing to improve productivity through:
  - a) Publications
  - b) Conferences
  - c) Associations
  - d) Research

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## G. Standard Cost Systems

- o A basis for cost control and a measure of productive efficiency when compared to actual costs.
- o Highlights inefficiencies and provides a means for management by exception.
- o Measures productivity efficiency of variable input elements against the standard.
- o Measures pricing impact on profit variance.
- o Output is not weighted.
- o It is difficult to allocate fixed and semi variable costs.
- o Generally only addresses cost performance; does not consider capacity utilization and effects of mix as effective ways to improve the productivity of capital.
- o Does not provide long-term measures for performance trends.
- o Standards can be costly to maintain.

H. Examples of labor partial measures illustrated:

- Sales per man-hour - mixed
- Sales per compensation dollar - financial
- Unit labor cost - unit cost
- Pure physical - units per man-hour - unweighted
- Weighted output to weighted input - weighted



PRODUCTION DATA

<u>Category</u>	<u>Period 1</u>			<u>Period 2</u>		
	<u>Value V</u>	<u>Quantity Q</u>	<u>Price P</u>	<u>Value V</u>	<u>Quantity Q</u>	<u>Price P</u>
<u>Total Output</u>						
Chairs	\$50,000	1,000	\$ 50	\$66,000	1,200	\$ 55
Tables	<u>\$40,000</u>	200	\$200	<u>\$33,600</u>	160	\$210
Total	\$90,000			\$99,600		
 <u>Labor Input</u>						
Woodworker	\$24,000	4,000	\$6.00	\$30,400	3,800	\$ 8.00
Finisher	<u>\$ 8,000</u>	1,000	\$8.00	<u>\$ 8,320</u>	800	\$10.40
Total	\$32,000			\$38,720		

PERFORMANCE MEASURES - LABOR

$$\begin{aligned} \text{Index A} &= \frac{\left(\frac{\text{Sales}}{\text{Man-hour}}\right)_2}{\left(\frac{\text{Sales}}{\text{Man-hour}}\right)_1} \times 100 \\ \text{(current data)} &= \frac{\left(\frac{\$99,600}{4,600}\right)_2}{\left(\frac{\$90,000}{5,000}\right)_1} \times 100 \\ &= 120.3 \quad (\text{A } 20.3\% \text{ increase}) \end{aligned}$$

- o Inflation effect not removed - sales are expressed in current dollars.
- o Differences in skill level of labor input not accounted for.
- o Tends to overstate performance due to inflation effects.

## PERFORMANCE MEASURES - LABOR

$$\begin{aligned} \text{Index B} &= \frac{\left( \frac{\text{Sales}}{\text{Compensation}} \right)_2}{\left( \frac{\text{Sales}}{\text{Compensation}} \right)_1} \times 100 \\ \text{(financial)} & \\ &= \frac{\left( \frac{\$99,600}{\$38,720} \right)_2}{\left( \frac{\$90,000}{\$32,000} \right)_1} \times 100 \\ &= 91.5 \quad (\text{An } 8.5\% \text{ decrease}) \end{aligned}$$

- o Important financial measure.
- o Compensates for different skill levels
- o Assumes ratio is self-deflating - but if inflation affects sales prices and wage rates differently, as is generally the case, ratio is not a good measure of productivity.

NOTE: This ratio is computed in APC Performance Measurement System (profitability performance ratio for labor).

PERFORMANCE MEASURES - LABOR

$$\begin{aligned}
 \text{Index C} &= \frac{\text{Standard Cost} - \text{Actual Cost}}{\text{Standard Cost}} \times 100 \\
 \text{(unit cost)} &= \left( 1 - \frac{\text{Actual Unit Cost}}{\text{Standard Unit Cost}} \right) \times 100 \\
 &= \left[ 1 - \frac{\left( \frac{\text{Labor cost}}{\text{Items Produced}} \right)_2}{\left( \frac{\text{Labor cost}}{\text{Items Produced}} \right)_1} \right] \times 100 \\
 &= \left[ 1 - \frac{\left( \frac{38,720}{1,360} \right)_2}{\left( \frac{32,000}{1,200} \right)_1} \right] \times 100 \\
 &= 1 - \frac{28.47}{26.67} \\
 &= -6.8 \qquad (6.8\% \text{ unfavorable})
 \end{aligned}$$

- o Distorted by change in output mix (adds tables and chairs).
- o Distorted by change in labor mix.
- o Must remove changes in wage rates to use as productivity measure.

PERFORMANCE MEASURES - LABOR

$$\begin{aligned} \text{Index D} &= \frac{\left( \frac{\text{Items produced}}{\text{Man-hours used}} \right)_2}{\left( \frac{\text{Items produced}}{\text{Man-hours used}} \right)_1} \times 100 \\ \text{(unweighted)} &= \frac{\left( \frac{1,360}{4,600} \right)_2}{\left( \frac{1,200}{5,000} \right)_1} \times 100 \\ &= 123.2 \quad (\text{A } 23.2\% \text{ increase}) \end{aligned}$$

- o Fails to account for quality differences in output - chairs are not the same as tables.
  
- o Fails to account for quality differences in input - woodworker skills are different from finisher skills.

PERFORMANCE MEASURES - LABOR

$$\begin{aligned}
 \text{Index E} &= \frac{\left( \frac{\text{Price-weighted output}}{\text{Price-weighted input}} \right)_2}{\left( \frac{\text{Price-weighted output}}{\text{Price-weighted input}} \right)_1} \\
 \text{base-period} & \\
 \text{price weighted} & \\
 &= \frac{\left( \frac{1,200 (50) + 160 (200)}{3,800 (6) + 800 (8)} \right)_2}{\left( \frac{1,000 (50) + 200 (200)}{4,000 (6) + 1,000 (8)} \right)_1} \times 100 \\
 &= 112.0 \qquad \text{(A 12.0\% increase)}
 \end{aligned}$$

- o Adjusts for quality and mix changes in both output and input.
- o Employs base-period price weighting which facilitates trend analysis in future periods.

NOTE: This ratio is computed in APC Performance Measurement System (productivity ratio for labor).

PERFORMANCE INDEXES

<u>INDEX</u>	<u>DESCRIPTION</u>	<u>CHANGE</u>
A	SALES/MAN-HOUR	+20.3
B	SALES/COMPENSATION	-8.5
C	UNIT COST	-6.8
D	ITEMS/MAN-HOUR	+23.2
E	WEIGHTED OUTPUT/WEIGHTED INPUT	+12.0

BEST MEASURE OF RESOURCE UTILIZATION

INDEX

(How Well You Used Labor)

E

#### IV. TOTAL PRODUCTIVITY MEASUREMENT

##### A. Advantages of total productivity measurement

- o Considers all the resources used in producing output
- o Evaluates resource trade-offs between inputs
- o Combines inputs according to their relative importance (weighted)
- o Accounts for both mix and quality changes
- o Appropriate weights that can be used to compute total productivity
  - Product prices - output
  - Total unit cost - input
  - Actual price of individual input elements - output and input

##### B. Limitations of total productivity measurement

- o Data collection is more difficult than for partials
- o Total is not a substitute for partial productivity measures - it is a supplement
- o Results are affected by selection of weighting system and/or price deflators
- o Weighting systems only approximate the effects of removing product mix and/or quality changes
- o Capital assumptions strongly affect results (i.e. return on capital and current value estimates)



C. Special capital productivity considerations

- o Return to capital (or opportunity cost) is included in addition to depreciation
- o Capital employed to be identified by period in order to be included as an input
- o Appropriate deflators must be selected and applied - i.e. construction indexes
- o Reproduction or replacement costs are used instead of book value to determine capital employed.
- o Capital input must be stated as a quantity-price relationship

## ON MEASUREMENT OF PRODUCTIVITY

"FACED WITH THE IMPOSSIBILITY OF EXACT ANSWERS TO QUESTIONS THAT WE WOULD DEARLY LIKE TO ANSWER, WE HAVE THREE OPTIONS: WE CAN FORGET ABOUT IT, WE CAN WILLFULLY FORCE THE ANSWERS AND TRY TO USE OUR AUTHORITY TO MAKE THEM STICK. OR WE CAN DEVISE AN ACCEPTABLE AND BELIEVABLE PROCESS FOR GENERATING ANSWERS EVEN IF THE ANSWERS THEMSELVES ARE KNOWN TO BE IMPERFECT"

ORGANIZATIONAL PRODUCTIVITY:  
THE HUMAN DIMENSION  
DANIEL H. GRAY

GRAY'S LAW

"PURITY, PRECISION AND PERFECTION  
KILL PRODUCTIVITY"

#### D. The APC Performance Measurement System

- o Measures total productivity at the firm or plant level.
- o Partial performance measures need to be determined.
- o Permits analysis of productivity tradeoffs between labor, capital, materials and energy.
- o Provides performance measures of profitability, productivity and price.
- o Performance measures are expressed in terms of indexes and dollar contribution to profitability.
- o Provides analytical technique for determining productivity impact on profits.
- o Allows analysis of the effect of inflation on profits.
- o Value, quantity, and price data is required for each product and resource in any level of detail desired.

- Sources of data:

Income statements

Balance sheets

Inventory records

Sales records

Payroll records

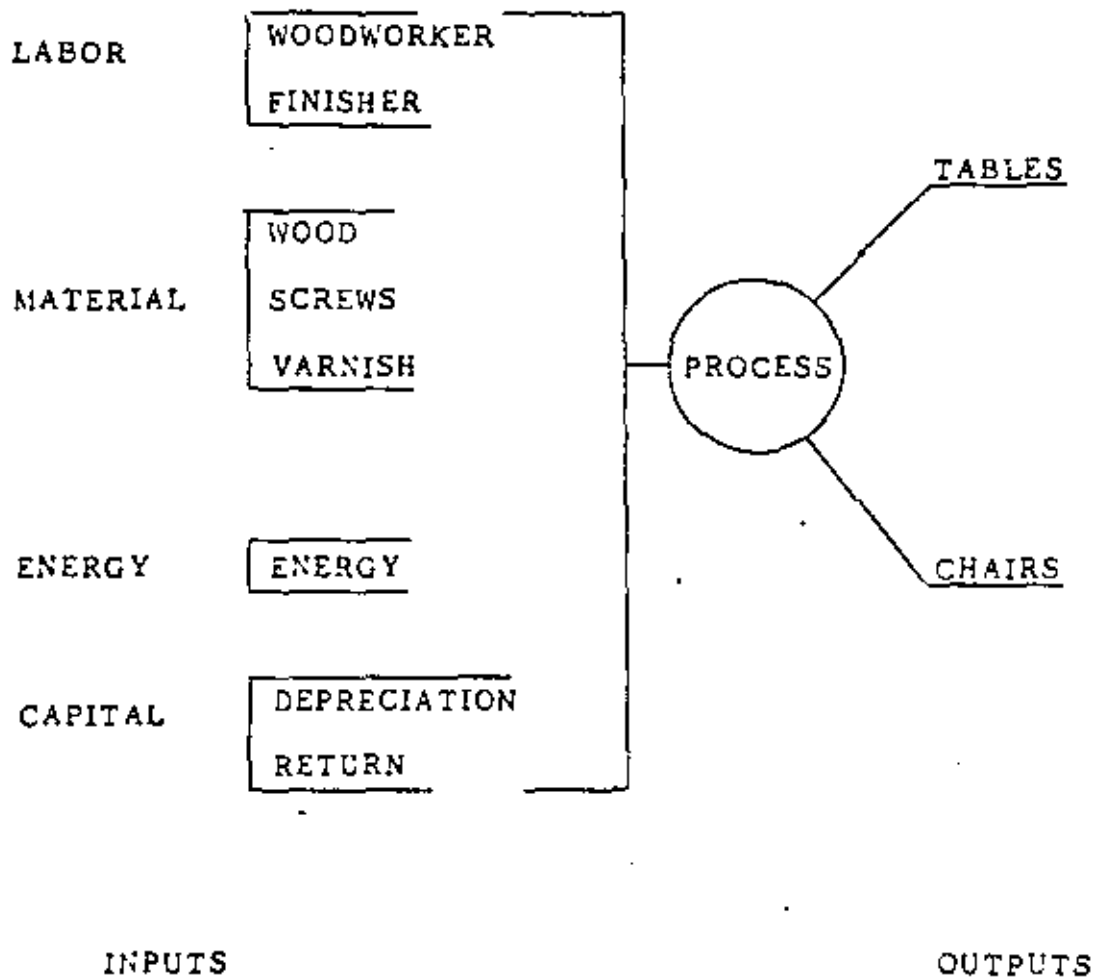
Production records

Voucher records

Shipment records

ALPHA PRODUCTS COMPANY

TOTAL PRODUCTIVITY ANALYSIS



#### E. Total Productivity Analysis

- o Collect data in suitable format for each time period (inputs and outputs)
- o Compute change ratios and dollar variances for all inputs and outputs
- o Compute performance indexes and profit effects for all inputs
- o Develop management summary of performance and profit analysis

#### F. Example Case of Total Productivity Measurement

## V. WHITE COLLAR PRODUCTIVITY MEASUREMENT

### A. Increasing Importance

- o American work force now majority "white collar"
- o Increasing education and aspirations of entry-level workers imply need for new techniques
- o Individual measurement and group measurement need different approaches

### B. Individual Productivity Measurement

- o Casual observation
- o Time monitoring (input emphasis)
- o Work standards (output emphasis)
- o Negotiated objectives ("management by objectives" link needed)

### C. Departmental Productivity Measurement

- o Collection of individuals
- o Department partial measures
- o Staffing comparisons (IBM)
- o Budgetary overhead control
- o Group set measures (NGT)

### D. Nominal Group Technique, Rationale

- o Conveniently exploits "grass roots" wisdom to solve difficult problem

- o Successfully tested in computer centers, manufacturing plants, oil companies, research organizations
- o Used for generating productivity improvements or measures, quality improvements or measures
- o "Nominal" because true group (interaction, conversation, informal leadership) not allowed to form
- o Uses vertical slice through organization, 10-15 talented individuals
- o "Outside" facilitator and "inside" scribe recommended

E. Nominal Group Technique, Procedure

- o Introduction and definition of problem ("List the important measures for productivity in your organization.")
- o Silent generation
- o Round-robin
- o Editing discussion
- o Voting and ranking
- o Consensus (and commitment)

F. Measures in Computer Center (selection from over 100)

- o % Meet User Deadline
- o Turnaround Time
- o % Info Received Not Relevant
- o % User Population Aware Capabilities
- o % Center Suggestions Adopted By User

- o User Attendance At User Meetings
- o % User Updates To Center Updates
- o Frequency of Errors Found By Users
- o Number Different Users Per Data Base
- o On-Line Response Time
- o Percent Downtime
- o Time Spent Rerunning Jobs

G. Nominal Group Technique, Aggregation

PRODUCTIVITY REPORT

<u>Measure</u>	<u>Weight</u>	<u>This Quarter</u>	<u>Last Quarter</u>
DOWNTIME	.3	17	20
MEET USER DEADLINE	.3	95	87
RERUN TIME	.2	250	221
REPEAT COMPLAINTS	.1	11	13
ON-LINE RESPONSE	<u>.1</u>	2.7	2.3
PRODUCTIVITY INDEX	1.0	88	82

H. Output Weighting System ("Scoring")

- o Imposed standards
- o Negotiated standards
- o Peer review
- o User review



I. Interface with Management System

- o Productivity goals, line and staff departments
- o Simultaneous review with profitability
- o All input factors (where appropriate)
- o ROHR vs. RONA (Upjohn)

J. Upjohn performance analysis technique

- o Inadequate attention normally given to efficient use of factors other than capital in divisional performance analysis and capital budgeting
- o The long-range commitment in hiring one entry-level professional employee exceeds \$2 million; yet less attention may be given to that decision than to the purchases of a \$50,000 machine.
- o In most analysis systems, B has improved, but A hasn't.
- o Whether C has improved or not depends on relative "utility" of ROHR or RONA in eyes of directors.

K. Impact of Technology

- o Definition of current work and future needs should dictate equipment purchases rather than vice versa
- o Segregation of logical process from traditional physical process; robotization versus rationalization
- o Interfunctional analysis to avoid sub-optimization from one department's isolated automation plan

## UPJOHN

### CAPITAL INVESTMENT

- NEEDS ANALYSIS
- MACHINE SPECIFICATION
- CAPITAL BUDGET/ROI
- INVESTMENT COMMITTEE
- PURCHASE

COMMITTED

\$50,000

### HUMAN INVESTMENT

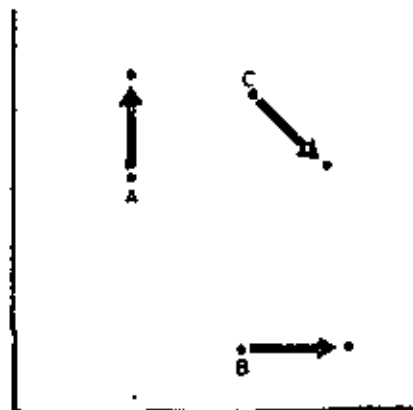
- NEEDS ANALYSIS
- JOB SPECIFICATION
- ?
- ?
- RECRUIT

COMMITTED

\$2,000,000

## UPJOHN

$$\text{ROHR} = \frac{\text{VALUE ADDED}}{\text{PAYROLL}}$$



$$\text{RONA} = \frac{\text{VALUE ADDED}}{\text{NET ASSETS}}$$

- o Psychological barrier analysis needed before, during, and after major change

L. Summary

- o Try measuring, integrate reporting of the measure, use it in other planning activities
- o Emphasize departmental measures rather than individual measures
- o Keep up with office technology, either major threat or major productivity improvement opportunity depending on treatment
- o Maximize employee participation in measure setting and analysis
- o Renovate measurement system occasionally through objective appraisal by non-participants

## VI. MEASURING PRODUCTIVITY IN YOUR FIRM

### A. Level of Analysis

- o Corporation/Division
- o Plant
- o Operating unit
- o Staff group

### B. Key Factors

- o Labor
- o Capital
- o Energy
- o Materials

### C. Participation Policy

- o Handed down
- o Negotiated between
- o Developed up

### D. Data Available

- o Formal financial records
- o "Informal" records
- o MBO
- o Engineered standards
- o Industry data

E. Bridge to Action

- o Focal person or group
- o Regular review at all levels
- o Integration with financial reporting
- o Planning goals
- o Systematic attack on weak spots
- o Start with successful operations

APPROACHES TO EVALUATING PRODUCTIVITY OPTIONS & ESTABLISHING  
PRIORITIES (STEP 5)

1. Analyze rate of return on investment
2. Evaluate assigned values.
3. Rank by weighting
4. Evaluate implications to cash flow
5. Evaluate the effect on short and long range strategy of:
  - a) Government regulations
  - b) Marketing strategy
  - c) Labor relations
  - d) Capital availability
  - e) Etc.
6. Maintain an awareness of political realities:
  - a) Individual
  - b) Group
  - c) Company
7. Apply personal judgement

## APPROACHES TO COUPLING OPTIONS WITH ACTION PLANNING (STEP 6)

1. Review recommended options with appropriate management personnel.
2. Prioritize options in conjunction with business strategy.
3. Implement immediately those options which do not require long-term scheduling and/or project development.
4. Incorporate selected options into overall planning system.
5. Establish systematic follow up to assure timely implementation and evaluation of benefits.
6. Summarize productivity performance for local and intra-company publicity.

PRODUCTIVITY

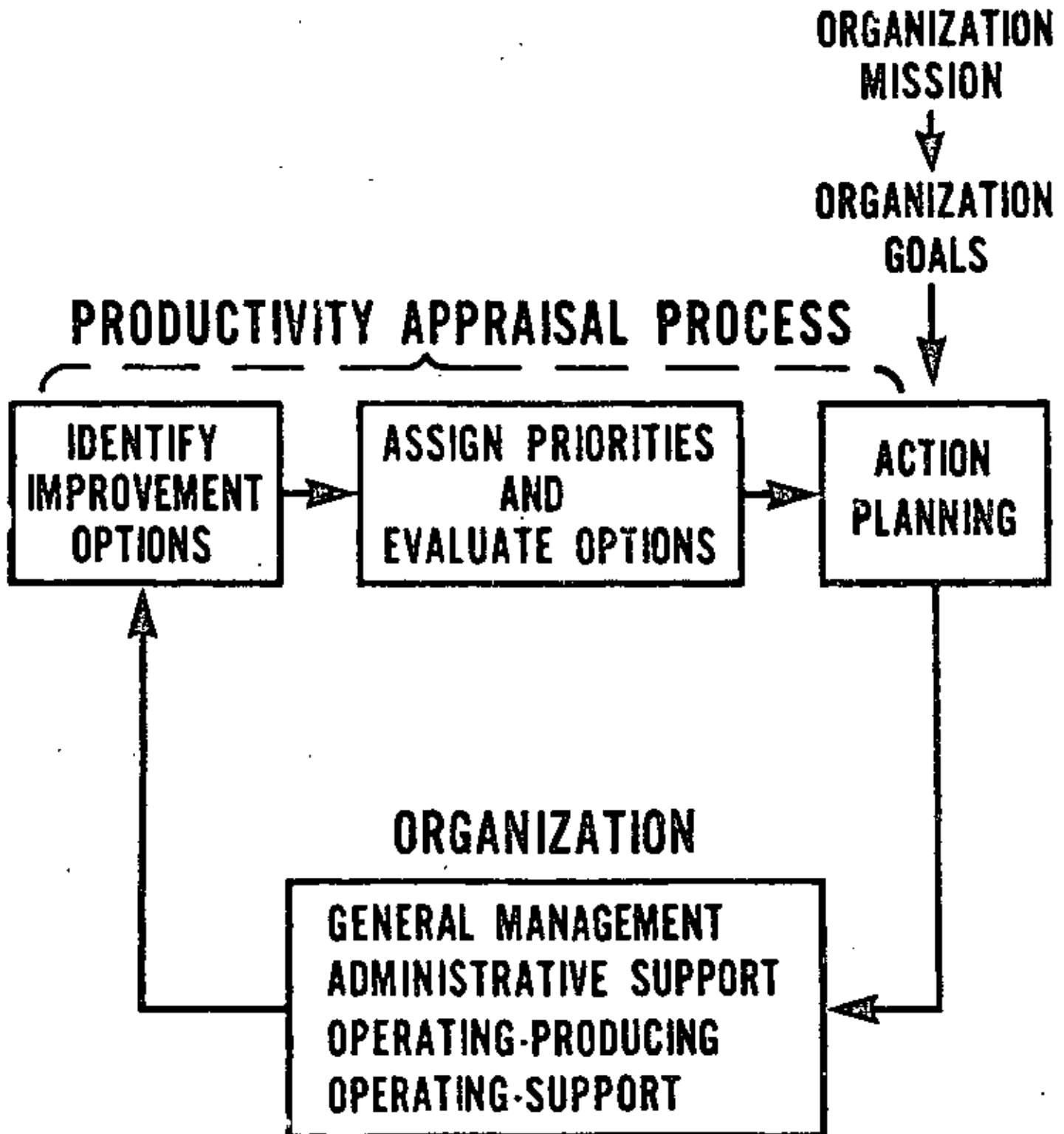
APPRAISAL



## OBJECTIVES & WHAT'S IN IT FOR YOU

1. Productivity Appraisal
  - o Identification of those areas, activities, jobs, functions or practices which are attractive options for enhancing productivity of any organization.
  - o Evaluation of these options, developing alternative approaches, establishing priorities.
  - o Provision for action planning in pursuit of full development and implementation of selected productivity improvements.
2. There Is No One Right Way
  - o Many approaches
  - o Situationally dependent
  - o Assess your own setting
  - o Tailor your strategy
  - o Tailor tactics to support strategy
3. Two Basic Concepts (Models)
  - o Appraisal-Based Planning
    - o At all levels
    - o Situationally dependent
  - o Productivity Appraisal Process

# APPRAISAL-BASED PLANNING MODEL



# PRODUCTIVITY APPRAISAL PROCESS MODEL

PREPARATION

1. OBTAIN ORGANIZATIONAL AWARENESS AND COMMITMENT
2. ESTABLISH TARGET AREAS AND ASSESS LEVERAGE POINTS
3. DEVELOP STRATEGIC PLAN AND TACTICAL SUPPORT FOR APPRAISAL EFFORTS

APPRAISAL

4. IDENTIFY PRODUCTIVITY IMPROVEMENT OPTIONS
5. EVALUATE PRODUCTIVITY IMPROVEMENT OPTIONS AND ESTABLISH PRIORITIES
6. COUPLE WITH ACTION PLANNING

## BICC

### British Insulated Callender's Cables Limited Technical Cost Measurement

1. BICC Operating Groups
  - o U.K. Metals Group
  - o U.K. Cables Group
  - o Overseas Group
  - o Balfour Beatty Organization
2. Management Techniques: Fundamental
  - o Relative importance of business area is clearly established
  - o Most appropriate technique is used in the study
  - o Technique practice is of high uniform standard
  - o Unless implemented, all previous work is wasted
3. Principal Techniques to Motivate and Assist Management to Implement Changes and Improvement
  - o Budget process
  - o Management by objectives
  - o Corporate planning
4. To Implement Improvement
  - o Incorporate philosophy to assist management in recognizing key areas
  - o Identify most effective techniques
  - o Have access to required techniques
  - o Assist in improving management's ability to budget, plan, and set objectives
5. Central Productivity Services Department Established
  - o Three functions:

- o Work study (industrial engineering)
- o Computers
- o Productivity measurements
- o Work study function
  - o Provide internal consulting service
  - o Develop workstudy policy
  - o Assist in selection and development of work study staff
  - o Technical audit of work measurement and incentive schemes
- o Computer function
  - o Computer planning
  - o Regional computer centers
  - o Systems and programming
  - o Computer service sales
- o Productivity measurements
  - o Apply management technique (Technical Cost Measurement)
  - o Developed in BICC group of companies

5. Technical Cost Measurement

- o Putting management in the position of knowing the least cost or highest productivity that is technically attainable in the key areas of their businesses, with action plans to achieve them
- o Productivity measurements functions divided into two parts
  - o Productivity engineers
  - o Audit teams
- o Productivity teams used in Technical Cost Measurement
  - o Two (2) from central productivity services dept.

- o Two (2) from company or division under study
- o Two (2) from next company or division to be studied
- o Philosophy of Productivity Team Approach
  - o Limited number of business' total activities significantly affect profits
  - o Productivity improvement can be made if these activities are subject to a fact-based study and implemented with action planning
- o Key areas studied in BICC group includes:
  - o Scrap reduction
  - o Material yields
  - o Plant and machinery utilization
  - o Control of finished stock
  - o Control of work in progress
  - o Minimization of accounts receivable
  - o Rationalization of pricing structures
  - o Product mix
- o Productivity team objectives
  - o Assist management to identify key tasks
  - o Examine selected number of activities which establish the scope for improvement
  - o Establish Technically Attainable Performance (TAP) targets
  - o Develop action plans to attain targets
  - o Highlight other areas for resident employees to continue pursuing

#### 7. 5 Step Approach

- o Determine most important factors for making a profit in the function (area selection)

- o Demonstrate theoretical proof of available productivity improvement
  - o Conduct physical sample experiment to properly test the validity of the theory in preceding step
  - o Prepare detailed action programs with management to allow targets to be met
  - o Develop performance measurements and Technically Attainable Performance (TAP) targets
8. Step Five Consists of Measuring Three Levels of Performance in a Specific Area
- o Actual performance - current level of attainment
  - o Technically measured performance - ultimate achievement, regardless of practicability
  - o Technically Attainable Performance (TAP) - highest agreed attainable level of performance

**PERFORMANCE  
LEVEL**

**ACHIEVED**

**TECHNICALLY  
MEASURED**

**NEVER**

**TECHNICALLY  
ATTAINABLE**

**WHEN SPECIFIED IN  
ACTION PLAN—  
NOT RELATED TO  
BUDGET CYCLE**

**BUDGET**

**BY END OF  
BUDGET YEAR**

**ACTUAL**

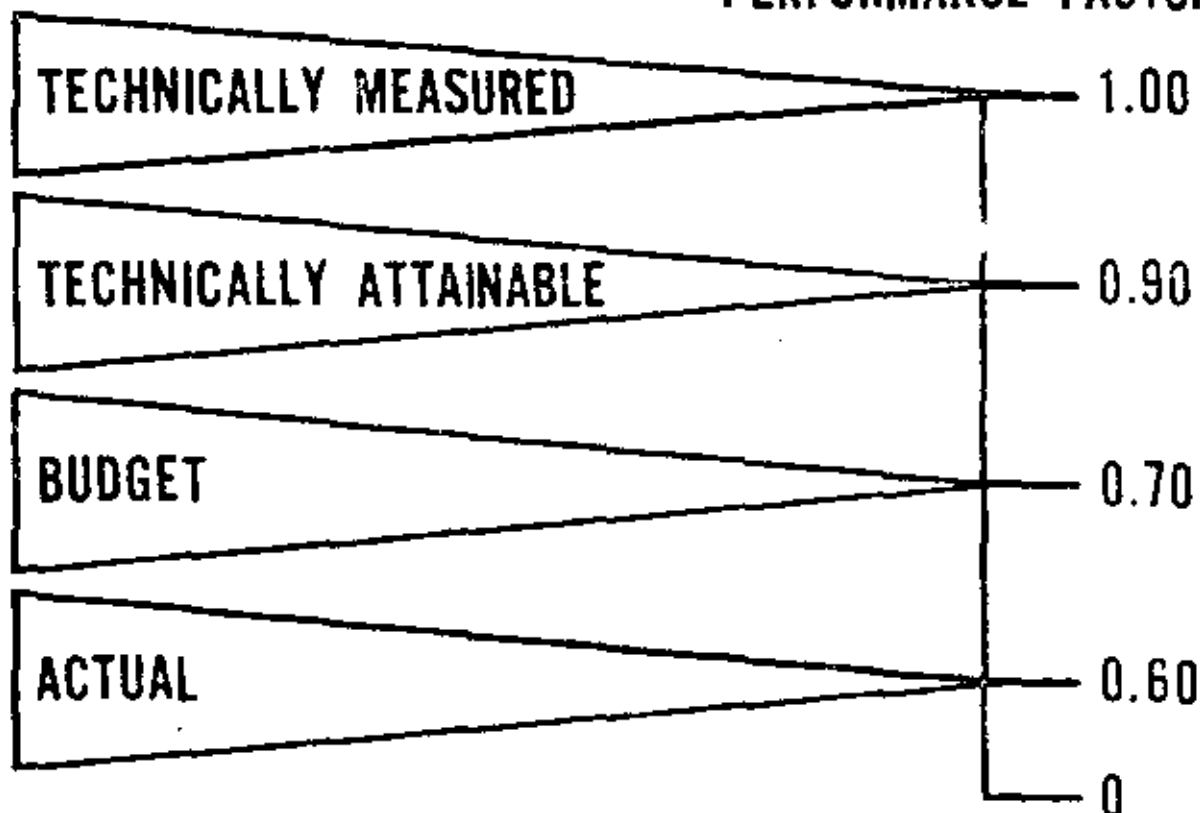
**NOW**



# EXAMPLE OF TECHNICAL COST MEASUREMENT

## MANPOWER

### PERFORMANCE FACTOR



### PERFORMANCE MEASUREMENT:

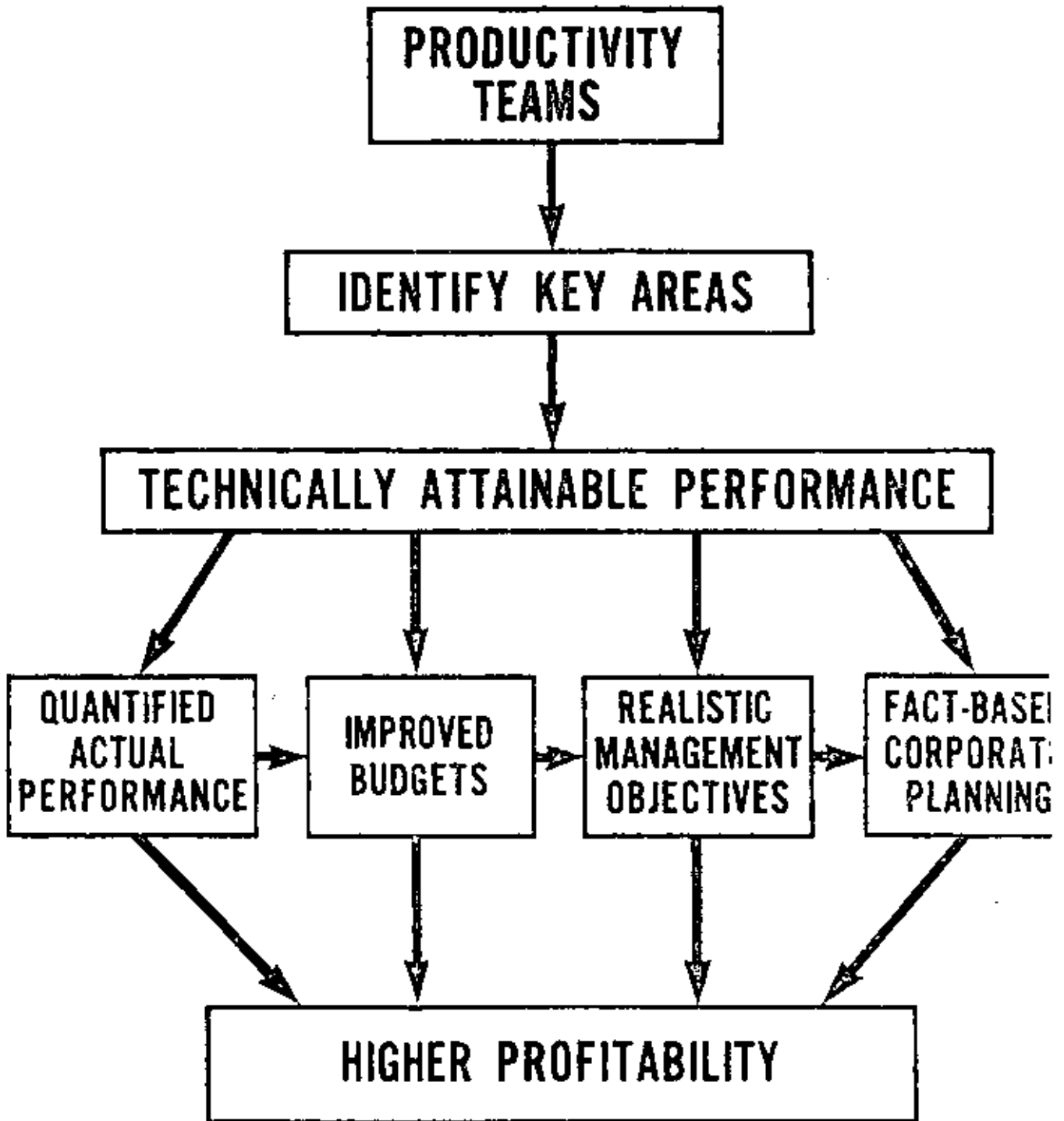
$$\frac{\text{PERFORMANCE FACTOR}}{\text{FACTOR}} = \frac{\text{STANDARD HOURS OF WORK}}{\text{TOTAL HOURS CLOCKED}}$$

9. In First Ten Major Sites Studied:

- o Potential improvements indicate an average productivity increase equivalent to an improvement in capital employed performance of between 40 and 50 percent

10. Benefits to Management

- o Quantifications of actual performance
- o Improved budgets
- o Realistic management objectives
- o Fact-based corporate planning



## TEAM GOAL APPROACH

### Evolution of an Additional Improvement Program

1. Innovator - highly successful - early use of advanced management practices
  - profit sharing - guaranteed annual employment - I.E. - etc.
2. Knee of the "Improvement" Curve
  - o How to Get Improvement Trend Going Up Again?
3. Measurement - A Way of Life
  - o Substantially all managers measured
    - o Direct wages
    - o Indirect labor
    - o Repairs & maintenance
    - o Yields & losses
    - o Steam/Power, etc.
  - o Bonus - based on performance relative to standards
  - o Budget preparation and control - I.E. responsibility
4. An Additional Approach
  - o Formally recognize dual managerial responsibilities
  - o Build on methods improvement program
5. Phase 1 - "Specialist"
  - o Cost reduction and work simplification focus
  - o Training for supervisory and management personnel
  - o I.E. the Specialist (and Bird-dog)
  - o Evaluation - each plant
    - o Savings/year/member of management (MOM)
  - o Results - about \$700/year/MOM

6. Phase 2 - "Coordinator"
  - o Can we do better?
  - o Behavioral factors
  - o New approach
    - o Stress direct participation
    - o Own problems and solutions
    - o Coordinator - a resource - to assist
    - o Initiated in fourth year
  - o Results - excellent reception  
performance increased threefold - About \$2,300/year/MOM
7. Phase 3 - "Teams"
  - o Can we do better?
  - o Behavioral factors
  - o Systems approach
    - o Broader concerns vs. job centered
  - o Team structure
    - o Initiated in seventh year
  - o Results - broader concerns  
excellent reception  
about \$3000/year/MOM  
all levels participating
8. One Plant an Exception
  - o Tested Team-Goal Approach - 7th year
  - o Results - substantially better, about \$5,000/year/MOM

9. Phase 4 - "Team-Goal Approach"

- o Adopted for all plants in 12th year
- o Specific problem areas, results desired, savings sought
- o First year results, about \$6,000/year/MOM
- o Continual increases, to about \$44,000/year/MOM
- o Program costs vs. benefits - 1/10

## PRODUCTIVITY IMPROVEMENT FOR PROFIT (P.I.P.) PROGRAM

### 1. Formal Program

- o Developed by Professor James M. Apple, School of Industrial and Systems Engineering, Georgia Institute of Technology
- o Published in copyright form by the ~~American~~ Institute of Industrial Engineers, Inc.
- o Forms available
  - o Printed program materials
  - o One-day seminar

### 2. P.I.P. Materials

- o Plan Book
  - o Focuses attention on functional areas
  - o Monthly area emphasis
  - o Calendar format
  - o 3 step problem solving procedure
    - o Evaluate
    - o Analyze
    - o Improve
- o Project log

# 1. IMPROVE RECEIVING PRODUCTIVITY

<b>EVALUATE</b> <small>the rated activities in terms of current performance level of 100% excellent</small>				<b>ANALYZE</b> <small>by carrying out the following procedure and suggestions as appropriate</small>				<b>IMPROVE</b> <small>by reviewing the specific suggestions below and designing them into your improved methods as appropriate</small>			
ACTIVITIES	Rating	Score	Target								
1. Date and efficiency unloading of carriers	1	80	80								
2. Check receipts against delivery tickets on being due	3	90	230								
3. Unpack as necessary	5	80	400								
4. Identify and sort	3	80	240								
5. Verify quantity and contents (NO S. and D.)	1	75	75								
6. Verify quality, i.e. dispatch in shape (cont)	1	60	60								
7. Recheck and recheck as necessary	5	60	300								
8. Prepare if appropriate	5	50	250								
9. Record receipts on Receiving Report	1	85	85								
10. Mark records on any unusual items to be noted	3	80	240								
11. Identify goods by appropriate labels	1	90	90								
12. Maintain accurate records	1	70	70								
13. Analyze the situation for planning and control	3	50	150								
<b>PROJECT LOG</b> <small>Select from above or from columns at right</small>				Project	Date	Date					
✓ VERIFY QUALITY				JLH	3/16						
✓ MAINTAIN RECORDS				RDC	4/3						
✓ VERIFY QUANTITY				CAS	4/20						
✓ SAFE UNLOADING				JAS	5/1						



### 3. Action Guide

- o Provides supplemental discussion on 12 functional areas
  - o Receiving
  - o Stores
  - o Product and processes
  - o Material flow
  - o Material handling
  - o Work methods
  - o Work standards
  - o Plant layout
  - o Production control
  - o Warehousing
  - o Shipping
  - o Maintenance
- o Gives sources for further information
- o Has additional checklists
  - o Includes instructions and examples for implementing the P.I.P. program
  - o Shows a "general problem solving procedure" developed by Professor Apple

# Action Guide

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