

LECTURE 1

INTRODUCTION

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Quiz: 30%

6 points for each, $6 \times 5 = 30$ points in total

at least 2 points if you attend the class

Final: 70%

SYLLABUS

Textbook:

Operations and Supply Chain Management (13th edition)

By F. Robert, Jacobs and Richard B. Chase, China Machine Press.

References:

Operations Management for Competitive Advantage (11th edition)

By Richard B. Chase, F. Robert Jacobs and Nicholas J. Aquilano, China Machine Press.

Operations Management (6th edition)

by N. Slack, S. Chambers and R. Johnston, Prentice Hall.

GOALS FOR THE COURSE

- Learn key operations management concepts.
- Understand the importance and applicability of these concepts in different operational environments.
- Learn new quantitative and qualitative tools and models.
- Practice the application of these tools and models to improve the performance of any business.

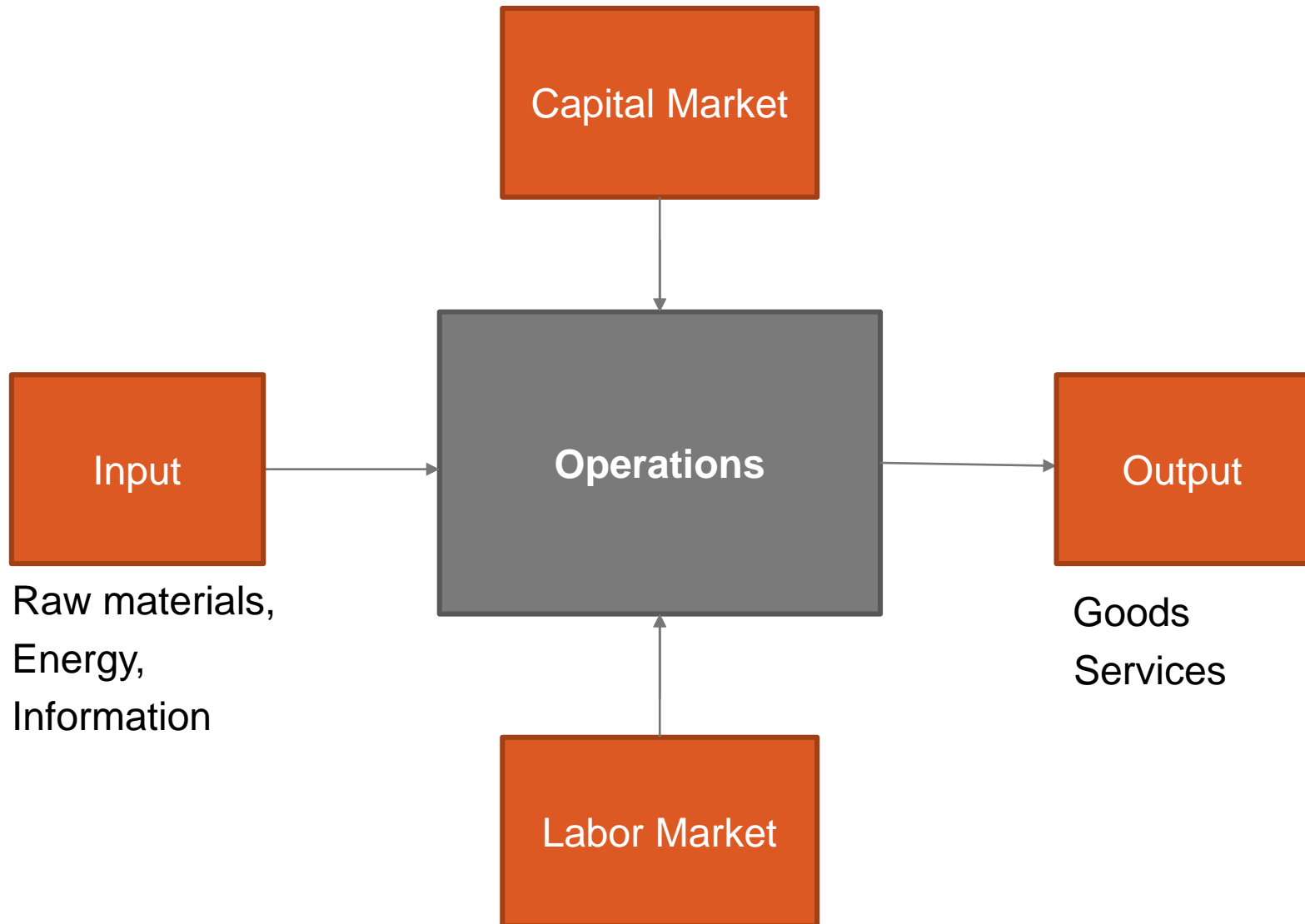
LEARNING OBJECTIVE FOR TODAY

- **What is operations management?**
- **Operations and supply chain management (OSCM)** is defined as the design, operation, and improvement of the systems that create and deliver the firm's primary products and services.
- **Why study operations management?**

OPERATIONS AND MONEY \$

- **Finance**
 - How to manage (raise / invest) money
- **Accounting**
 - How to keep track of the money
- **Marketing**
 - How to convince customers to show you the money
- **Operations**
 - How to make money by producing goods / services

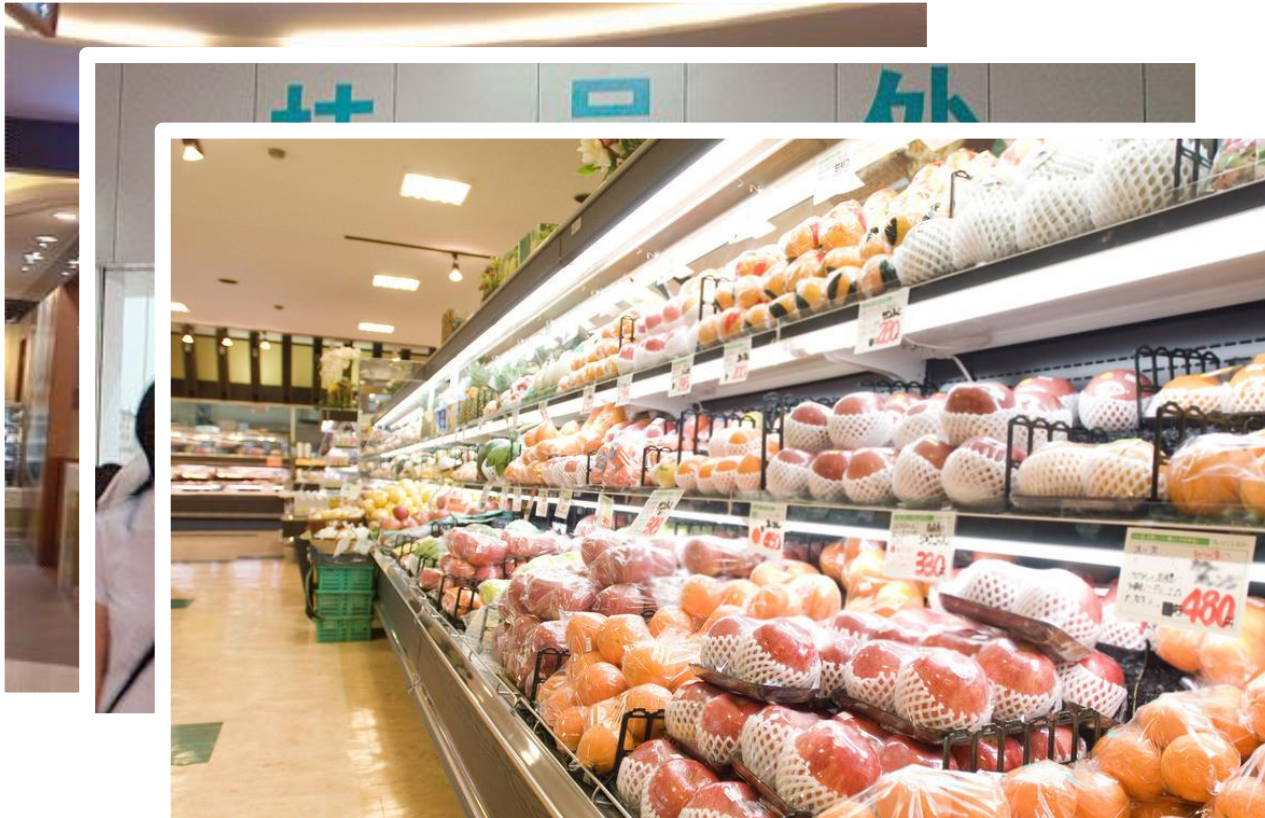
OPERATIONS INTERFACE WITH OTHER BUSINESS FUNCTIONS



GENERAL QUESTIONS OF OM

- **How do I allocate my resources? (manufacturing)**
 - People, Machines, Money
- **When should I promise delivery? (services)**
- **How much inventory do I order when demand is uncertain? (retail)**
- **How do I produce high-quality products? (manufacturing)**
- **How to distribute my products? (manufacturing, retail)**

OPERATIONS EXAMPLE



PRODUCTION SYSTEMS: EXAMPLES

Production System	Primary Inputs	Transformation	Primary Output
Automobile (上海大众)			
Restaurant (苏浙汇)			
University (上海财大)			

OPERATIONS DOES NOT MAKE A DISTINCTION BETWEEN WHAT IS A PRODUCT AND A SERVICE

Traditionally, “operations management” has been associated with physical goods

But services, the provision of intangibles to customers, is a larger share of the economy

WHAT ARE THE OM PROBLEMS?

PRODUCTION/QUALITY MANAGEMENT



REVENUE MANAGEMENT

Sell the right product at the right price to the right customer



LAYOUT MANAGEMENT



SUPPLY CHAIN MANAGEMENT



WAITING LINE MANAGEMENT

Banks

Transportation Hubs

Hospitals



INVENTORY MANAGEMENT

Retailing

Manufacturing

Finance



A digital display showing exchange rates for various countries and currencies. The display is organized into rows, each representing a different country or region. Each row includes a small flag icon, the country name, the currency code, and two columns of numerical values representing exchange rates. The background is dark blue, and the text and numbers are in white and red.

	CANADA	CAD	0.9512	0.8883
	CHINA	CNY	7.3169	6.0910
	EURO	EUR	0.6644	0.6100
	JAPAN	JPY	109.00	102.00
	SINGAPORE	SGD	1.3712	1.2630
	HONG KONG	HKD	7.0043	6.4072
	NEW ZEALAND	NZD	1.1646	1.0675
	MALAYSIA	MYR	3.2536	2.7818

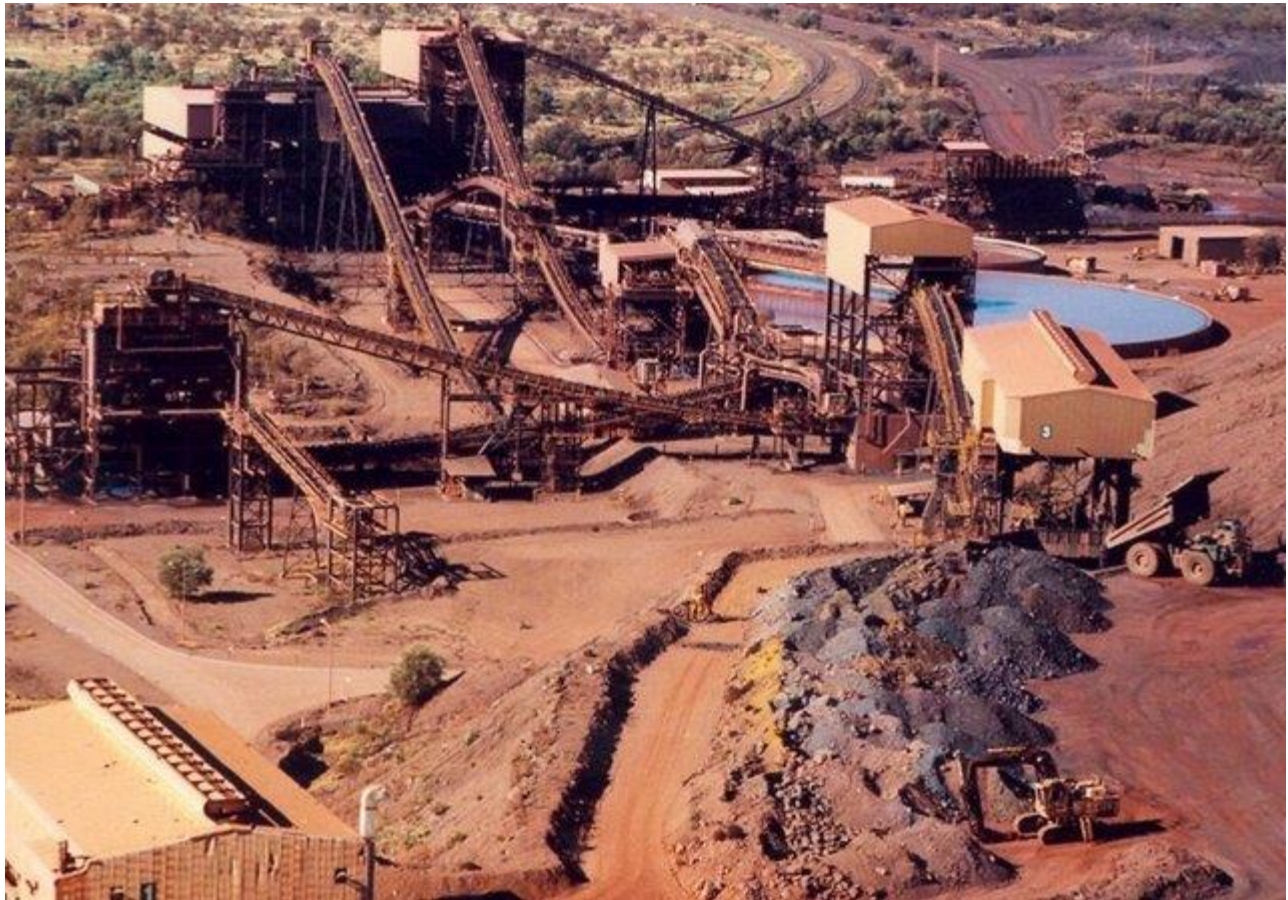
SUSTAINABILITY IN INTERFACE INC.'S OPERATIONS TRANSFORMATION PROCESS

They use their own post-consumer waste (used carpet) as raw material input to their production system.



GLOBALIZATION: JOURNEY OF IRON ORE

"I guess we are all linked, even if we never think we are"



E-COMMERCE



GOODS AND SERVICES

- **Service is intangible (may not be patented nor try out before purchase)**
- **Service requires interaction with customer**
- **Heterogeneous (variable)**
- **Perishable**
- **Service are evaluated in a package of features**
 - Supporting facility (location, decoration, layout, architectural appropriateness)
 - Facilitating goods (variety, consistency, quantity of the physical goods)
 - Explicit services (training of the service personnel, consistency of service performance)
 - Implicit services (attitude of the servers, atmosphere, waiting time)

THE GOODS-SERVICE CONTINUUM

Pure Goods	Core Goods	Core Services	Pure Services
Commodities Food	Appliances Data storage system Automobiles	Hotels Airlines Internet service providers	Teaching Medication Consulting

Goods

Service



Which catalog does the following goods-service belong to?

The Great Gatsby Movie

农夫山泉

新东方

Canteen of Shufe

GROWTH OF SERVICES

Nation	% Worldwide Labor	% Agriculture	% Manufacturing	% Services	25-yr Growth in Service
China	21	50	15	35	191
India	17	60	17	23	28
U.S.	4.8	3	27	70	21
Russia	2.5	12	23	65	38
Japan	2.4	5	25	70	40

WHY STUDY OPERATIONS AND SUPPLY MANAGEMENT

- **Presents interesting career opportunities**

Plant Manager

Hospital Administrator

Branch manager

Department store manager

Supply chain manager

Quality control manager

Project Manager

OM Consultant

WHY STUDY OPERATIONS AND SUPPLY MANAGEMENT

- **Presents interesting career opportunities**
- **An essential part of business organization**

WHY STUDY OPERATIONS AND SUPPLY MANAGEMENT

- Presents interesting career opportunities
- An essential part of business organization
- Principles of process thinking can be applied across the organization.
- OM is an interesting and challenging field of study
(qualitative and quantitative).

IS OM LIKE COMMON SENSE?

Essentially business really boils down to common sense

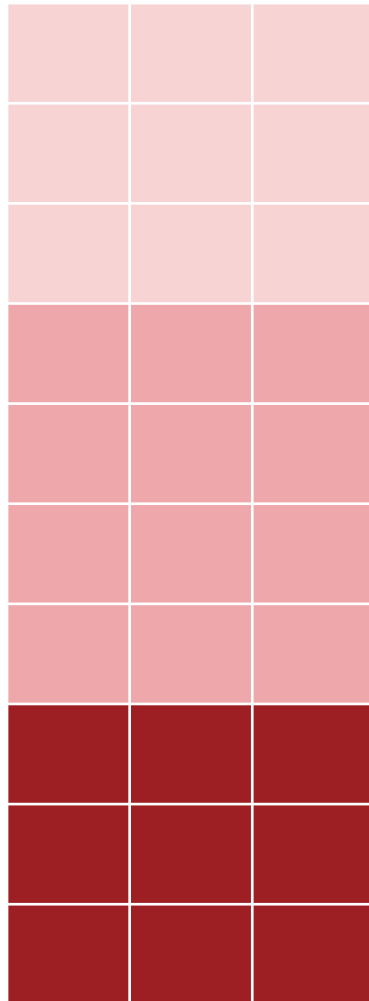
Go even deeper beyond common sense, using mathematics and modeling to uncover “laws of physics” in process flows that just aren’t obvious to the casual observer

AMERICA WEST'S INNOVATION IN EFFICIENCY

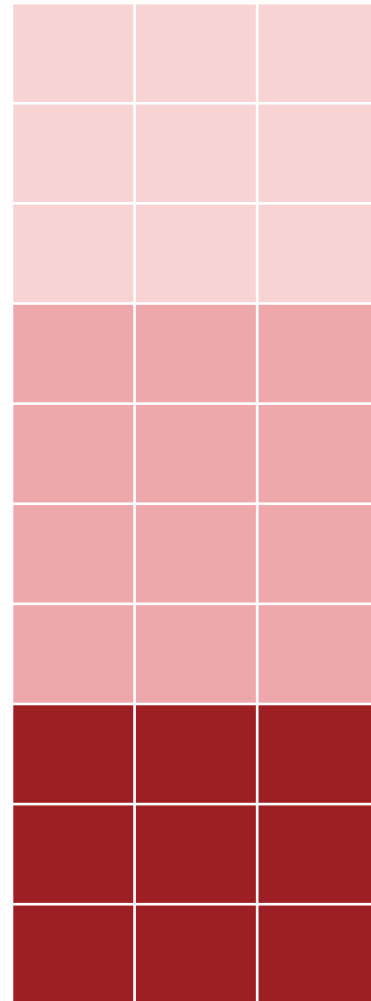


AMERICA WEST'S INNOVATION IN EFFICIENCY

Window



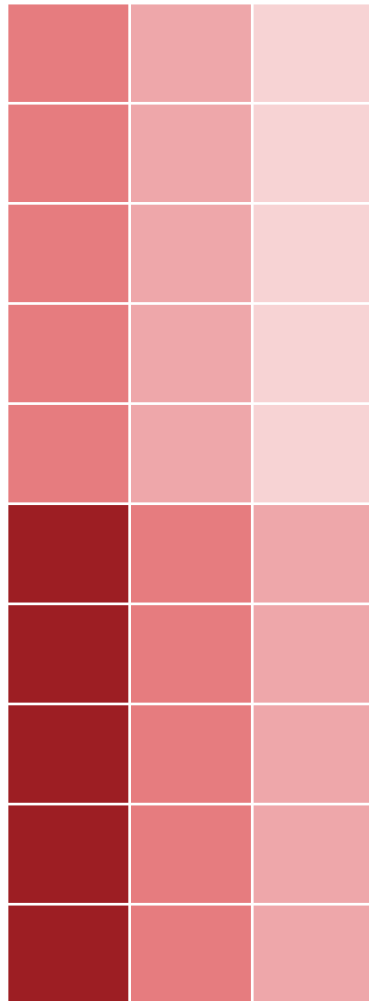
Aisle



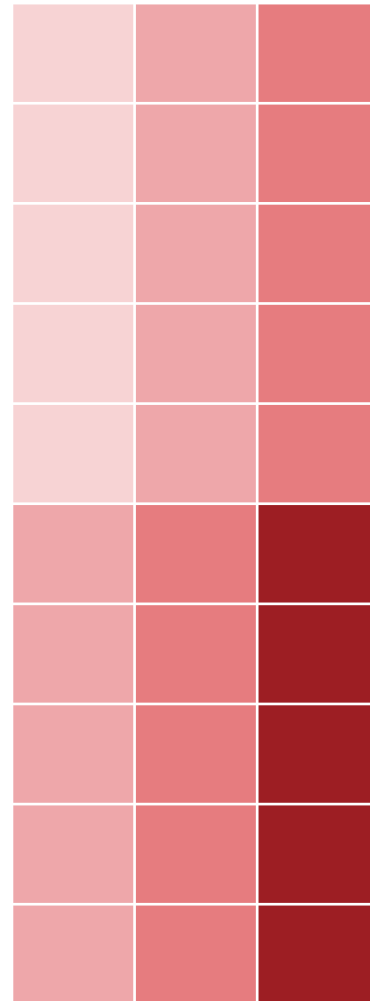
Window

AMERICA WEST'S INNOVATION IN EFFICIENCY

Window



Aisle



Window

Minimize

$$z = \lambda_1^s \sum_{i \in N} \sum_{k \in G} x_{iAk} x_{iBk} x_{iCk} + \lambda_1^s \sum_{i \in N} \sum_{k \in G} x_{iFk} x_{iEk} x_{iDk} \quad (1a)$$

$$+ \lambda_2^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iAk} x_{iBk} x_{iCl}$$

$$+ \lambda_3^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iAk} x_{iBl} x_{iCk}$$

$$+ \lambda_4^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iAl} x_{iBk} x_{iCk} \quad (1b)$$

$$+ \lambda_2^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iFk} x_{iEk} x_{iDl} + \lambda_3^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iFk} x_{iEl} x_{iDk}$$

$$+ \lambda_4^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iFl} x_{iEk} x_{iDk} + \lambda_5^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iAk} x_{iBl} x_{iCl}$$

$$+ \lambda_6^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iAl} x_{iBk} x_{iCl}$$

$$+ \lambda_7^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iAl} x_{iBl} x_{iCk} \quad (1c)$$

$$+ \lambda_5^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iDk} x_{iEl} x_{iFl} + \lambda_6^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iFl} x_{iEk} x_{iDl}$$

$$+ \lambda_7^s \sum_{i \in N} \sum_{k, l \in G: k < l} x_{iFl} x_{iEl} x_{iDk}$$

$$+ \lambda_8^s \sum_{i \in N} \sum_{k, l, m \in G: k < l < m} x_{iAl} x_{iBm} x_{iCk}$$

$$+ \lambda_9^s \sum_{i \in N} \sum_{k, l, m \in G: k < l < m} x_{iAk} x_{iBl} x_{iCm}$$

$$+ \lambda_{10}^s \sum_{i \in N} \sum_{k, l, m \in G: k < l < m} x_{iFm} x_{iEl} x_{iDk}$$

$$+ \lambda_{11}^s \sum_{i \in N} \sum_{k, l, m \in G: k < l < m} x_{iFk} x_{iEm} x_{iDl}$$

$$+ \lambda_{12}^s \sum_{i \in N} \sum_{k, l, m \in G: k < l < m} x_{iFm} x_{iEk} x_{iDl}$$

$$+ \lambda_1^a \sum_{i \in N} \sum_{u, v \in L: v \neq u} \sum_{k \in G} x_{iuk} x_{ivk}$$

$$+ \lambda_1^a \sum_{i \in N} \sum_{u, v \in R: u \neq v} \sum_{k \in G} x_{iuk} x_{ivk} \quad (2a)$$

$$+ 2\lambda_2^a \sum_{i \in N} \sum_{u, v \in M: u \in L, v \in R} \sum_{k \in G} x_{iuk} x_{ivk} \quad (2b)$$

$$+ \lambda_3^a \sum_{a, b \in N: a < b} \sum_{u, v \in M} \sum_{k \in G} x_{auk} x_{bvk} \quad (2c)$$

$$+ \lambda_4^a \sum_{i \in N} \sum_{u, v \in R} \sum_{k, l \in G: k < l} x_{iuk} x_{ivl}$$

$$+ \lambda_4^a \sum_{i \in N} \sum_{u, v \in L} \sum_{k, l \in G: k < l} x_{iuk} x_{ivl} \quad (2d)$$

$$+ \lambda_5^a \sum_{i \in N} \sum_{u \in L, v \in R} \sum_{k, l \in G: k < l} x_{iuk} x_{ivl}$$

$$+ \lambda_5^a \sum_{i \in N} \sum_{u \in R, v \in L} \sum_{k, l \in G: k < l} x_{ivl} x_{iuk} \quad (2e)$$

$$+ \lambda_6^a \sum_{a, b \in N: a < b} \sum_{u, v \in M} \sum_{k, l \in G: k < l} x_{auk} x_{bvl} \quad (2f)$$

subject to

$$\sum_{k \in G} x_{ijk} = 1 \quad \text{for all } i \in N, j \in M, \quad (3)$$

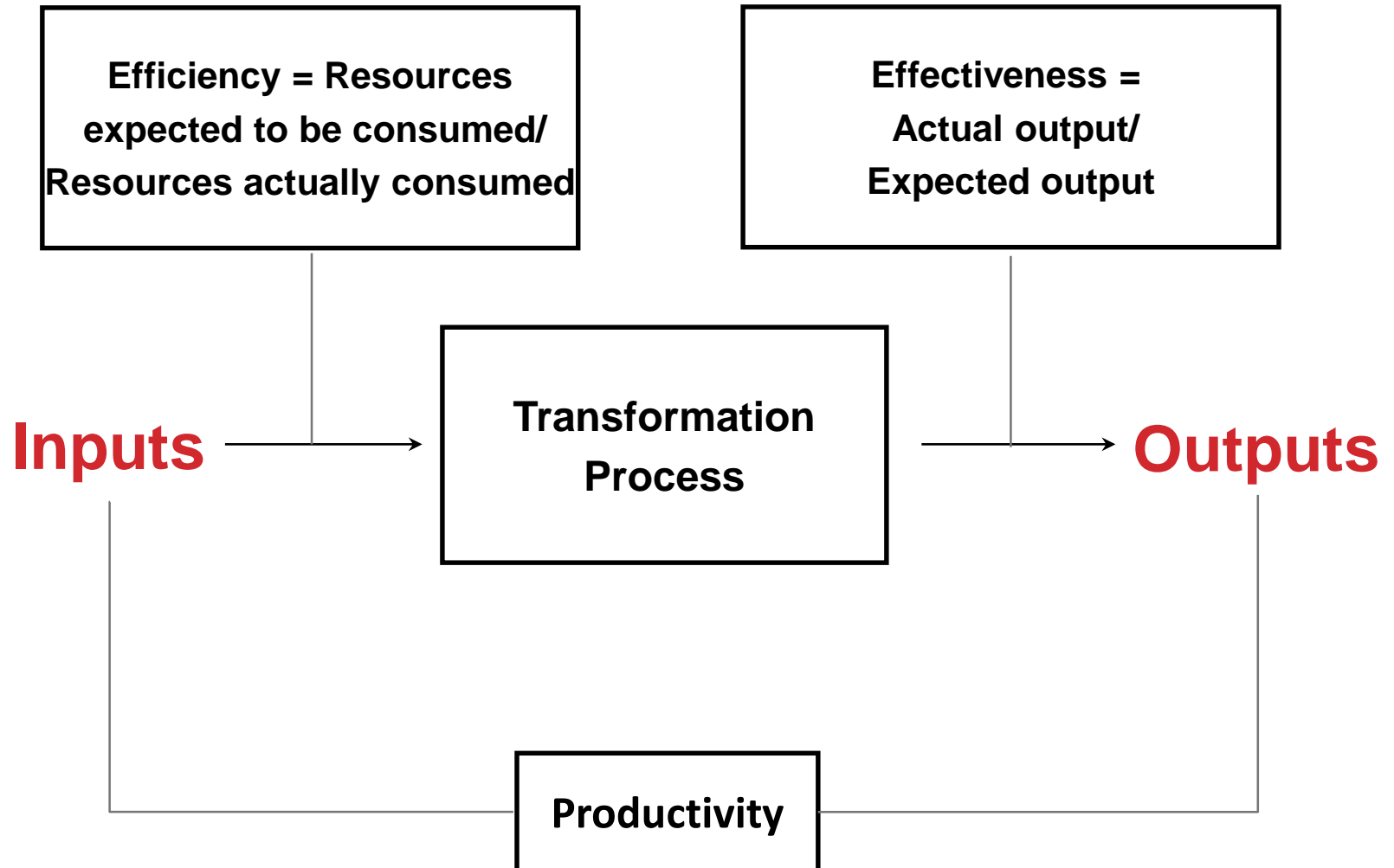
$$\sum_{i \in N} \sum_{j \in M} x_{ijk} \geq C_{\min} \quad \text{for all } k \in G, \quad (4)$$

$$\sum_{i \in N} \sum_{j \in M} x_{ijk} \leq C_{\max} \quad \text{for all } k \in G, \quad (5)$$

$$x_{ijk} \in \{0, 1\} \quad \text{for all } i \in N, j \in M, k \in G. \quad (6)$$

H.L. van den Briel, R. Villalobos, G. L. Hogg, T. Lindemann, and A. Mule.
America West Airlines develops efficient boarding strategies.
Interfaces, 35(3):191–201, May 2005.

PRODUCTIVITY MEASUREMENT



HOW DO WE MEASURE PROCESS PERFORMANCE?

EFFICIENCY VS. EFFECTIVENESS

Efficiency:

- Doing something at the lowest possible cost.
How well are inputs transformed into outputs?

Effectiveness:

- Doing the right thing to create most value.
How far is a stated objective achieved?

Example: Bank

- **Efficient:** using fewest people possible at counter
- **Effective:** minimize time customers need to wait

EFFICIENCY VS. EFFECTIVENESS

	Efficiency	Effectiveness
Washing Machine	Energy consumption per cycle	Cloths clean? Do they smell so bad?
Car	Fuel consumption	Too small?
Elevator attendants in fancy hotels	No: Lifts are easy to operate!	Yes: It reassures customers and they offer guidance and assistance.

Managers need to find the right balance!

WHAT IS A GOOD PROCESS?

Maximize Productivity

- Maximize output for a given amount of input

Minimize Cost (Improve Efficiency)

- Minimize cost to produce a given amount of output

Match supply and demand at the lowest cost!

PRODUCTIVITY MEASUREMENT

- **Productivity is how well a country/industry/business is using its resources**
- **Productivity = Output / Inputs**
 - Restaurant: Customers per labor hour
 - Retail store: sales per square feet
 - Chicken farm: pounds of meat per pound of feed
 - Utility plant: Kilowatts per ton of coal
- **Comparison:**
 - Compare with similar operations within the industry
 - Compare over time

PRODUCTIVITY MEASURE

Partial Measure	Output / Labor, Output / Capital, Output / Material, Output / Energy
Multifactor Measure	Output / (Labor + Capital + Energy)
Total Measure	Output / Input

PRODUCTIVITY MEASURE

Output		Input	
Finished units	\$10,000	Human	\$3,000
Work in progress	\$2,500	Material	\$153
Dividends	\$1,000	Capital	\$10,000
Bonds		Energy	\$540
Other		Other	\$1,500
Total	\$13,500		\$15,193

Total Measure	Total output / total input = $13,500 / 15,193 = 0.89$
Multifactor	Total output / (Human + Material) = $13,500 / 3,153 = 4.28$
Partial	Finished units / Energy = $10,000 / 540 = 18.52$

SUMMARY

- **What is Operations Management**
- **Aspects of Operations Management**
- **Goods and Services**
- **Productivity Measures**