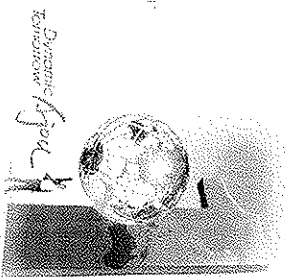


Operations Management and Simulation

(Managing Business Process Flow)

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School of Business Administration
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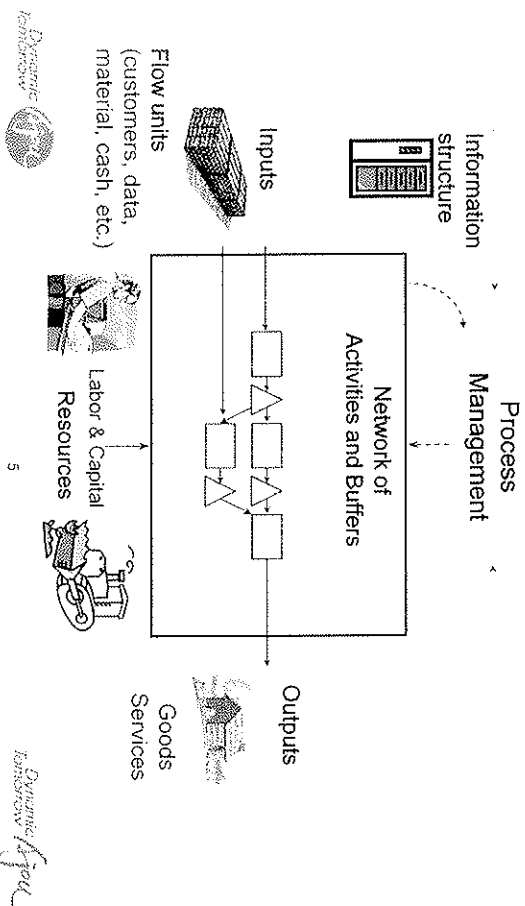
5 Review

Operations Mgmt?

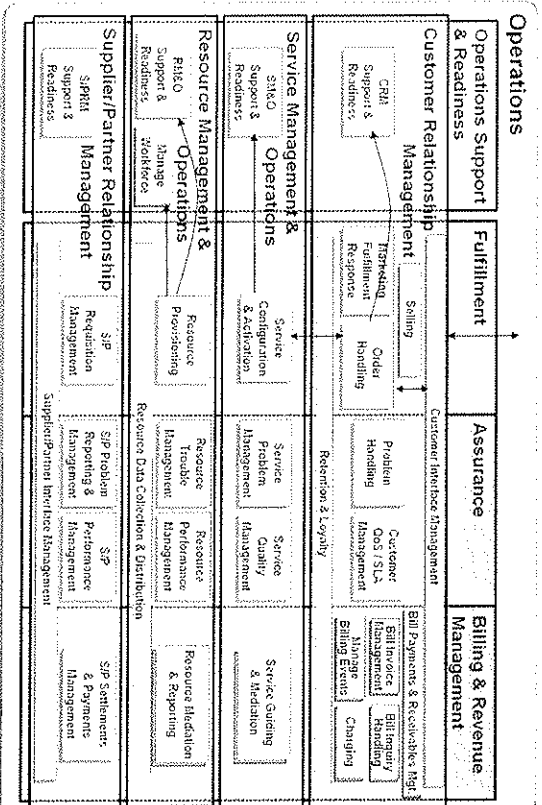
- View operations mgmt. in terms of design, control, and improvement of business processes and use the process view as the unifying paradigm to study operations.
- Consider manufacturing as well as service operations in make-to-stock as well as make-to-order environments.
- Objective is to show how managers can design and control process structure and process drivers to improve the performance of any business process.
- Simulation a good tool to achieve the goal.

The Process View of Organizations

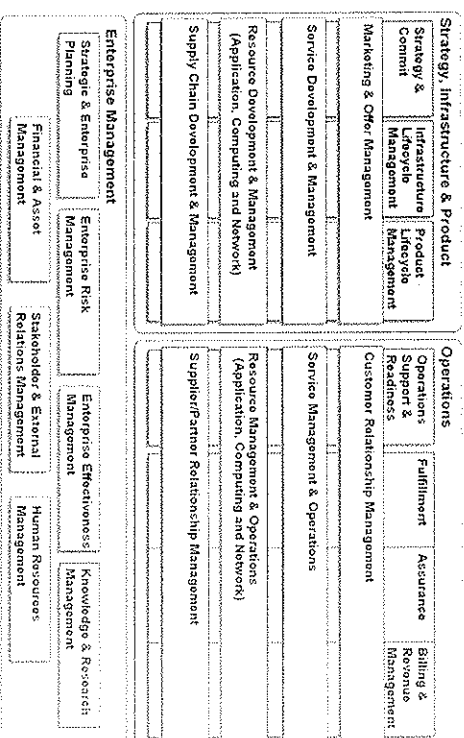
■ The five elements of a process to characterize the transformation:



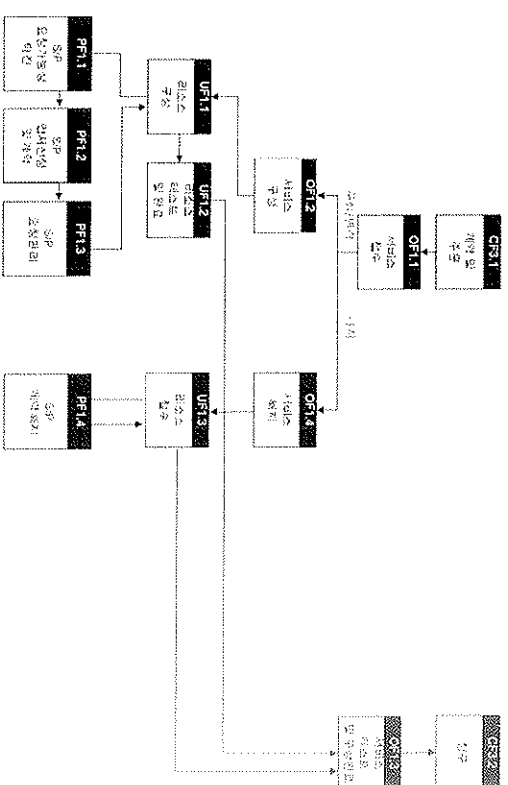
Process Flow Example



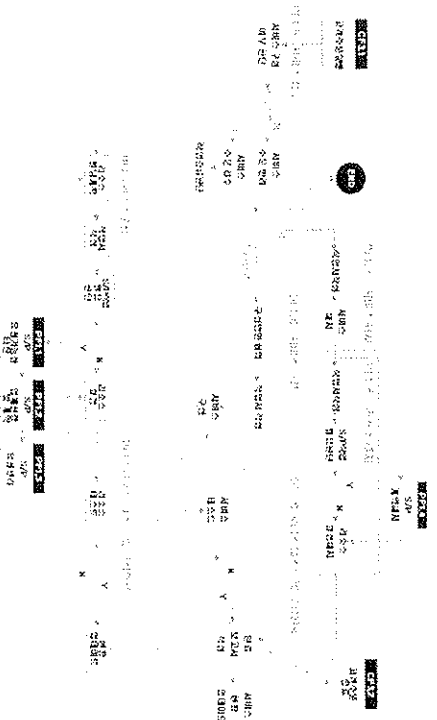
Business Process Framework for Telecom Company



Order Handling Process Example



Order Handling Process Example



The Essence of Process Flow

Throughout the lecture, we examine processes from the perspective of **flow**. Specifically, we look at the process dynamics as inputs enter the process, flow through various activities performed and finally exit the process as outputs.

Contents

2 Little's Law

The Essence of Process Flow

In our study of process-flow performance, we look at three measures and answer three important questions.

1. On average, how much time does a typical flow unit spend within the process boundaries? → Time
2. On average, how many flow units pass through the process per unit of time? → Rate
3. On average, how many flow units are within the process boundaries at any point in time? → Inventory

Statistics, Simulation, Queuing Theory, and Optimization

Throughput in a Stable Process

- A stable process is one in which, in the long run, the average inflow rate is the same as the average outflow rate.
 - ✦ Ex) In the airline checkpoint example, the average inflow rate is 600 passengers per hour. Because the X-ray scanner can process up to 720 passengers per hour, the average outflow rate also is 600 passengers per hour. The security checkpoint thus is a stable process.
- When we have a stable process, we refer to average inflow or outflow rate as **average flow rate**, or throughput, which is the average number of flow units that flow through (into and out of) the process per unit of time.
 - ✦ We will denote the throughput simply as R .



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Dynamic Tutor

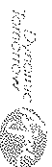
Little's Law: Relating Average Flow Time, Throughput, and Average Inventory



- In a stable process, there is a fundamental relationship among average flow time (T), throughput (R), and average inventory (I).
- This relationship is known as Little's Law, which states that average inventory equals throughput times average flow time:

$$\begin{aligned} \text{Average Inventory (I)} \\ &= \text{Throughput (R)} * \text{Average Flow Time (T)} \\ \text{or} \\ I &= R * T \end{aligned}$$

Little's Law

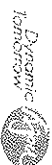


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Dynamic Tutor

Throughput in a Stable Process

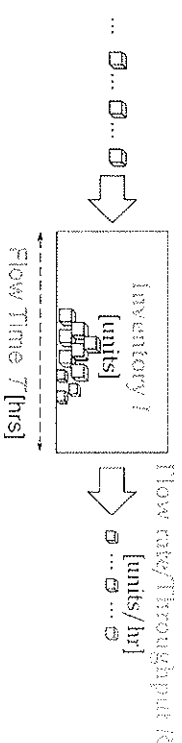
- Even though inventory fluctuates over time, in a stable process we can define the average inventory over time and denote this by I .
- While the actual flow time varies across flow units, we can define the average flow time as the average (of the flow times) across all flow units that exit the process during a specific span of time.
 - ✦ We denote the average flow time by T .
 - ✦ Calculation: Track the flow time of each flow unit over a long time period and then compute its average.



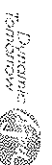
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Dynamic Tutor

Little's Law: Relating Average Flow Time, Throughput, and Average Inventory



$$\begin{aligned} \text{Inventory} &= \text{Throughput} \times \text{Flow Time} \\ I &= R \times T \\ \text{Inventory Turnover} &= \text{Throughput} / \text{Inventory} \\ &= 1 / T \\ \text{Takt Time} &= 1 / R \end{aligned}$$



Dynamic Tutor