Production Systems

BA291

THAMMASAT

people & sustainability

Learning Objectives:

1. Explain the systems perspective, and identify seven principles of systems thinking that can improve your skills as a manager.
2. Describe the *value chain* concepts and discuss the controversy over offshoring
3. Define *supply chain management* and explain its strategic importance
4. Identify the major production types and operations management

The Systems View of Business

System

An interconnected and coordinated set of *elements* and *processes* that converts *inputs* to desired *outputs*

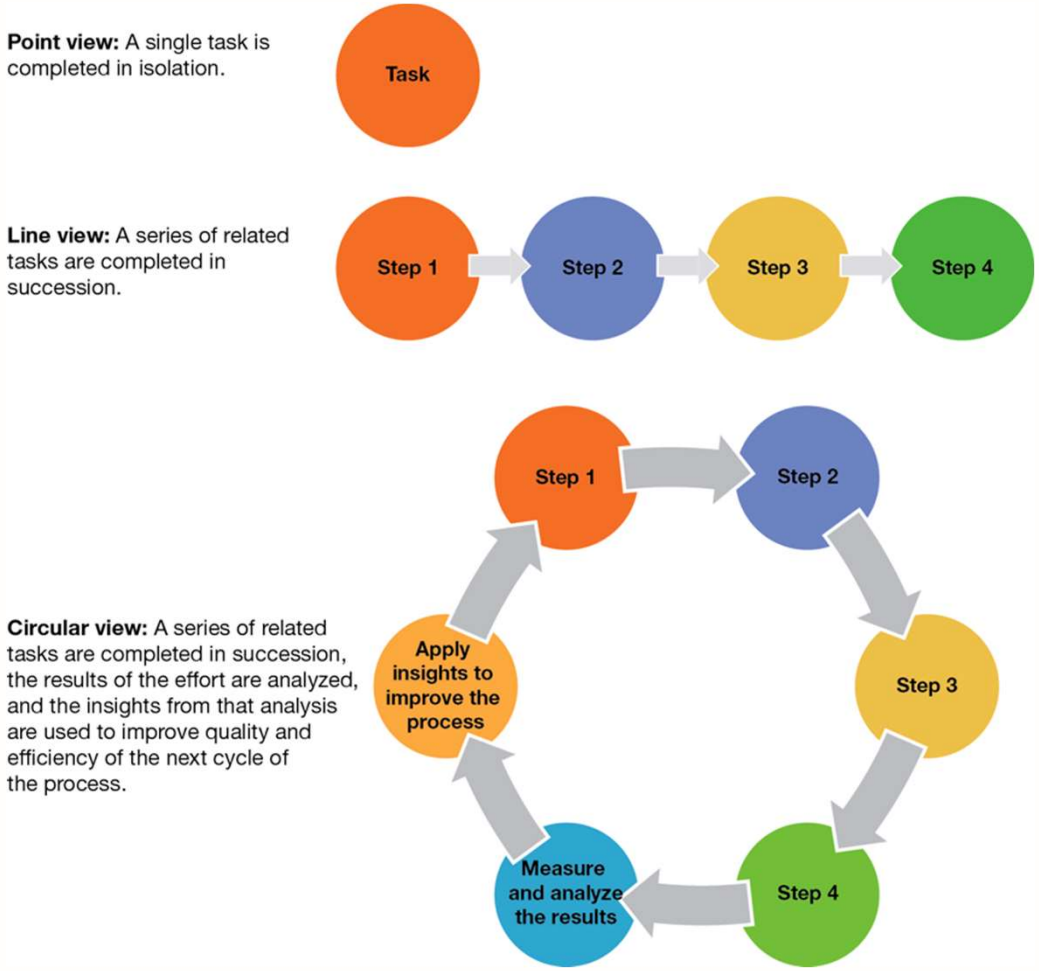
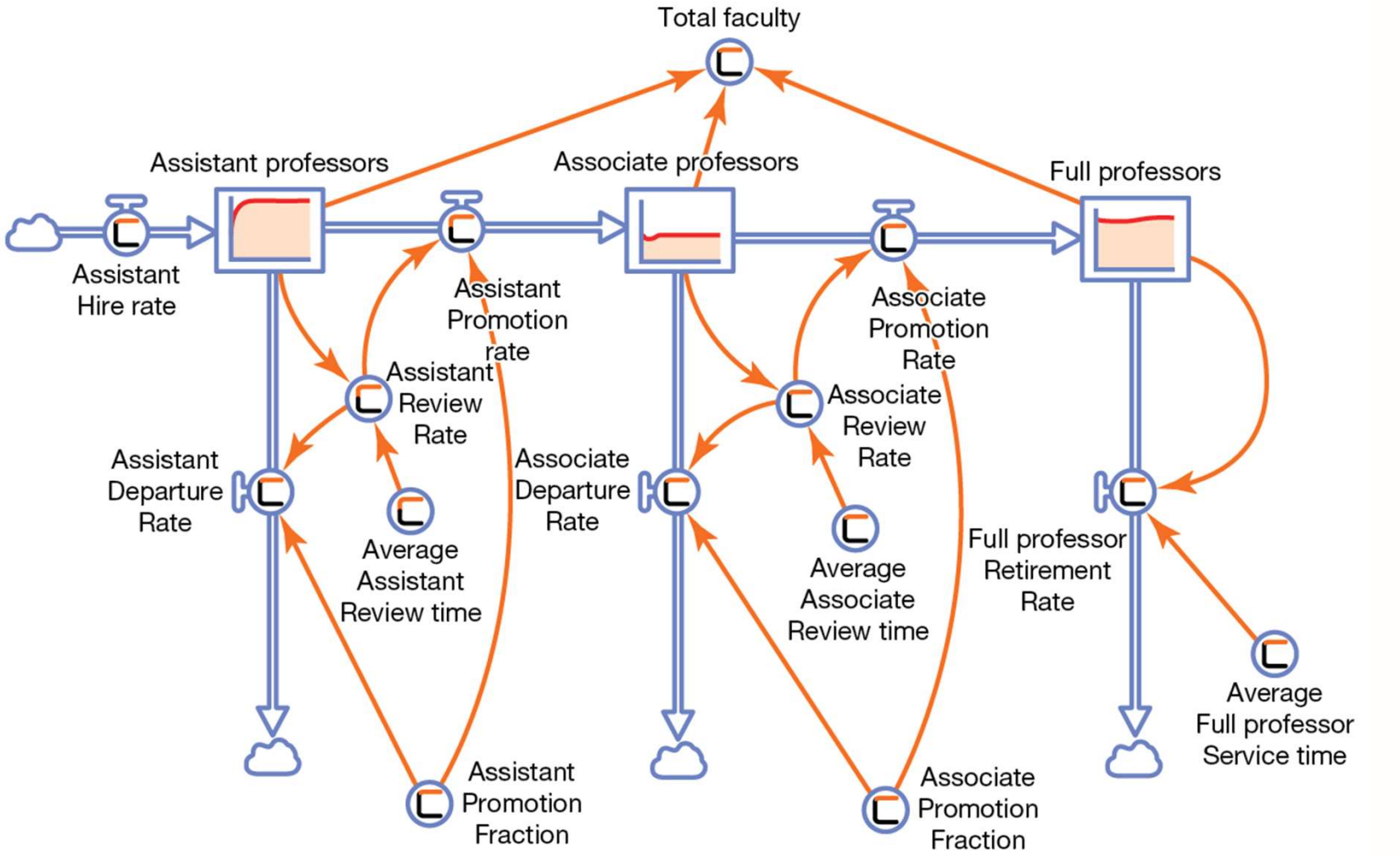


Exhibit 9.2 Systems Diagram and Simulation



Managing Systems for Peak Performance (1 of 2)

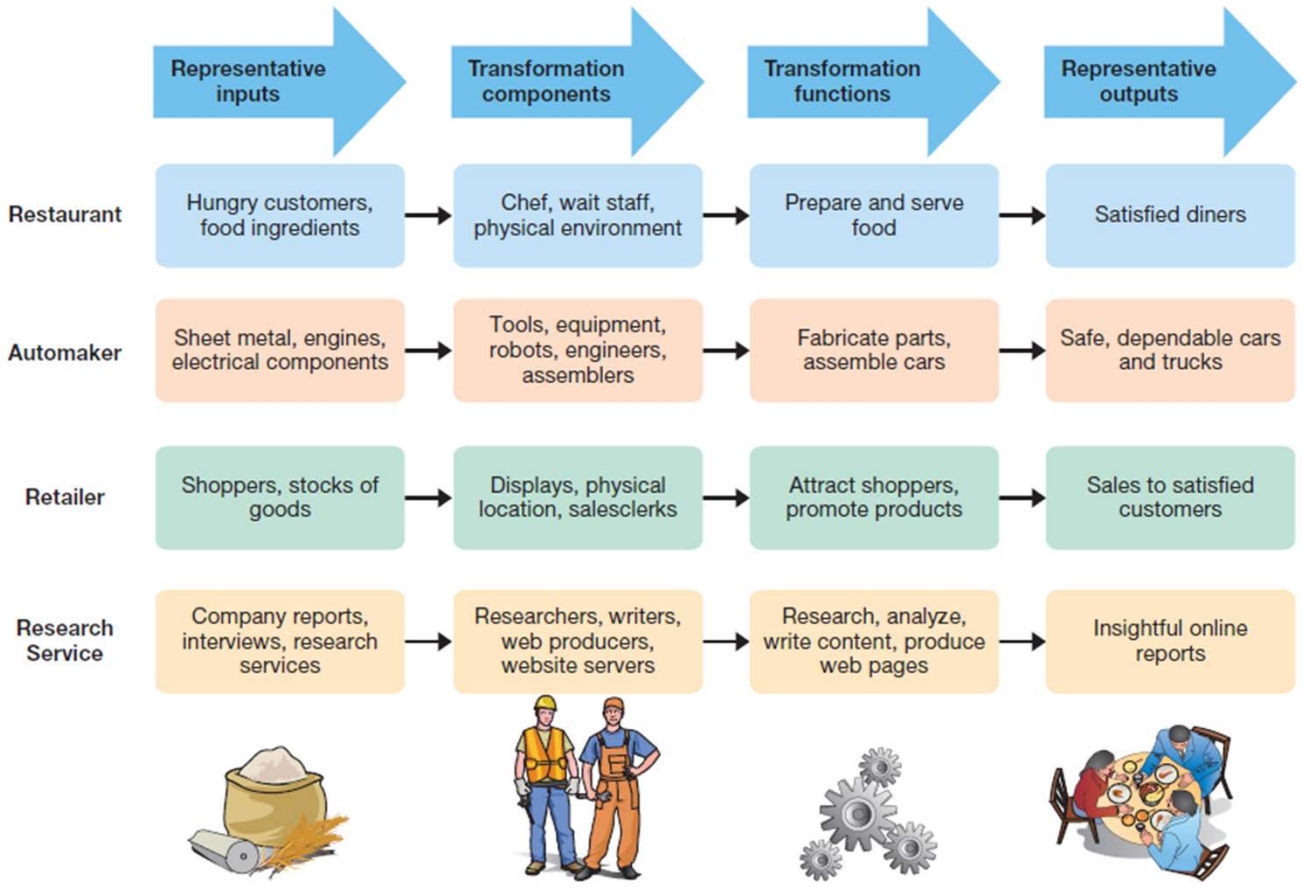
1. Help everyone see the big picture
2. Understand how **individual systems** really work and how they **interact**
3. Understand problems before you try to **fix** them
4. Understand the **potential impact** of solutions before you implement them

Managing Systems for Peak Performance (2 of 2)

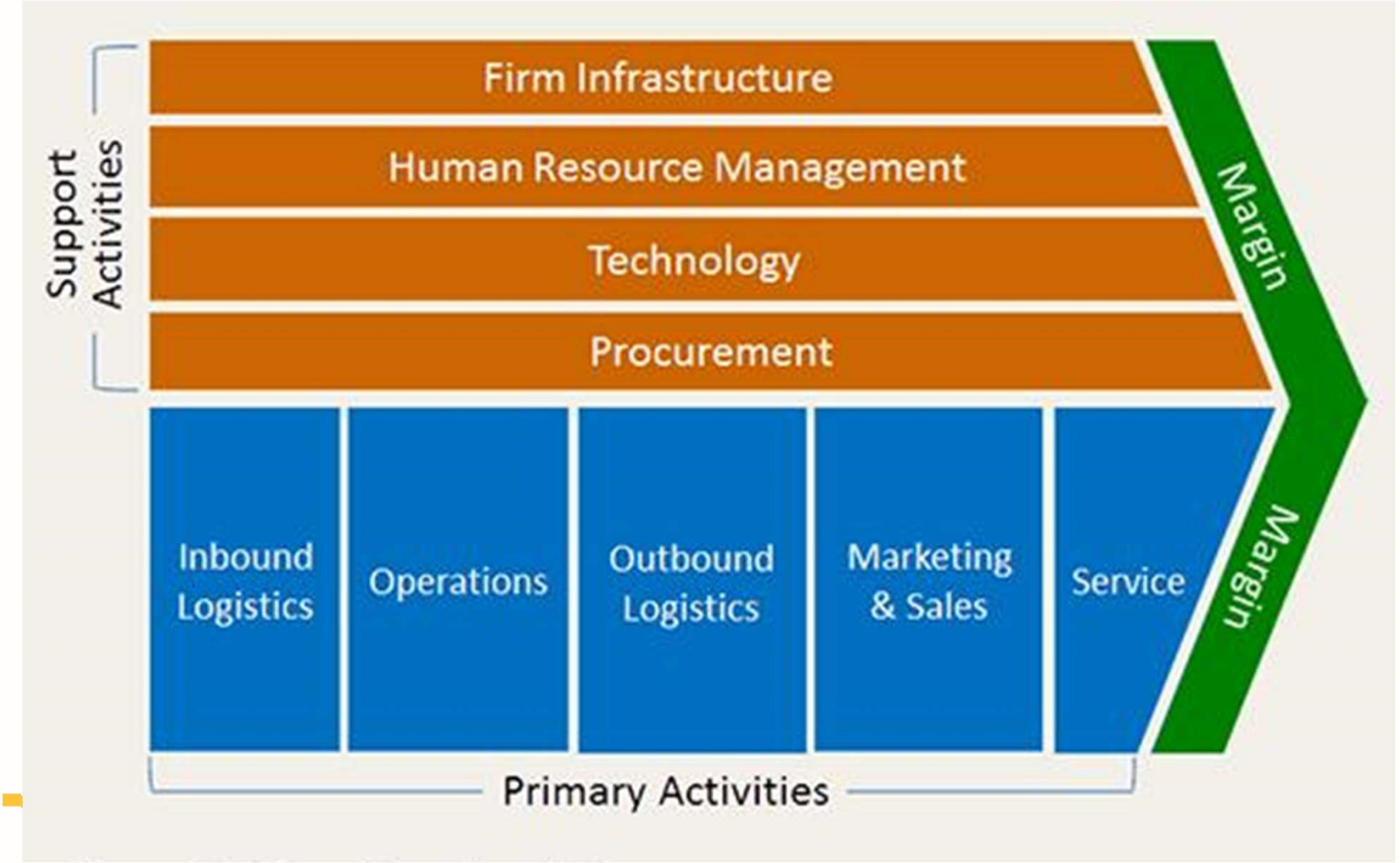
5. Don’t just move problems **around—solve them**
6. Understand how feedback works in the system
7. Use mistakes as **opportunities** to learn and improve

Value Chain

Value Chain
All the elements and processes that add value as raw materials are transformed into the final products made available to the ultimate customer



Porter's Value Chain



Redefining Organizations with Value Webs

- **Outsourcing**
  - Contracting out certain business functions or operations to other companies
- **Value webs**
  - Multidimensional networks of suppliers and outsourcing partners

Outsourcing

Outsourcing

Contracting out certain business functions or operations to other companies

Offshoring

Transferring a part or all of a business function to a facility (a different part of the company or another company entirely) in another country

Advantages

- Speed
- Flexibility
- Opportunities to access talents and techno
- Cost reduction

Disadvantages

- Lack of control
- Offshoring controversy

Trump: 'We can't continue to allow China to rape our country'

The Offshoring Controversy

Arguments for Offshoring		Arguments Against or Concerns About Offshoring	
Stakeholders who benefit	**Argument**	**Stakeholders who suffer**	**Argument**
 Shareholders	**Responsibility to shareholder interests:** Companies that engage in offshoring say they have a duty to manage shareholder investments for maximum gain, so it would be irresponsible not to explore cost-saving opportunities such as offshoring.	 Workers	**Loss of well-paid U.S. jobs:** Opponents of offshoring say that companies are selling out the U.S. middle class in pursuit of profits and pushing a trend that can only harm the country.
 Consumers	**Lower prices for U.S. Consumers:** For goods in which labor represents a significant portion of production costs, dramatically lowering labor costs lets a company lower its prices to consumers.	 Shareholders	**Hidden costs and risks:** Critics and some insiders say the real savings are not as great as proponents claim and that same companies fail to adequately analyze the costs and risks. Says J.Paul Dittman of the University of Tennessee, "Many firms are rethinking the mad rush to outsource . . . the long supply lines, incredibly volatile fuel costs, exchange rates, the geopolitical risks have all come home to roost."
 Shareholders	**Lack of choice in competitive industries:** Given the pricing advantage that offshoring can give U.S. companies, as soon as one company in an industry does it, the others are put under pressure to lower their prices—and offshoring might be the only way for some to lower costs enough to do so.	 Shareholders	**Business agility and responsiveness:** When companies rely on operations halfway around the world, marketplace trends and customer service matters.
 Shareholders	**Support for local customers around the world:** Some companies say that as they expand into other countries, they have no choice but to hire overseas employees in order to support local customers.	 Shareholders	**Knowledge transfer and theft risk:** By hiring other companies to perform technical and professional services, U.S. companies transfer important knowledge to these other countries—making them more competitive and potentially depleting the pools of expertise in the United States. Offshoring can also increase the risks of product piracy and theft of intellectual property.
 U.S. economy	**U.S. competitiveness:** Proponents say that offshoring is crucial to the survival of many U.S. companies and that it saves other U.S. jobs by making U.S. companies more competitive in the global marketplace.	 U.S. economy	

Top 10 Factors, Reshoring + FDI, 2010-2017					
Rank	Negative Offshore Factor	Citings	Rank	Positive Domestic Factor	Citings
1	Quality/rework/warranty	292	1	Government Incentives	527
2	Freight cost	196	2	Proximity to customers/market	493
3	Total cost	147	3	Skilled workforce training/availability	446
4	Delivery	100	4	Image/brand Made in USA	398
5	Inventory	91	5	Eco-system synergies	336
6	Rising Wages	88	6	Lead time/Time to market	251
7	Supply chain interruption risk/Natural disaster risk/Political instability	78	7	Infrastructure	239
8	Intellectual property risk	64	8	Automation/technology	211
9	Communications	61	9	Manufacturing/engineering joint innovation (R&D)	155
10	Green considerations	53	10	Higher productivity	141

Source: https://www.industryweek.com/economy/reshoring-rise-what-it-means-trade-debate

> What we should be focusing on is not reshoring but ‘rightshoring’, making sure we put things in the right place

Janet Godsell, professor of operations and supply chain strategy at Warwick

Supply Chain Management

Supply Chain

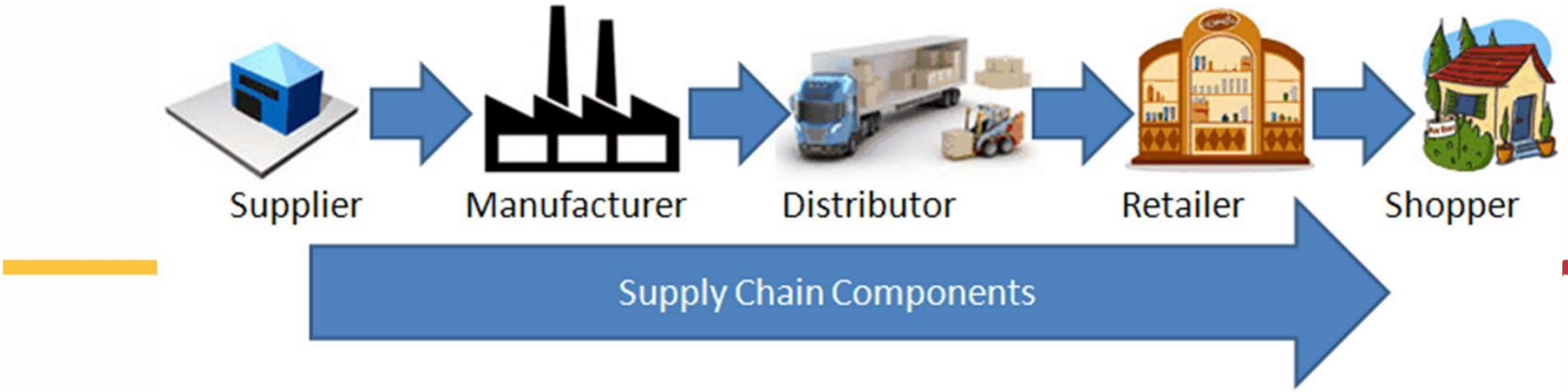
A set of connected systems that coordinates the flow of goods and materials from suppliers all the way through to final customers

Supply chain management (SCM)

The business procedures, policies, and computer systems that integrate the various elements of the supply chain into a cohesive system

Goal

Getting the right materials at the right price in the right place at the right time for successful production



Strategic Impact of SCM

- ✓ Managing risks
- ✓ Managing relationships
- ✓ Managing trade-off
- ✓ Promoting sustainability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Join the #
1
alberto balsam
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CLEAR
Lifebuoy
3in1
@tresemmeid
@clearindonesia
@lifebuoyid
REFILL STATION
CERITAKAN PENGALAMANMU DAN TAG @UNILEVERIDN & MEREK PILIHANMU!
REFILL
SAMPO ANDA

Supply Chain Systems and Methods

Inventory
Goods and materials kept in stock for production or sale

Inventory Control
Determining the right quantities of supplies and products to have on hand and tracking where those items are

Procurement
The acquisition of the raw materials, parts, components, supplies, and finished products required to produce goods and services

Lead Time
A period the elapses between placing the supply order and receiving materials

Material requirements planning (MRP)

Manufacturing resource planning (MRP II)

Enterprise resource planning (ERP)

Production and Operations Management

Production and Operations Management
Overseeing all the activities involved in producing goods and services

Productivity
The efficiency with which an organization can convert inputs to outputs

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Lean Systems
Systems (in manufacturing and other functional areas) that maximize productivity by reducing waste and delays

Just-in-Time (JIT)
Inventory management in which goods and materials are delivered throughout the production process right before they are needed

JIT → Inventory = "0"

NEWS

Ever Given ship freed in Suez Canal

The Ever Given has been freed in the Suez Canal and traffic has begun to flow again. The container ship was blocking the canal for nearly a week, holding up billions in trade.

Engineers straighten ship wedged in Suez Canal

A huge container ship that has been stuck in the Suez Canal for nearly a week has been released, authorities said on Monday.

Date 29.03.2021

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COLUMN

Today's supply chains are too lean

The COVID-19 pandemic has highlighted the dangers of just-in-time principles.

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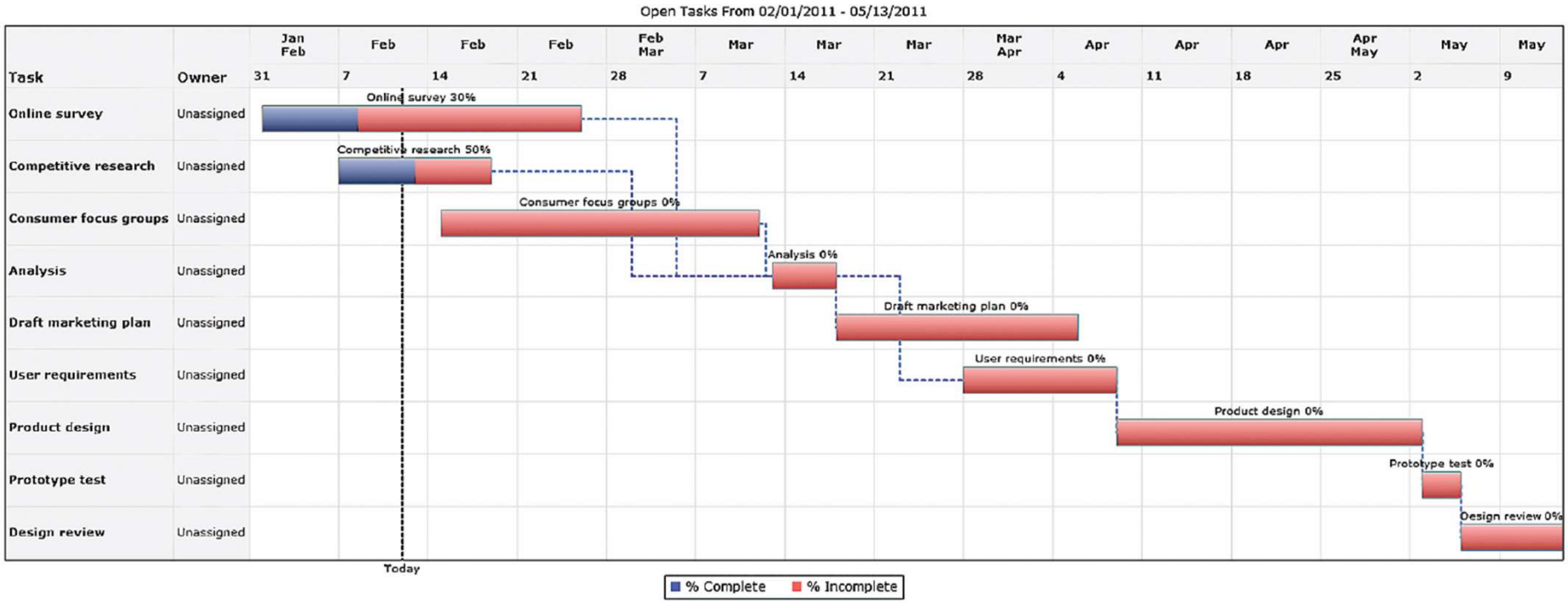
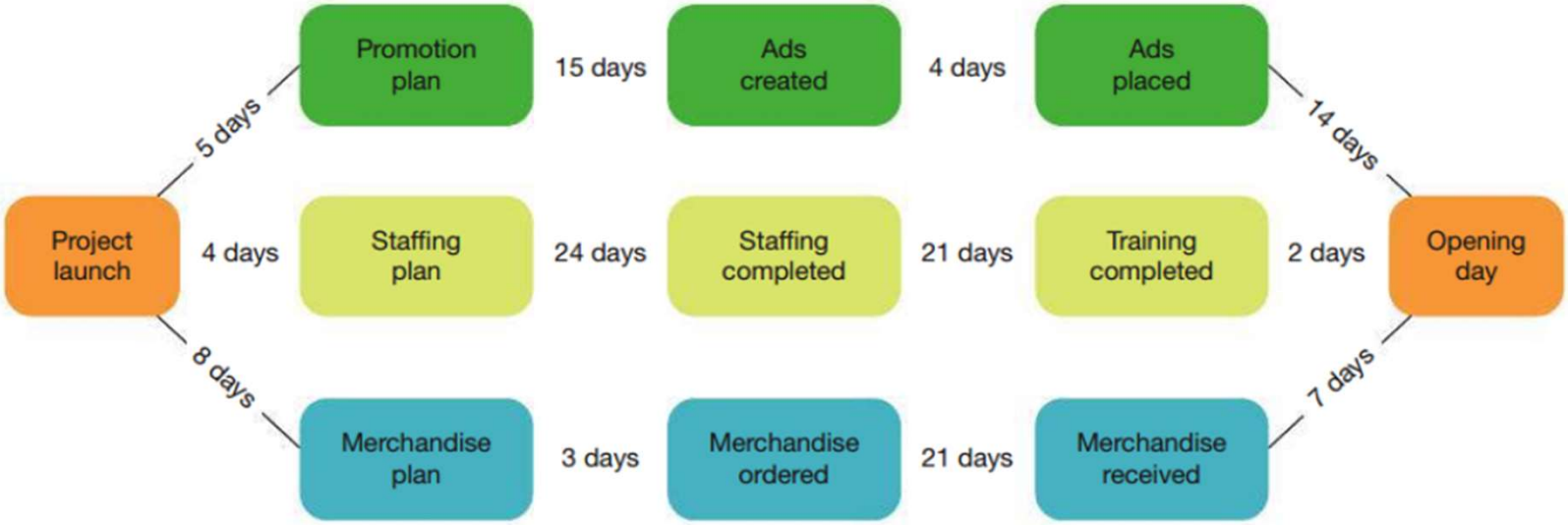
Gantt Charts for Project Management



Scheduling: The Program Evaluation and Review Technique (PERT)

EXHIBIT 9.4 **Simplified PERT Diagram for a Store Opening**

This PERT diagram shows a subset of the many tasks involved in opening a new retail store. The tasks involved in staffing are on the critical path because they take the longest time to complete (51 days), whereas the promotion tasks can be completed in 38 days and the merchandise tasks can be completed in 39 days. In other words, some delay can be tolerated in the promotion or merchandise tasks, but any delay in any of the staffing tasks will delay the store's opening day.

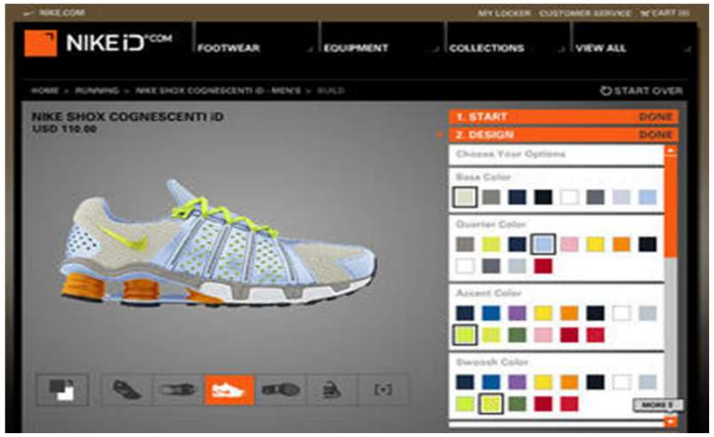


Types of Production

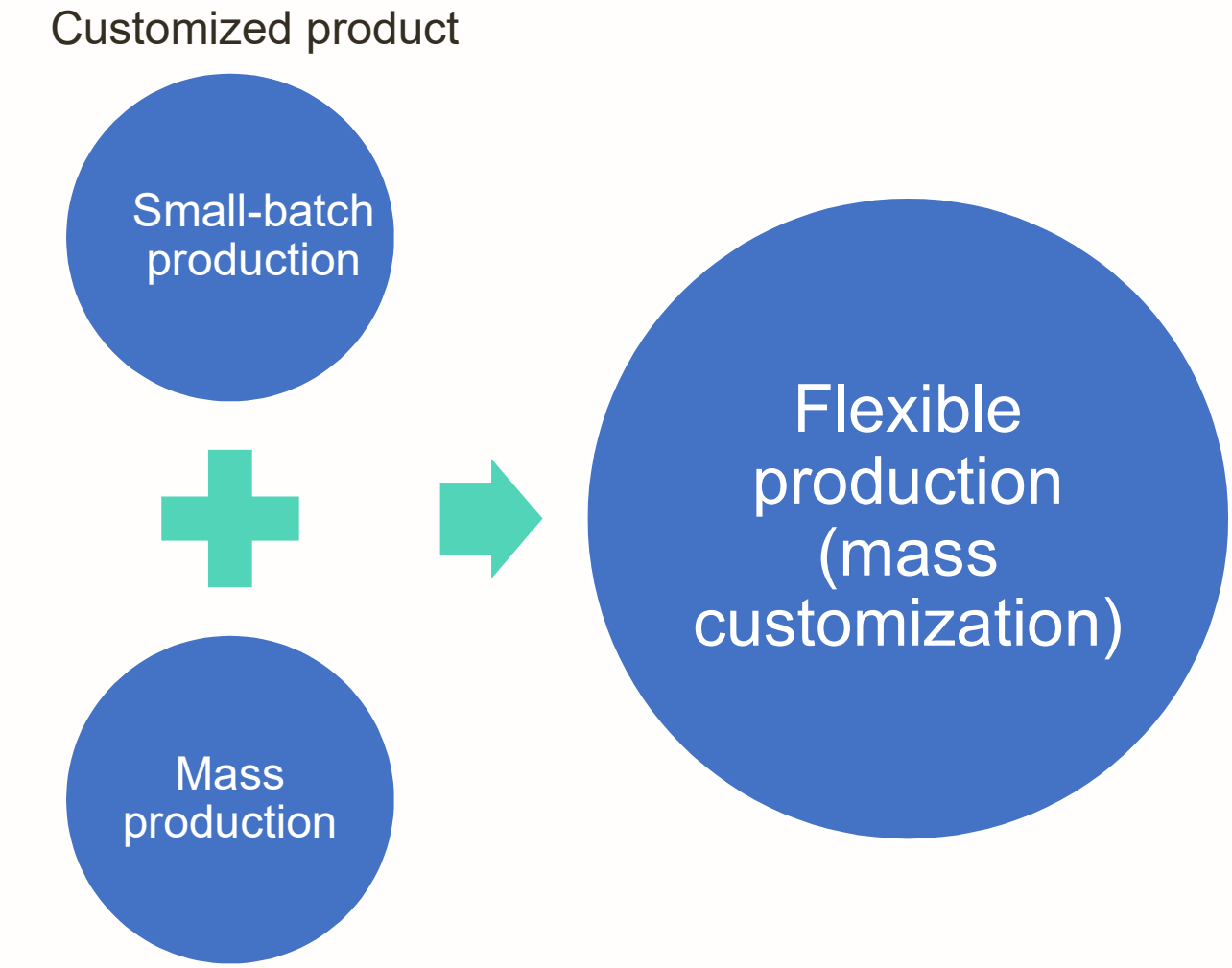
Mass Production
The creation of identical goods or services, usually in large quantities

Customized Production
The creation of a unique good or service for each customer

Mass Customization
A manufacturing approach in which part of the product is mass produced and the remaining features are customized for each buyer



Types of Production (cont'd)



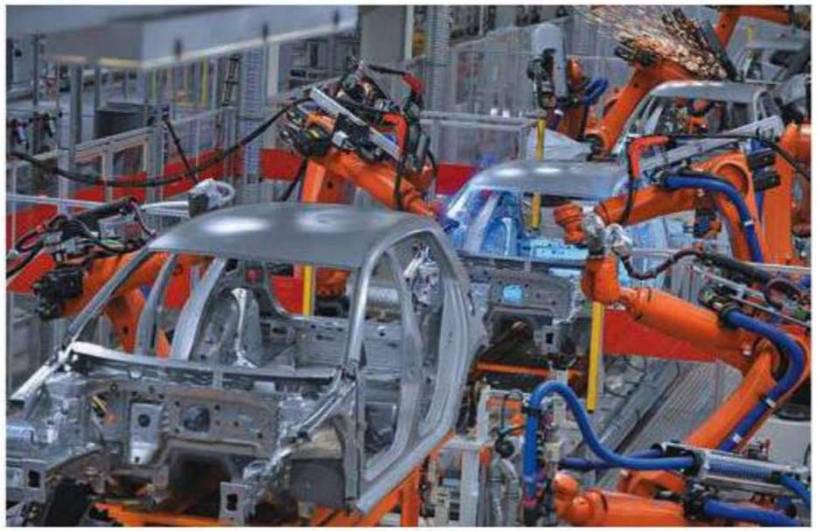
Postponing the task of differentiating a product for a specific customer until the latest possible point in the supply network

Industry 4.0 and the Smart Factory

Industry 4.0

The digital transformation of manufacturing, moving from automated factories to smart factories that emphasize the use of cyber-physical systems

- cyber-physical systems
- Additive manufacturing
- IoT



Olga Serdyuk/123RF

The smart factories of Industry 4.0 promise greater agility and adaptability in addition to improvements in efficiency and productivity.

Speed and efficiency

Greater agility and adaptability

Engagement Question

- Would you characterize Industry 4.0 as a revolution or more of an evolution? Why?

- Why might various companies have an interest in promoting Industry 4.0 as a conceptual “brand”?

BEHIND THE SCENES

Printing the Impossible at Voodoo Manufacturing

It's a safe bet that Brooklyn's Voodoo Manufacturing is the only company in the world that has manufactured custom mannequins, prosthetic hands, action figures from video games, trophies for VH1's Hip Hop Honors show, architectural models, brain-sensor helmets, and dog goggles. These are only a few of the products the company has made for its growing list of more than 2,000 customers.

Max Friefeld, Jonathan Schwartz, Oliver Ortlieb, and Patrick Deem hatched the idea of offering 3D printing as a service while working for one of the leading makers of 3D printers. Many people are aware of 3D printing from a hobbyist's perspective, but the three colleagues and roommates saw the potential for a fresh take on the idea of contract manufacturing. Their mission is both simple and bold: "We're giving everyone on Earth the power to manufacture."

Voodoo's business model is based on on-demand 3D printing, in which clients upload digital models of whatever they would like to have made, then Voodoo's battalion of printers (more than 200 already, with more to come) go to work creating them. The process doesn't require the expensive molds or tooling that traditional manufacturing needs, and the turnaround time is usually a matter of days rather than the months that ramping up traditional manufacturing can involve.

With no start-up costs, no minimum volume requirements, and rapid turnaround, this mode of manufacturing opens up powerful possibilities for Voodoo's clients. Advertising agencies and other marketing firms use the service to create small batches of promotional items, for instance. Other companies use the service for rapid and iterative *prototyping*, in which they quickly test a physical product for design errors or functional issues, tweak their digital model, get another physical item to test, and repeat the cycle until the design is optimized. This is also a great way to test-market products by putting them in the hands of potential customers to get their reactions.

To support a wide range of customers, Voodoo expanded its business model both upstream and downstream from the manufacturing stage. If customers don't have the design or technical skills to create digital models of the products they would like to make, Voodoo offers custom design services to take clients from the idea stage through manufacturing. And on the downstream side, it offers *fulfillment* services from its Brooklyn factory, in which it can ship finished products directly to a client's customers. In other words, if you had an idea for a product but no clue how to design it or make it and no company in place to ship products to customers, Voodoo could handle the entire process for you.

The 3D printing that Voodoo uses is a form of *additive manufacturing* (the terms are sometimes used interchangeably), in which digital models are reproduced in plastic, metal, or other substances by applying or "printing" successive layers of material. Voodoo currently offers its clients two types of plastic: a biodegradable corn-based plastic and a plastic with the elasticity and flexibility of rubber. Other types of additive manufacturing include metal powders that are melted into solids using lasers and machines that can print houses using fast-drying concrete. Additive manufacturing is used for a vast range of products today, including movie props, custom-fit hearing aids, machinery components, car parts, shoes, and even rocket parts.

Voodoo has received several rounds of investment funding, and Friefeld and his colleagues are upbeat about the company's prospects. Their next move is continuing to automate the manufacturing process using robotic arms that extract finished goods from those hundreds of printers so that production can continue virtually without pause 24 hours a day.

The next time you get an idea for a great product that no one has ever made, don't dismiss it as an idle daydream. Voodoo can help you make that dream a reality.[39]

Critical Thinking Questions

9-1. How does a service such as Voodoo support the concepts of virtual and unstructured organizations discussed in Chapter 8?

9-2. What advantages does iterative prototyping offer companies that are introducing new types of products to the market?

9-3. How does Voodoo represent the concepts of cyber-physical systems and the smart factory?

Learn More Online

Visit **voodoomfg.com** and explore the examples section to see what the company has been manufacturing for its customers. Read about the printing, design, and fulfillment services to get a better idea of how the company can support a wide range of customers. What materials and printing services does Voodoo currently offer? How does it present those capabilities to potential customers?

Voodoo Manufacturing
Case study (answer in MS Team)

1. How does a service such as Voodoo support the concepts of virtual and unstructured organizations? (Virtual organization will be discussed next week)
2. What advantages does iterative prototyping offer companies that are introducing new types of products to the market?
3. How does Voodoo represent the concepts of cyber-physical systems and the smart factory?