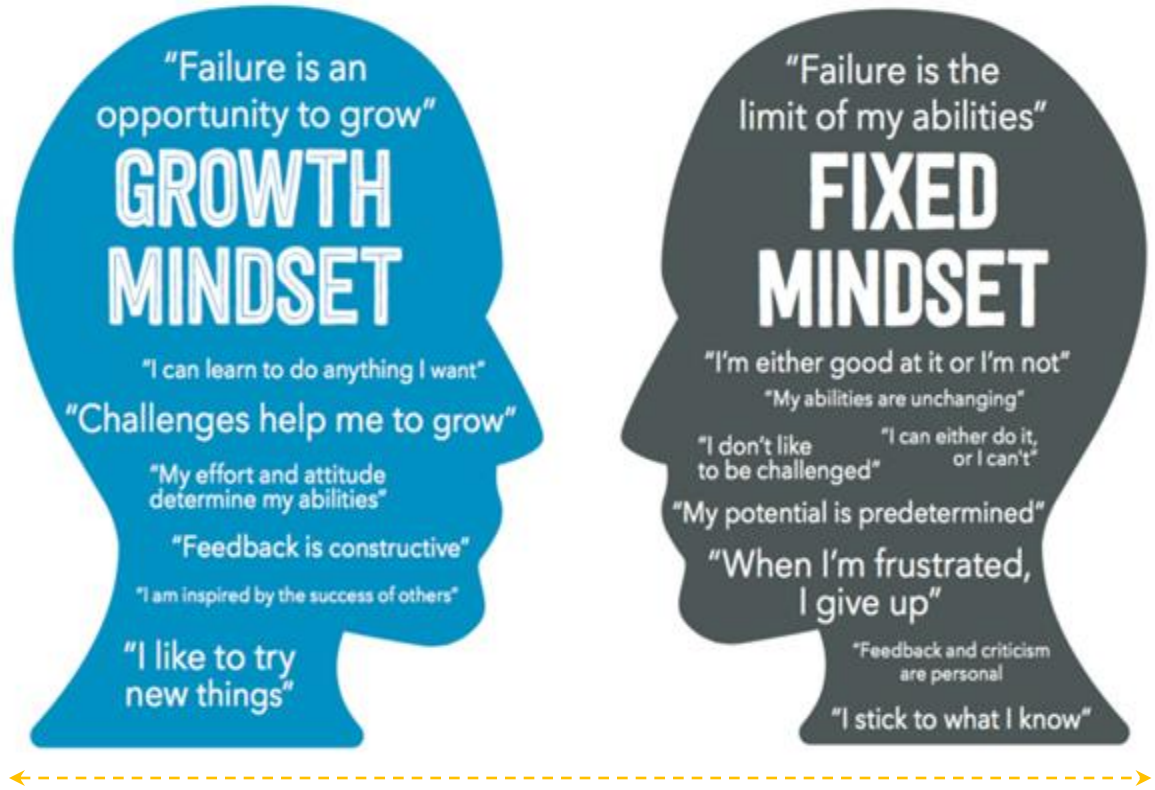
Production Management (ME-419)

Course Introduction

Amin Kaboli

Week 1 – Session 1 – September 13th, 2024

Agreement #1 – Cultivate Growth Mindset



We are here to learn, embrace setbacks and mistakes

Agreement #2 – Disconnect to connect

Turn off your phone

Or put it on silent mode

Penalty

Agreement #3 – Connect and Bond with Class

Listen twice

and speak once

Effective & Non-violent Communication

4-sentence rule

Question?

Raise your hand

About You?

2 Min

1

Get familiar with your classmates

2

Introduce yourself

Your name

Why did you take this course?

What is special about you?

3

Listen and connect

Agenda

- **13:15 – 14:00** Introduction to Production Management (ME-419)
  - Class statistics
  - The course objectives, framework, structure, assessments, …
  - Motivation and expectations
  - Assessment methods and success factors
  - Summary of seven Agreements

Course Objectives


Understanding how a production company works.


Recognizing the critical challenges that a production company faces with.


Analyzing production of a given product/service.


Knowing how to lead and manage a given product/service from A to Z.

The Learning Outcomes

By the end of the course, the student must be able to:

Understand fundamentals of production management

Evaluate and analyze a production system based on key performance indicators

Design and execute a demand/supply plan and improvement a production system

Course Framework

Business plan
Strategic plan
Financial plan

Production Management (ME-419)

Module 1	Module 2	Module 3	Module 4	
Introduction to PM	**Demand Management**	**Supply Management**	**Digital Transformation**	**Final Presentation**
Sep	**Sep-Oct**	**Oct-Nov**	**Dec**	**Dec 20th**
Value Adding Network Production Process Flows, Production procedures, Items, BOM	Demand disruptions Forecasting Methods Qualitative methods Quantitative methods Demand plan	Supply disruptions Production Planning AP, MPS, MRP Capacity Planning Inventory Management Supply Plan	Digital technologies for PM, Demand and Supply Analytics, From Products to Ecosystems	Final presentation & solid understanding of the course

Class Structure (Min 10h/week required)

2h

Before the class

To **understand** the concept:

- Readings
- Videos
- Case studies
- …

4h

Class

To **learn and implement**:

Exercises, case studies, presentations…

4h

After the class

To **learn and implement**:

- Assignments
- Projects
- Reports
- …

Assessments – Continuous Evaluation

30%

100%

Final report

Final presentation

understanding of the course

25%

Presence

Participation

Class engagement

45%

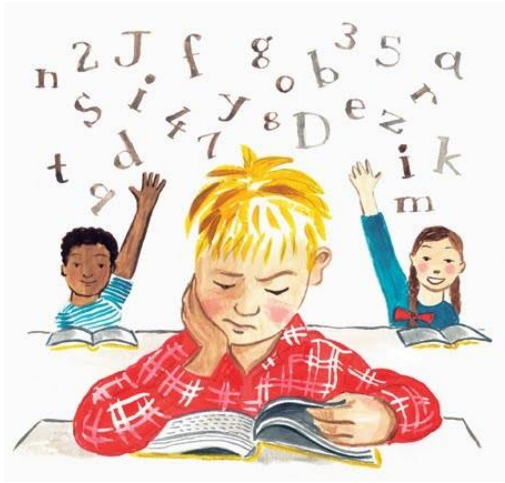
70%

Class assignments/projects/cases

Presentations

Reports

Diverse Learning Needs – Inform Me ASAP



Dyslexia

Affects reading and related language-based processing skills

Dyscalculia

Affects a person's ability to understand numbers and learn math facts

Other

Dysgraphia, Non-verbal learning disabilities, Oral/written language disorder, ADHD, …

What Do We Expect From You?

Individual

Respect

Presence

Involvement

Team

Respect

Teamwork

Openness to learn

Key Success Factor – Attention

Self-learning

Reading slides

Hand-outs

Class learning

Play & Practice

Guest speakers

Group learning

Team work

Creating study groups

Resources

Slides

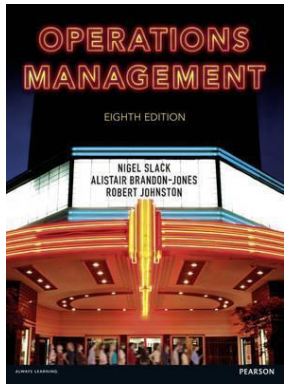
Hand-outs

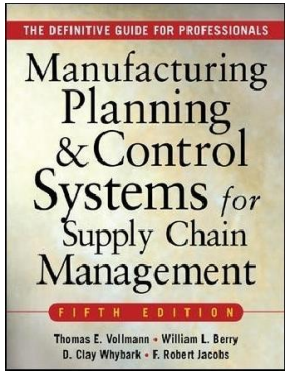
Case Studies

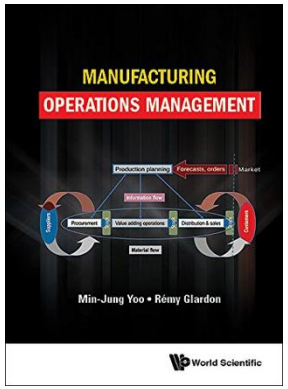
Videos

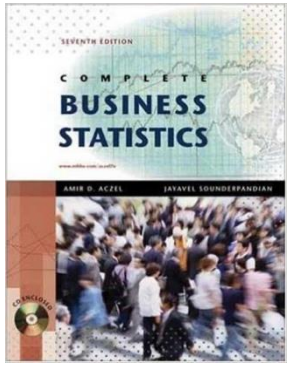
Books

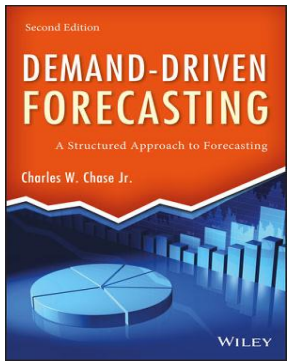
Resources – Selected Books

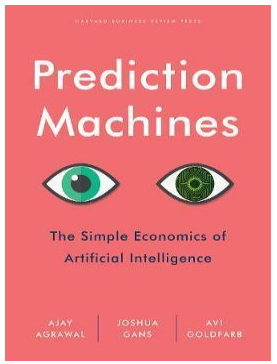


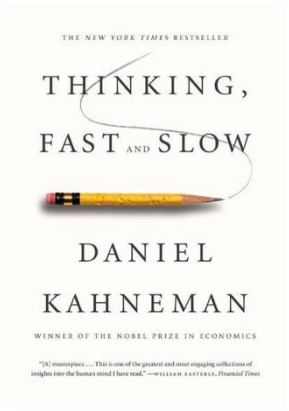


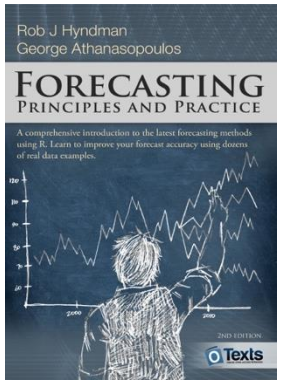


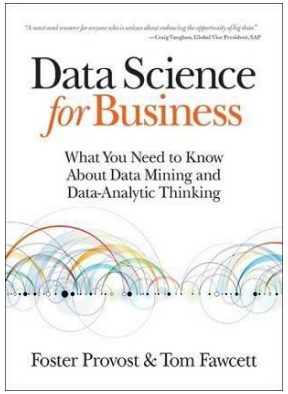


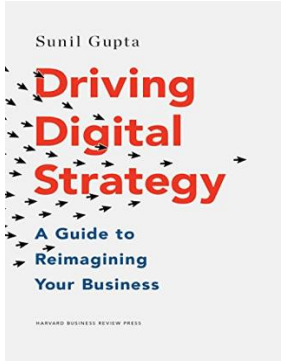


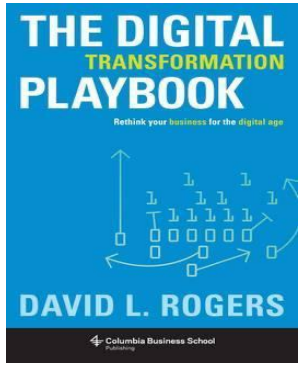


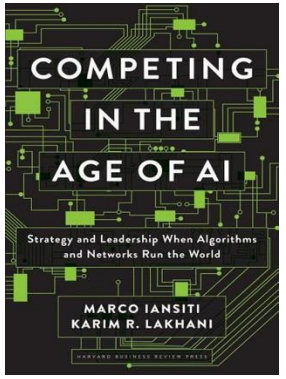


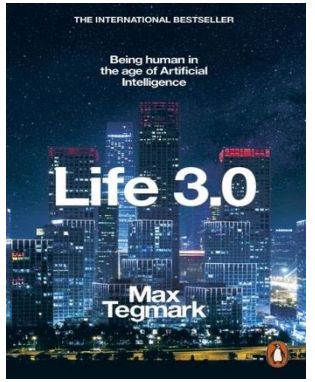












Module 1: Introduction to Production Management

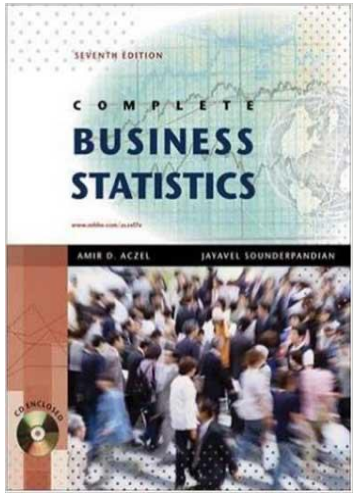
Module 2 & 3: Demand & Supply Management

Module 4: Digital Transformation

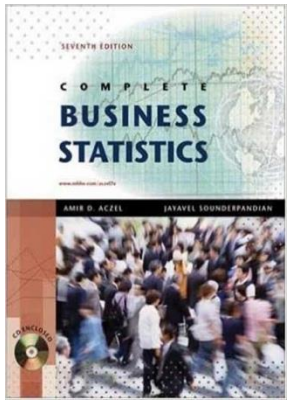
Learning Prerequisites – Required Courses

Required Courses

Probability & Statistics



Learning Prerequisites – Basic Statistics

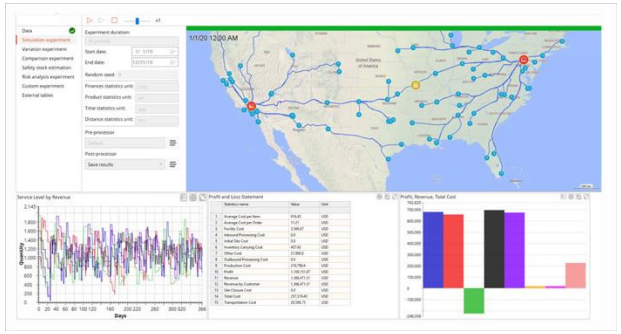


Chapter 1	Chapter 3	Chapter 4	Chapter 5	Chapter 6	Chapter 10
Descriptive Statistics	Random Variable	Normal Distribution	Sampling & Distribution	Confidence Intervals	Regression & Correlation

- Chapters are shared on Moodle

Extra Learning Opportunity – Simulation Software

AnyLogisticx

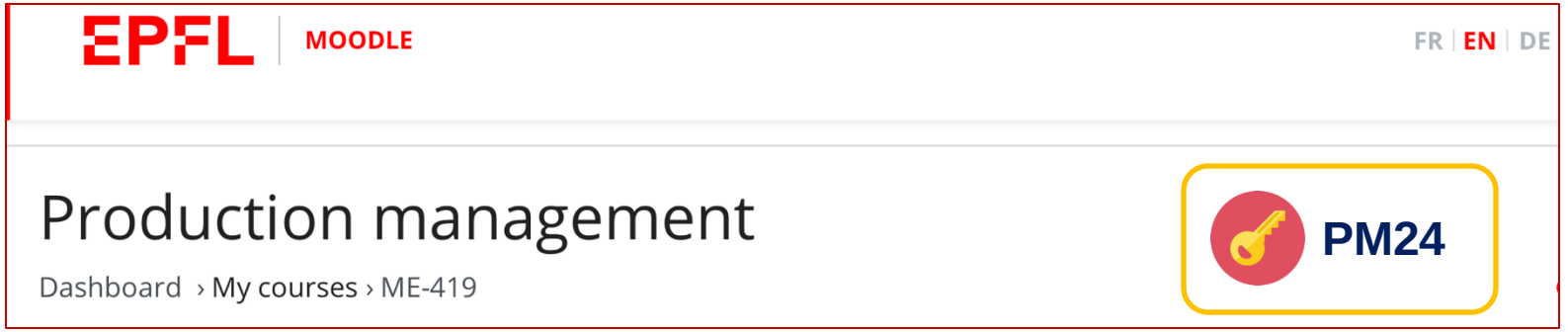


4 Lab sessions on Friday Mornings

Nov 24, Dec 1st, Dec 8th, Dec 15th

Certificate of participation

Agreement #4 – Stay Connected/Communicate via Moodle



Hand-outs

Plans

Data

Slides

Videos, …

Agreement #5 – Report Professionally

Executive summary/abstract
Conclusion

Problem/Analysis/Outcome

Citation and referencing

Agreement #6 – Present Professionally

Structured, short, concise, to the point

Visualize Problem/Analysis/Outcome

Respect allocated time

Agreement #7 – Giving and Receive Effective Feedback

Feedback is a gift

Feedback/comments are always welcome

Seven Agreements – Summary

Cultivate Growth mindset

Disconnect to connect

Connect and bond with your team, coaches, class

Stay connected off-class (Moodle)

Report Professionally

Present Professionally

Give and receive effective feedback

7 Reasons to NOT Take This Course

1. Friday afternoon (**13:00-17:00**)

2. Overlap with other courses and participate less than **85%**!

3. **No passion for products**

4. The course is **human-centric and needs your full involvement**

5. There is **no** cookbook, and you need to read from different references!

6. High **workload** and **limited time!**

7. **Disagreement** with the seven agreements!

7 Reasons to Take This Course

1. **Set of practical and hands-on skills** that equip you for industry

2. Practice how to **attend (pay attention)**

3. Learn to **build authentic connection** with your team, coach, class

4. Reignite and nurture your passion for product innovation and design

5. Learn how to **lead multiple projects in a tight deadline**

6. Learn how **industry experts and various companies** manage products

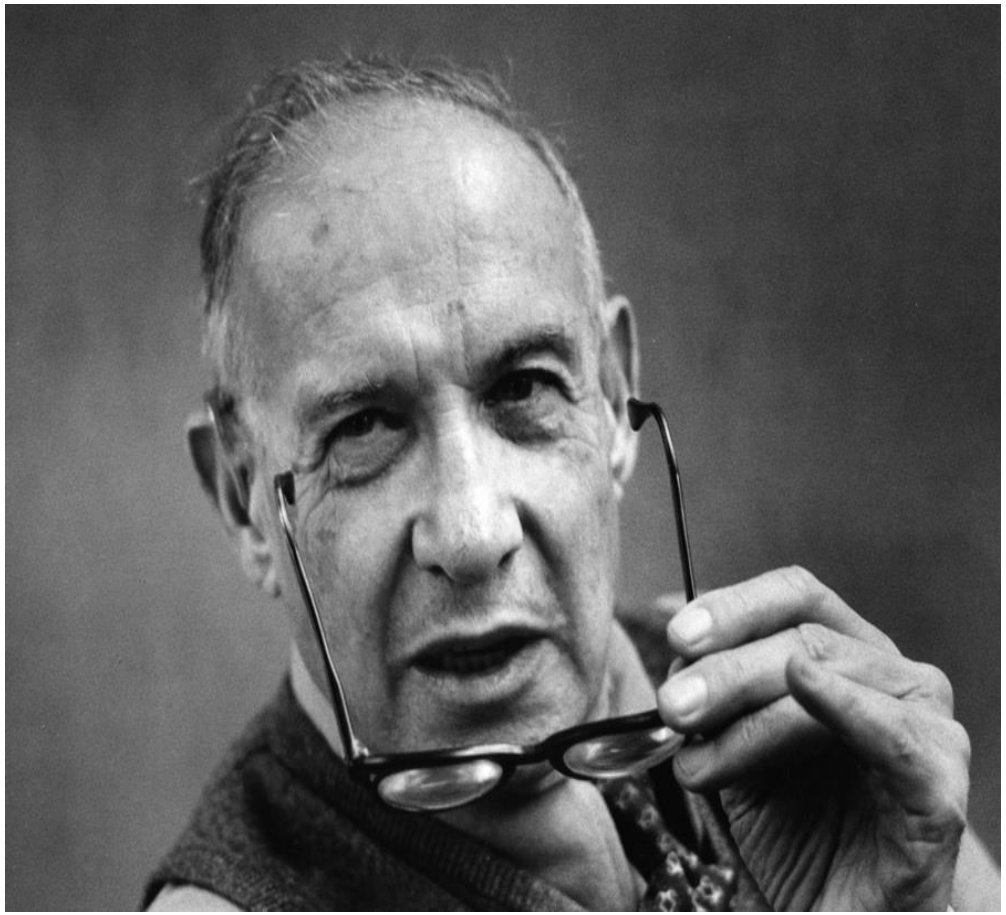
7. You **master the seven agreements** over the semester

You Have a Choice

… In a few hundred years, when the history of our time will be written from a long-term perspective, it is likely that the most important event historians will see is not technology, not the Internet, not e-commerce.

It is an unprecedented change in the human condition. **For the first time, literally, substantial and rapidly growing numbers of people have choices.** For the first time, they will have to manage themselves. And society is totally unprepared for it.

Peter Drucker 1909-2005



Production Management (ME-419)

- Group Formation & Intros
- PM in Action

Amin Kaboli

Week 1 – Session 2 – September 13th, 2024

Meet Your Coaches & Group Members

Coaches

Saria

Joao

Xavier

Case Studies – Summary

Saria
(Coaching Room: GCA 330)

Joao
(Coaching Room: GCA 331)

Xavier
(Coaching Room: GRA 332)

Meet Your Coaches & Group Members

Coaches

Saria

GCA 330

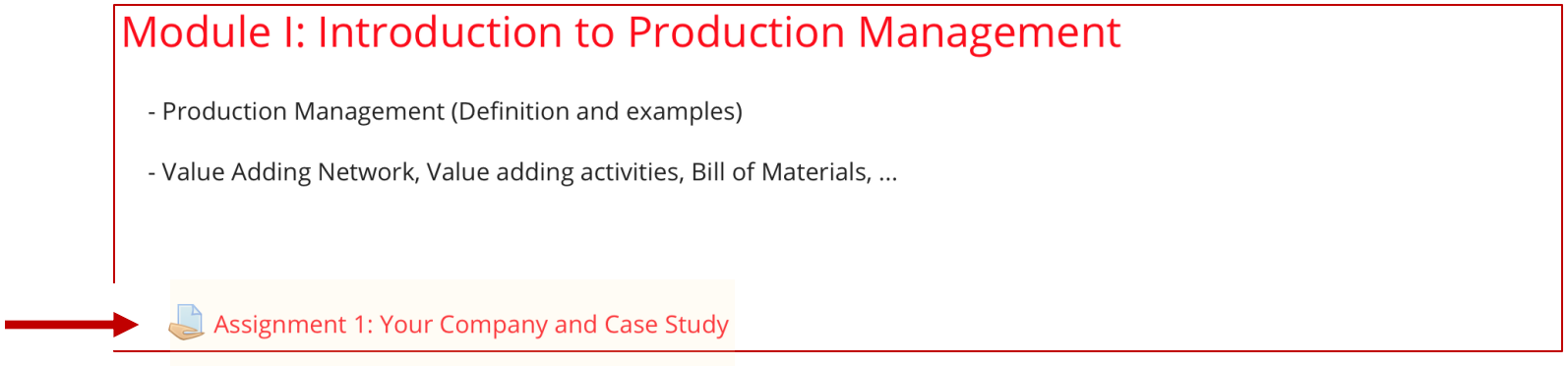
Joao

GCA 331

Xavier

GRA 332

Assignment 1 – Your Company and Case Study



1) Download the Assignment 1 from Moodle

2) Read and review the case study within your group

3) Get to know your company and the product that you will manage over the upcoming 14 weeks

Production Management (ME-419)

Module 1 – Introduction

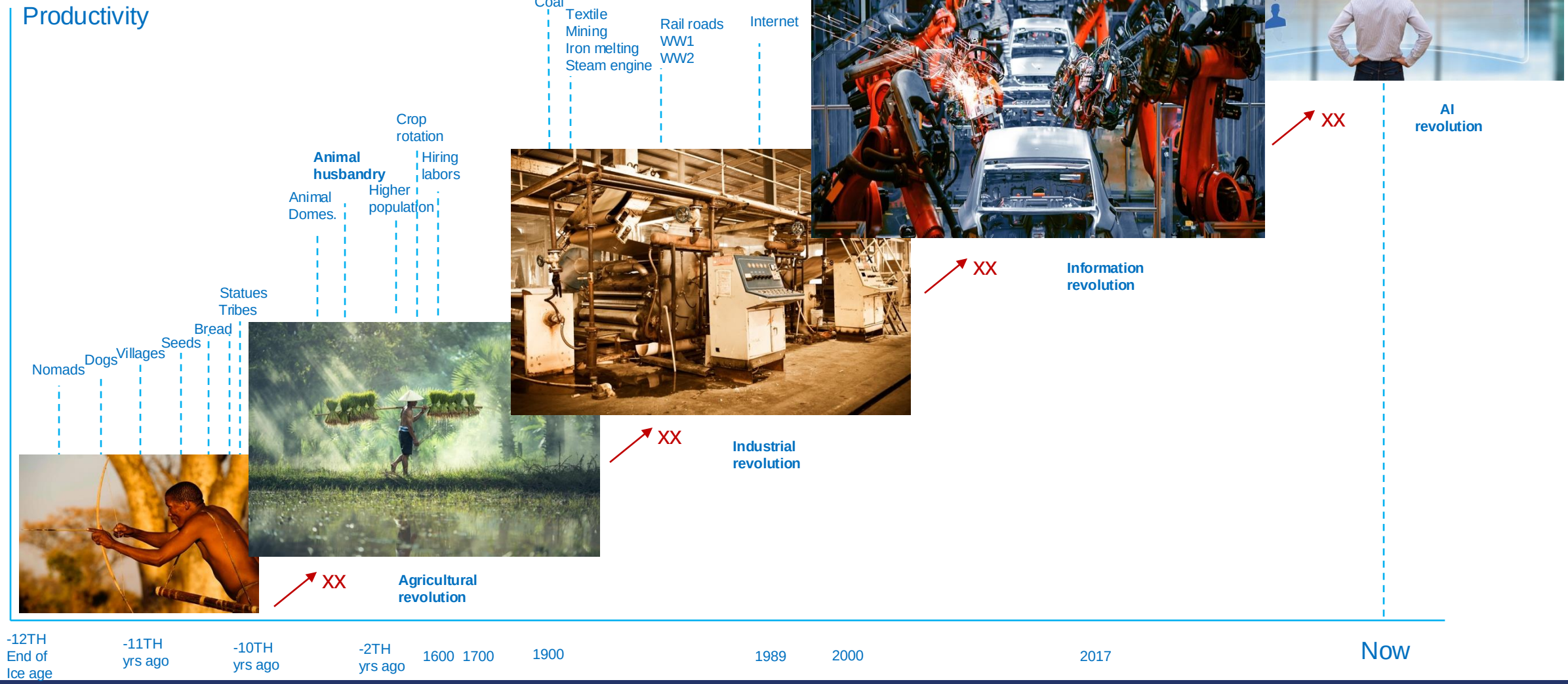
Amin Kaboli

Week 1 – Session 3 – September 13th, 2024

Agenda of the session

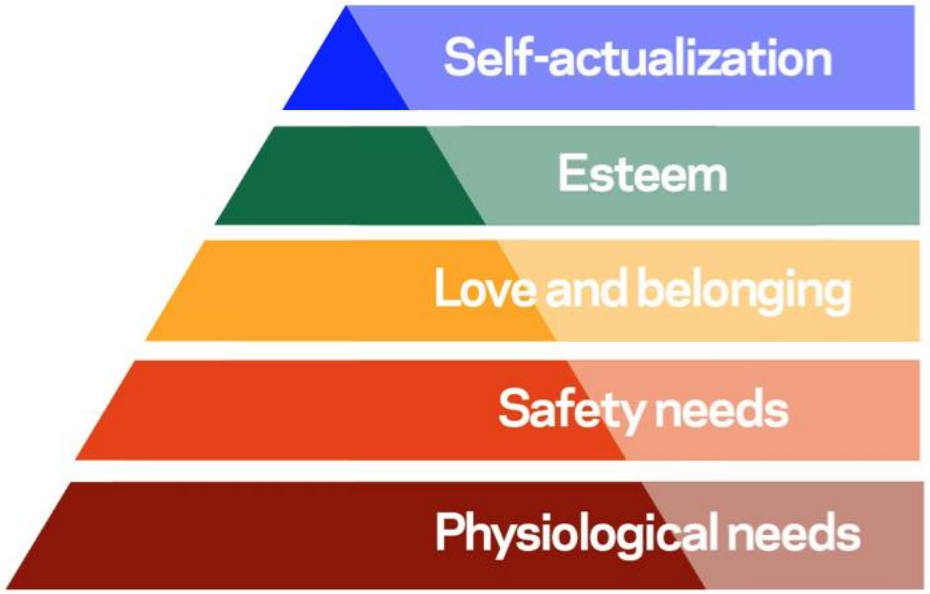
- **15:15 – 16:00** Introduction to Production Management (PM)
  - A big picture
  - Production Process Strategy
  - Dynamics & Flows (material and information)
  - PM definition and examples
  - Product development
  - Bill of Materials (BOM)
  - Value Adding Activities
  - Value Adding Network (VAN)

A Big Picture



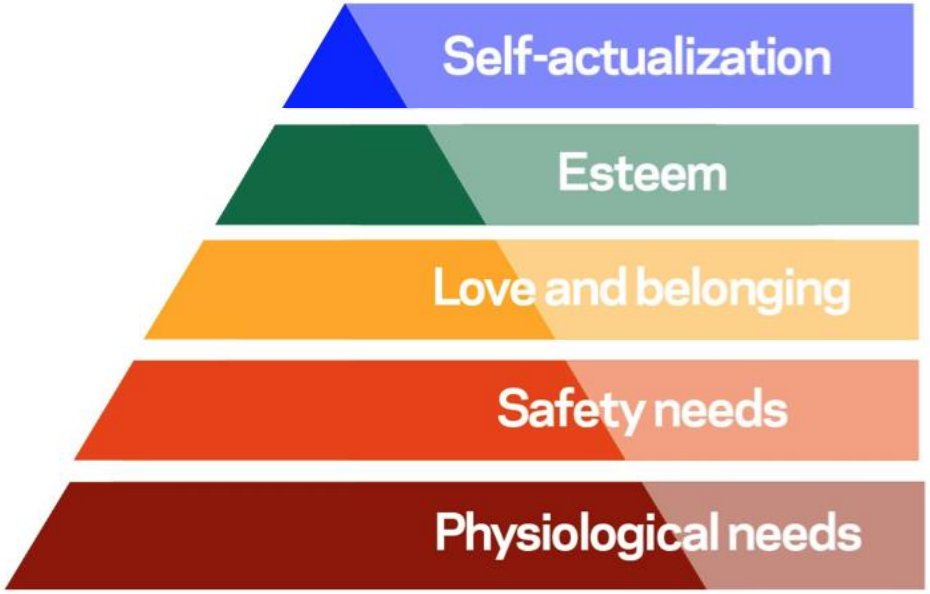
Value & Needs

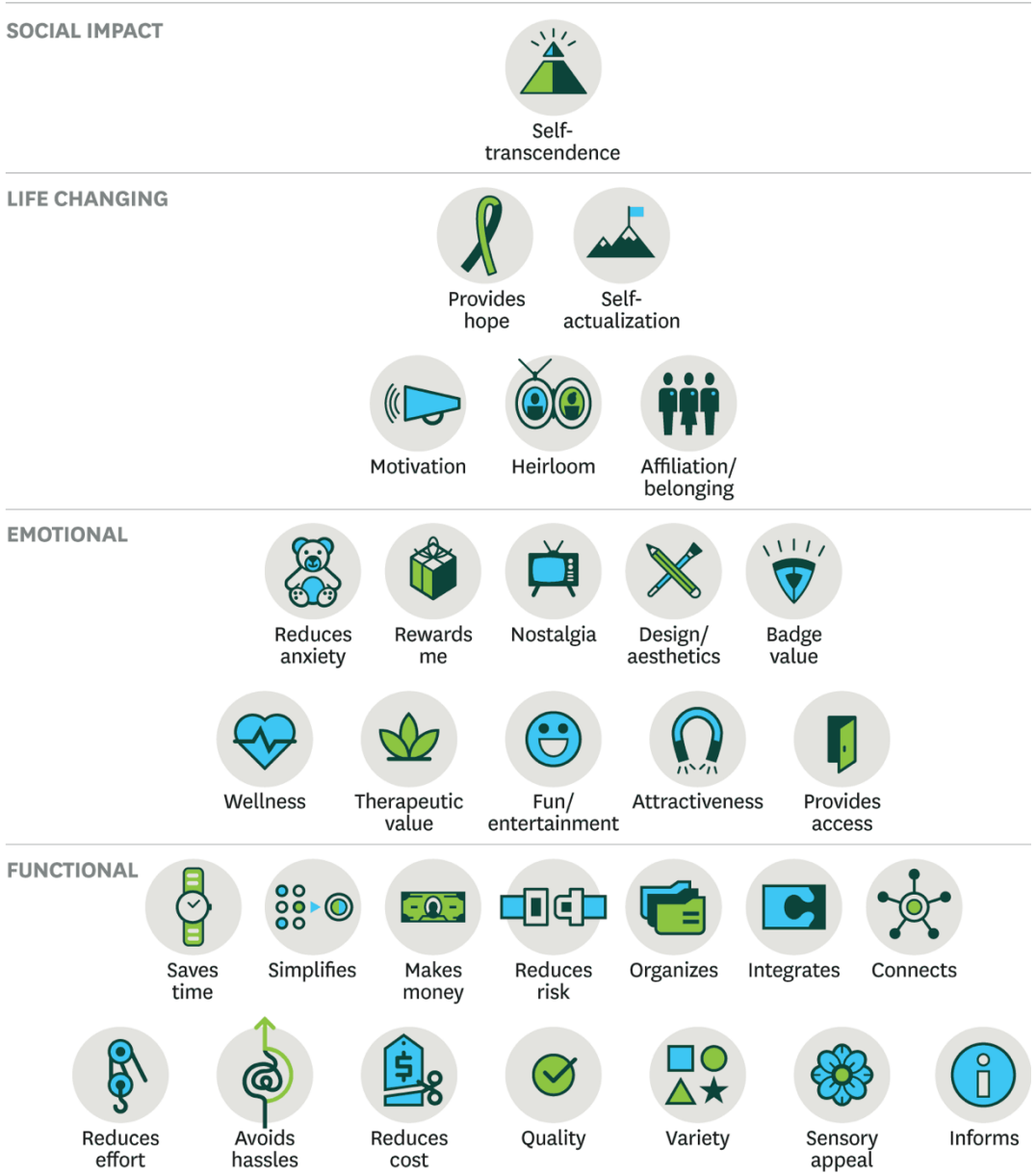
Human Needs



Source: A. Maslow, A Theory of Human Motivation, 1943.

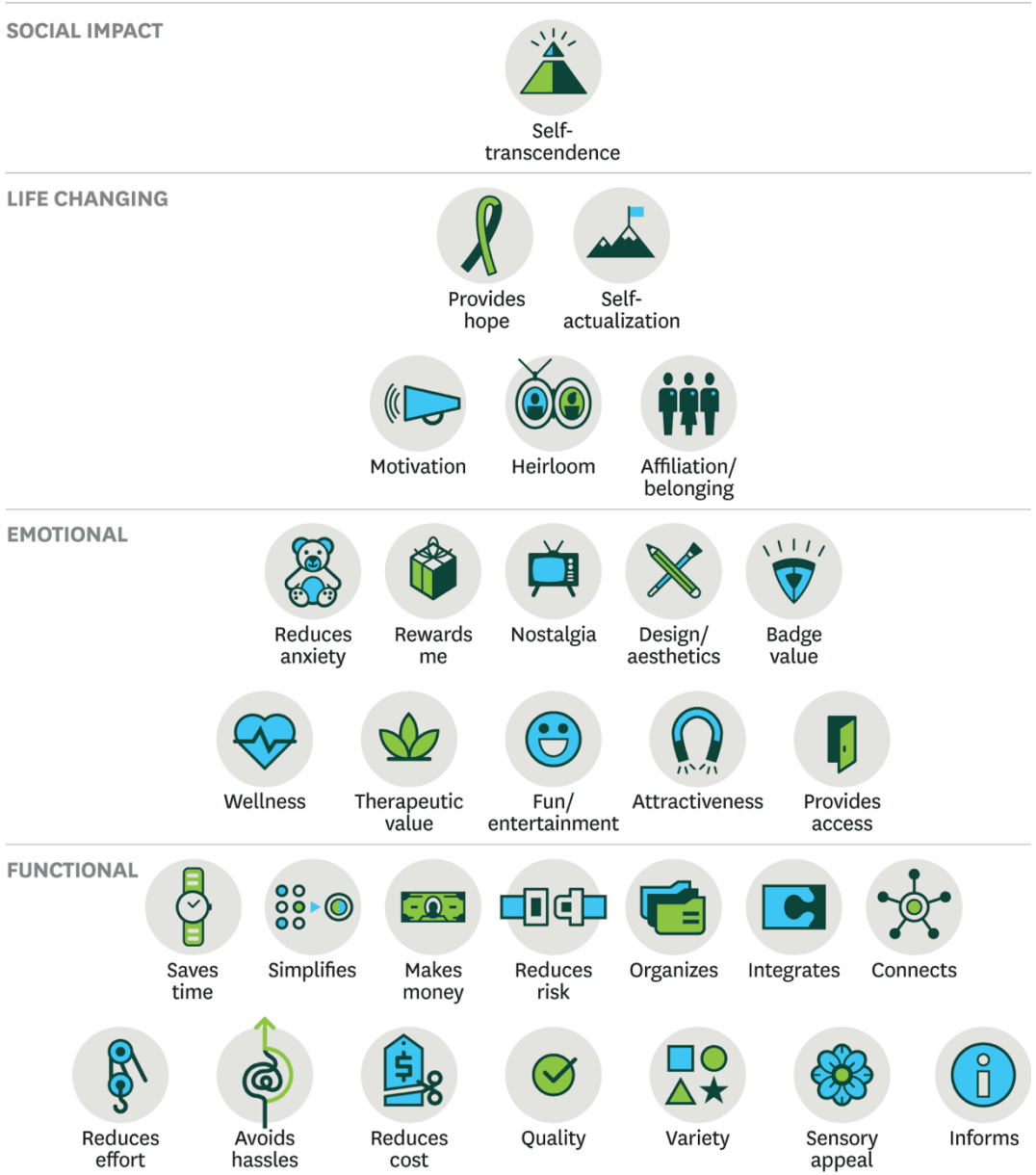
The Elements of Value





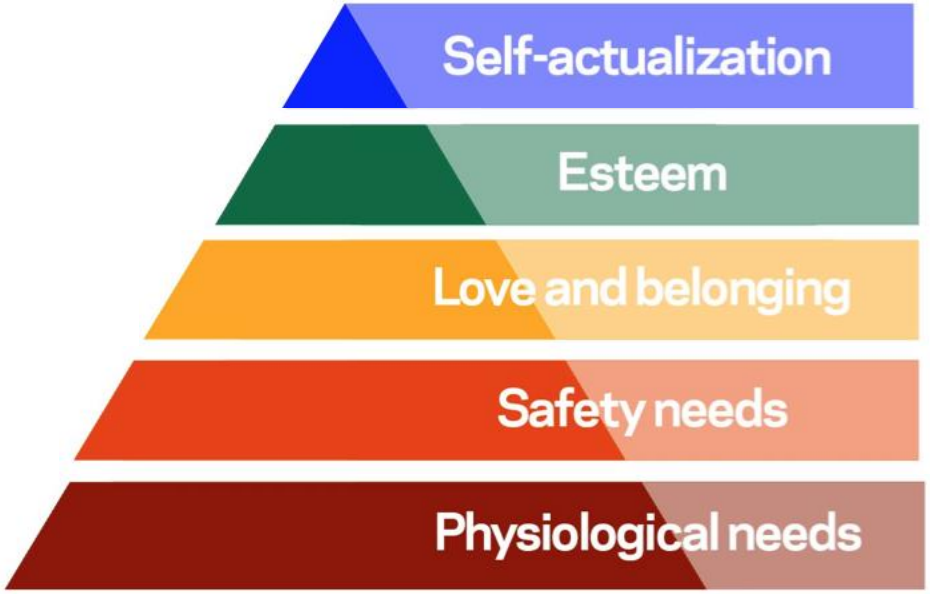
Source: 2015 Bain & Company - The Elements of Value, Harvard Business Review, 2015

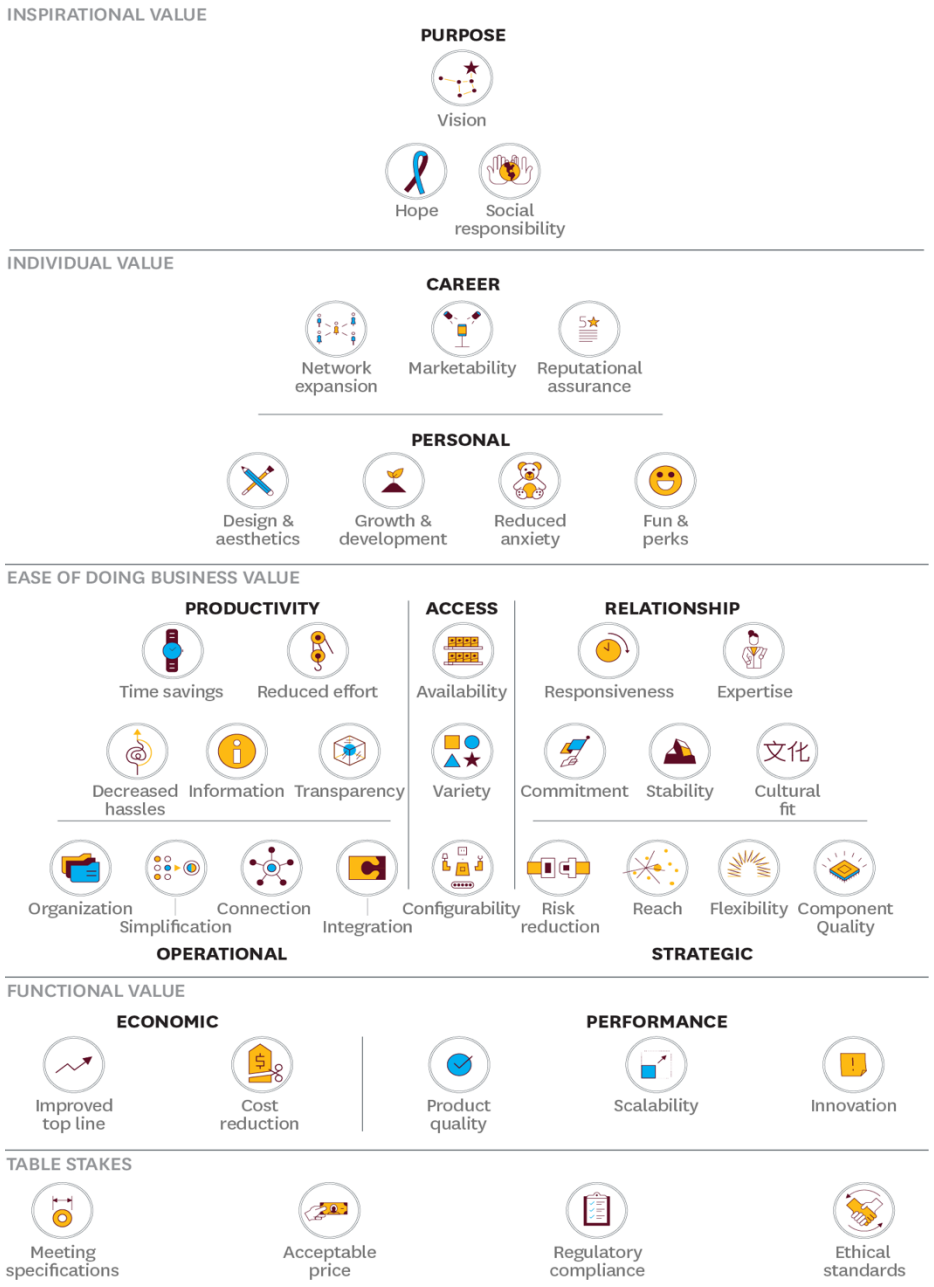
What Are Elements of Values?



Source: 2015 Bain & Company - The Elements of Value, Harvard Business Review, 2015

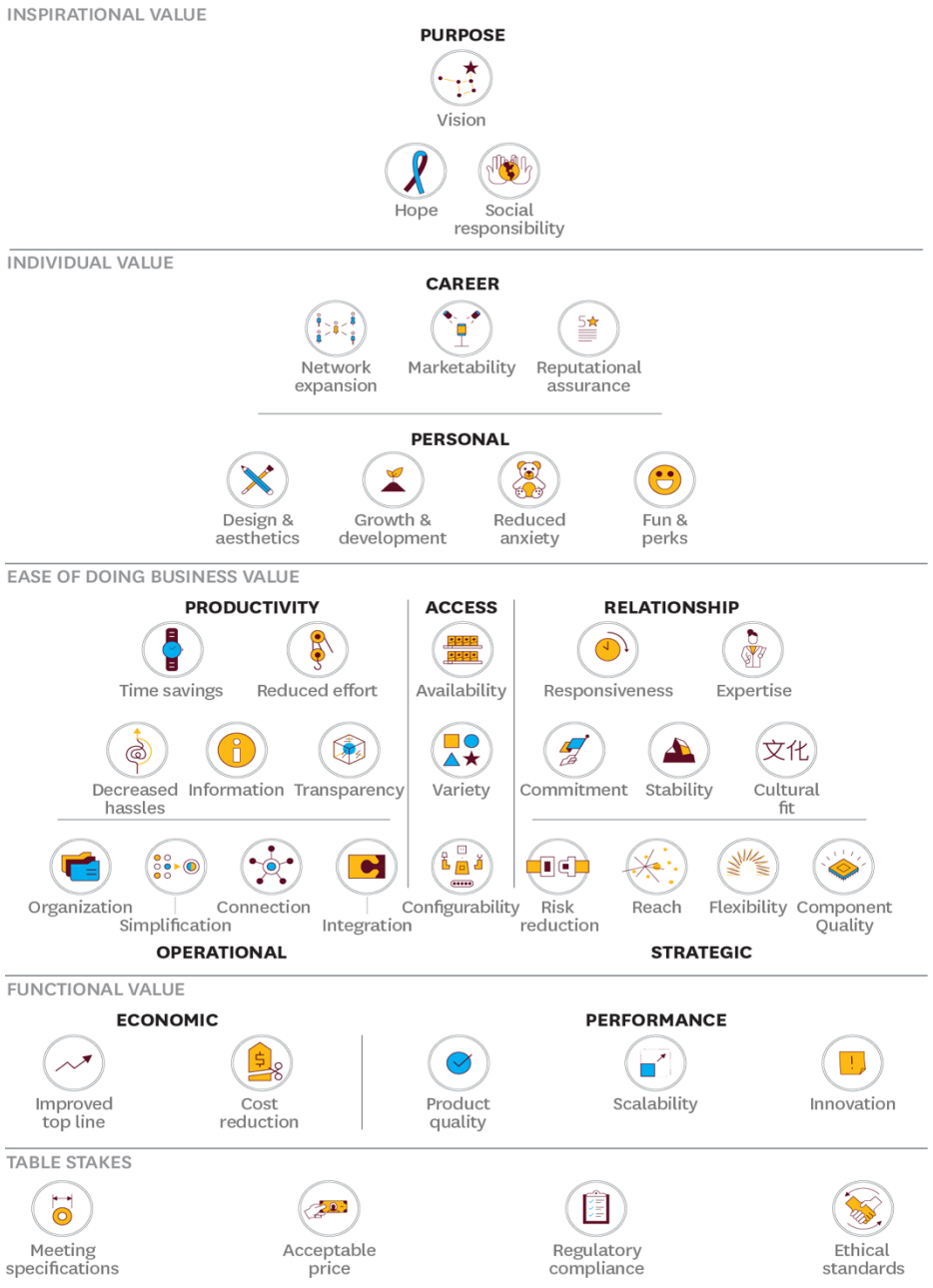
The B2B Elements of Value





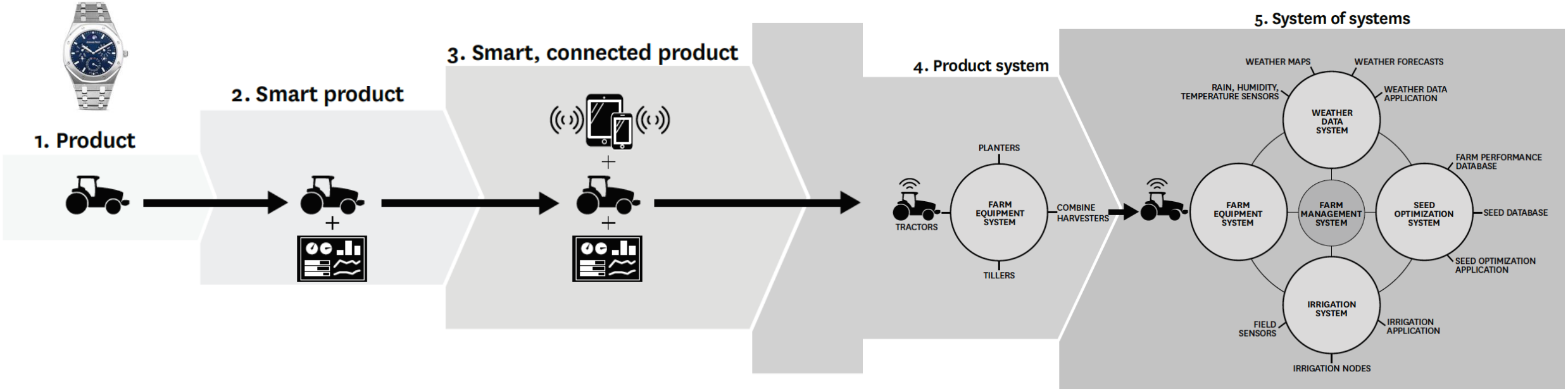
Source: 2018 Bain & Company - The B2B Elements of Value, Harvard Business Review, 2018

What Are B2B Elements of Value?



Source: 2018 Bain & Company - The B2B Elements of Value, Harvard Business Review, 2018

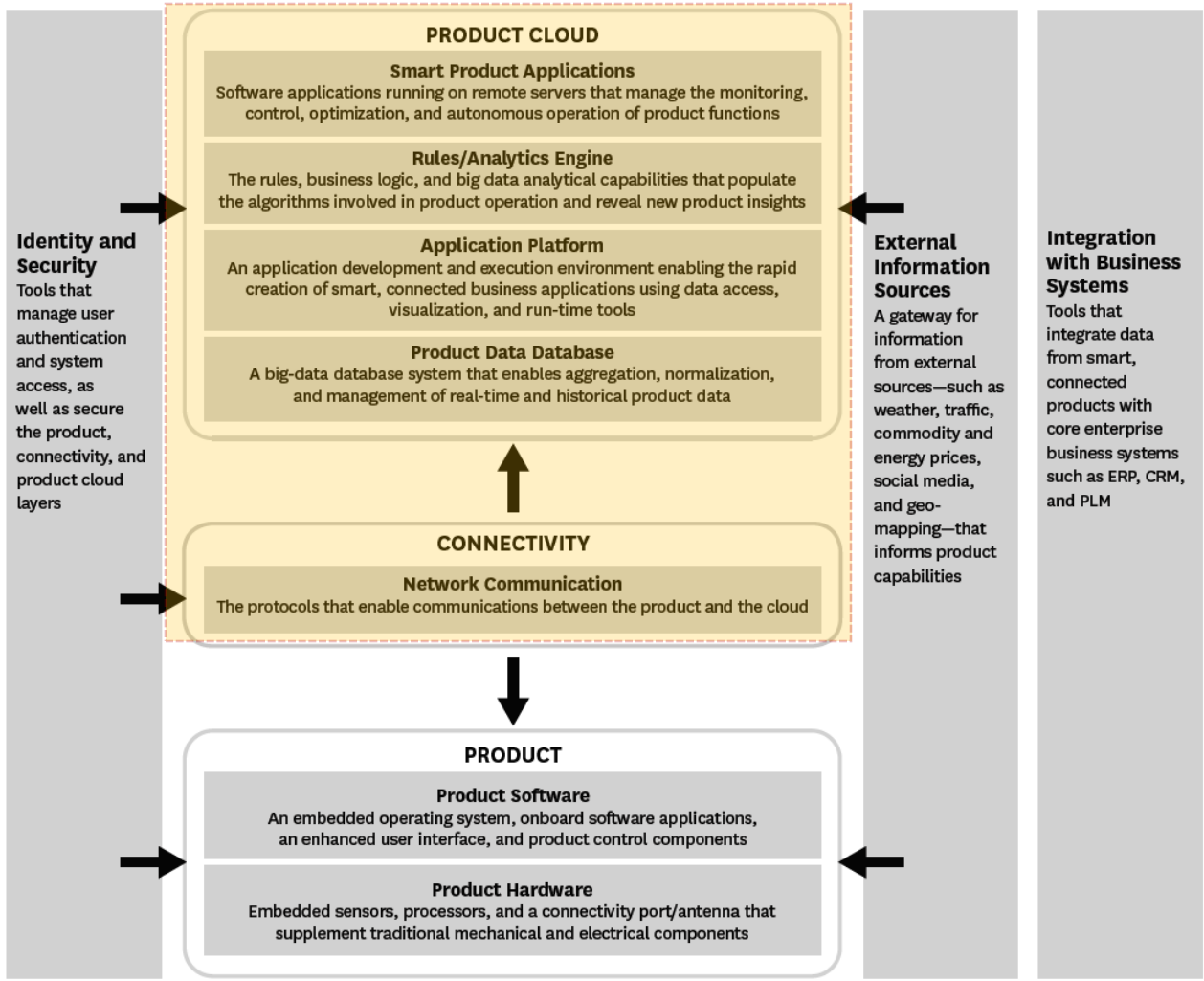
From Product to System of Systems



Source: How Smart, Connected Products Are Transforming Companies, Harvard Business Review, 2014

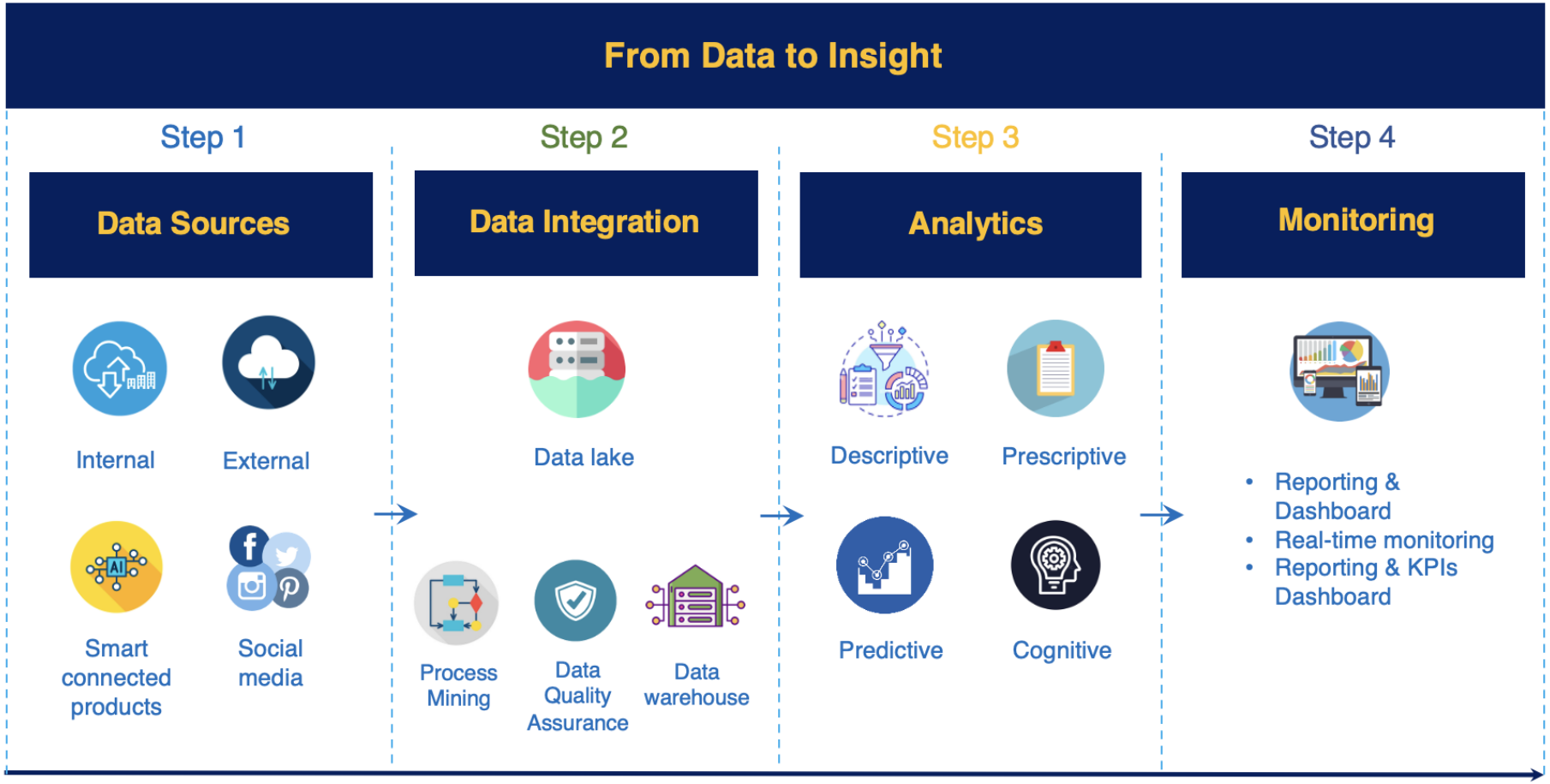
Creating Value with Data

The New Technology Stack

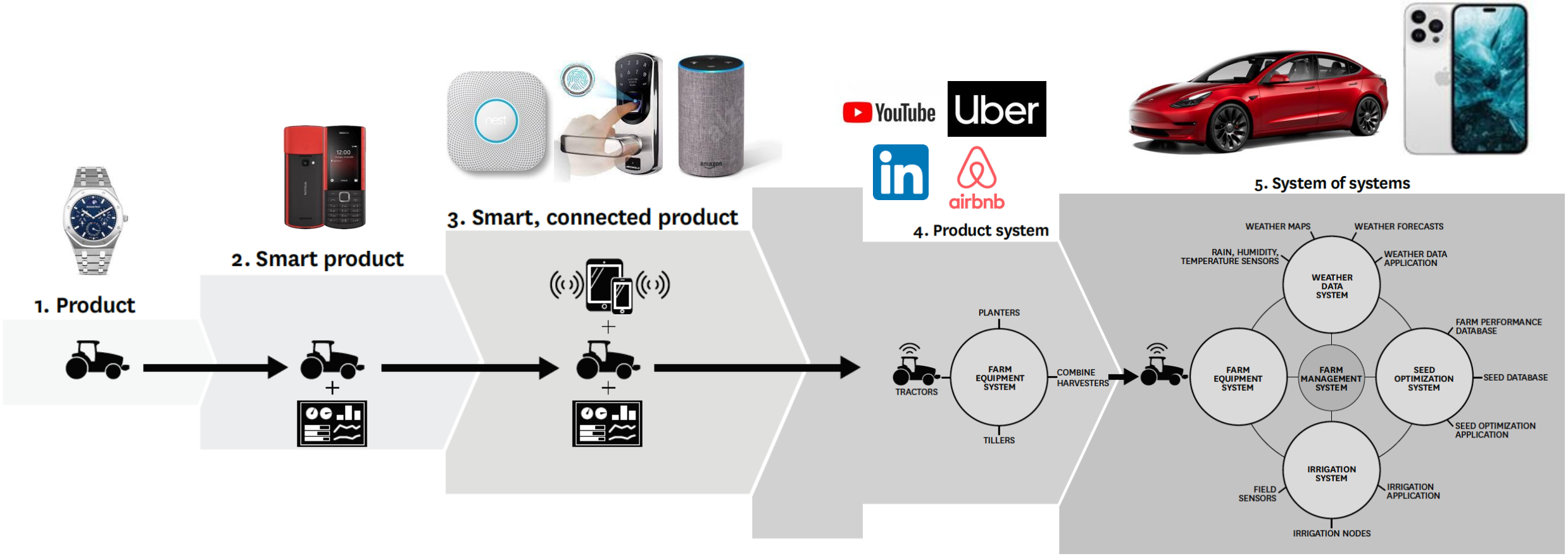


Source: How Smart, Connected Products Are Transforming Companies, Harvard Business Review, 2015.

Creating New Value with Data



From Product to System of Systems



Source: How Smart, Connected Products Are Transforming Companies, Harvard Business Review, 2014

Production Management

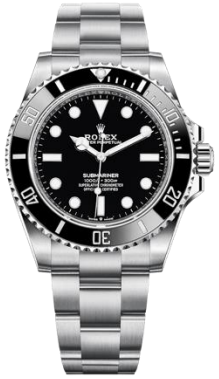
Production Process Strategy

- Company’s overall approach for manufacturing/producing goods/services.
- Production process strategy defines two major factors:

Capital intensity
(machines, automation, labor resources)

Process flexibility
(responsive to demand, technology, resource fluctuations)

Production Management – From Watch to Air-condition



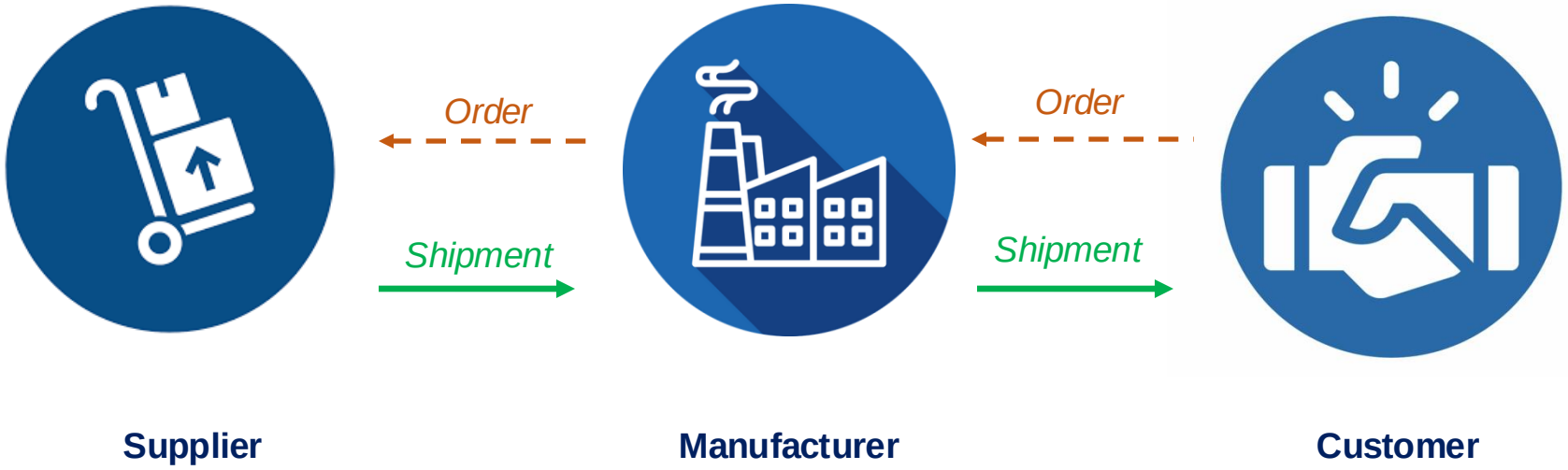
Rolex
Submariner

iPhine 14 Pro

Giant

Dyson

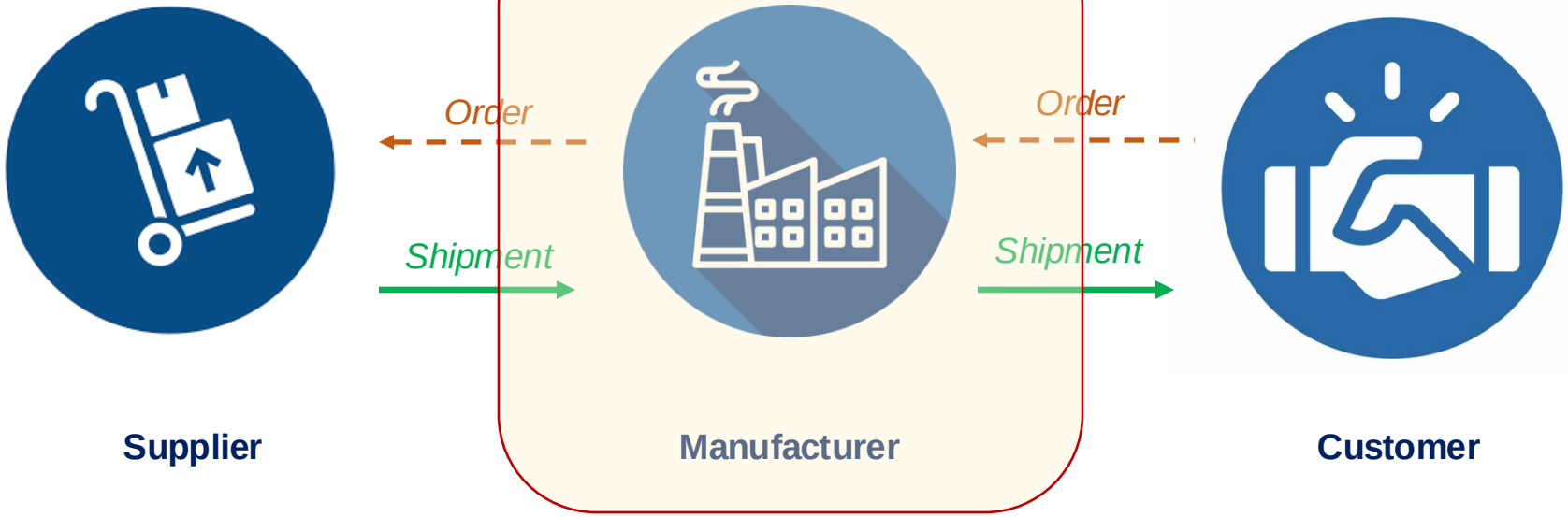
Material & Information Dynamics & Flows



Material & Information Dynamics & Flows – The Focus of PM

Q2: How to plan production to fulfill future demands?

Q1: How to use historical data to better plan production for future?



Q3: How to buffer stock against demand and supply disruptions?

Ques-cussion?

3 Min

A question-based discussion:

- All interventions must be questions
- Only one question at a time

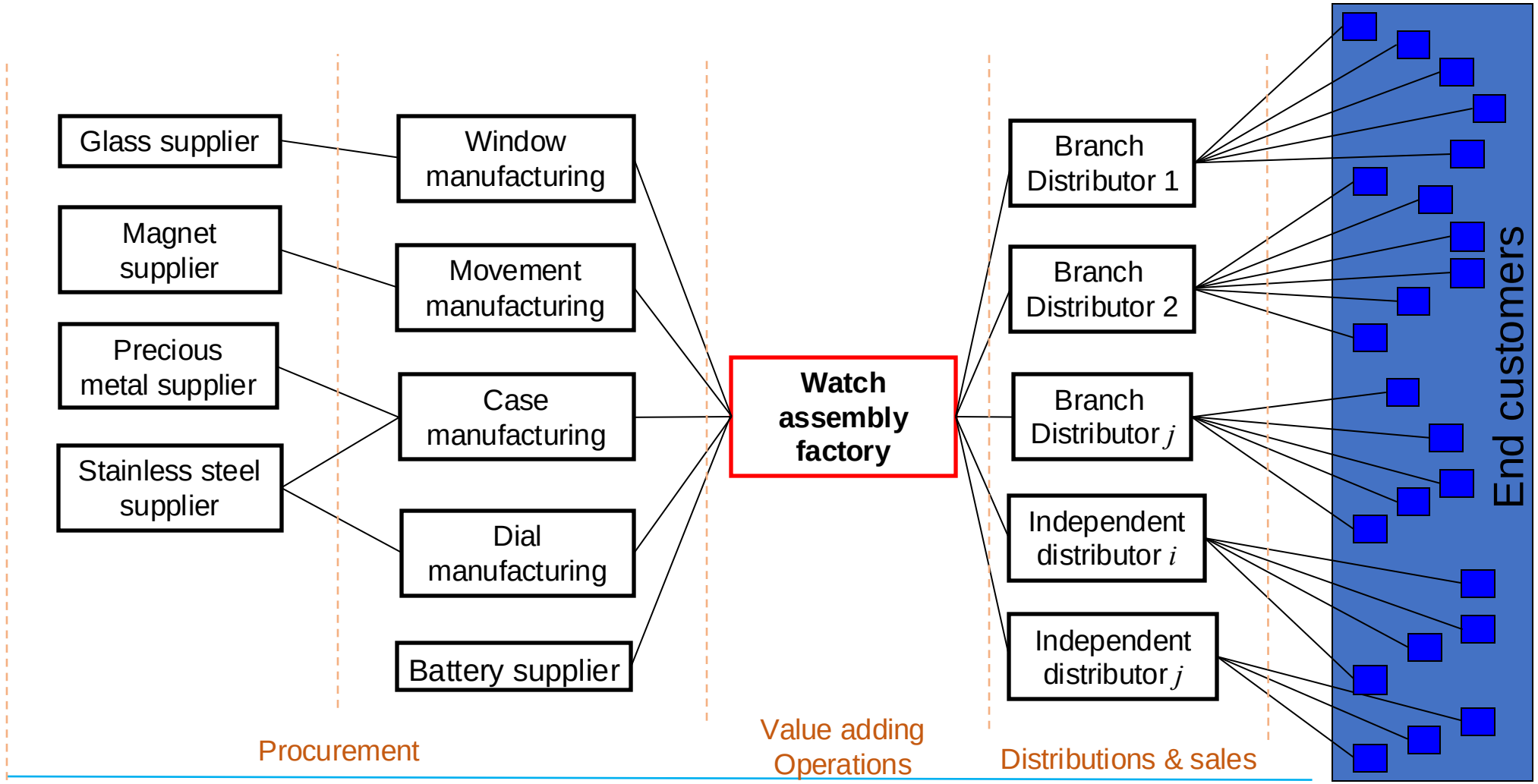
What is Production Management?

Production Management – Definition

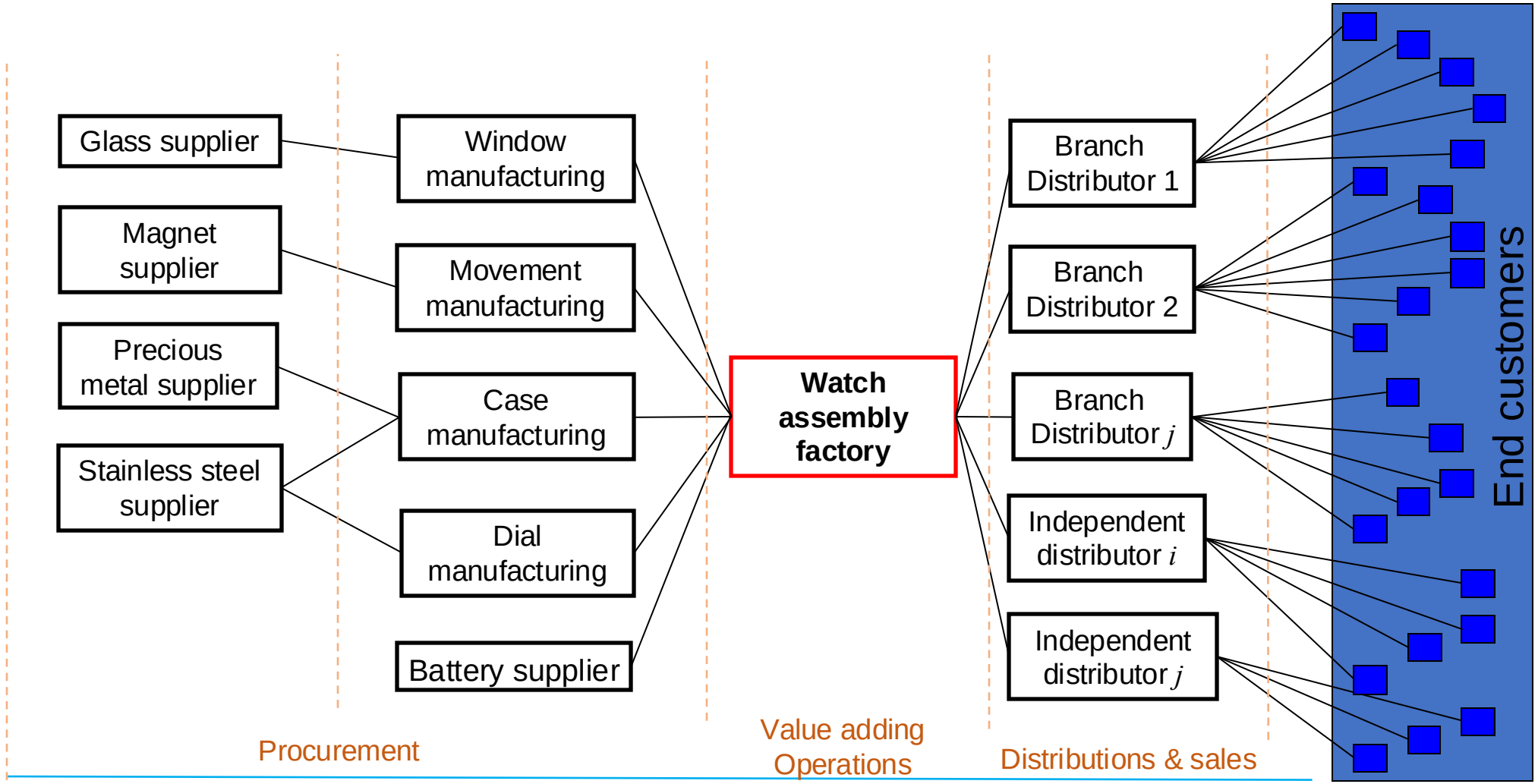
Planning and control of processes to ensure that goods/services are available at the right time, quantity, and quality with minimum cost.

Value Adding Networks

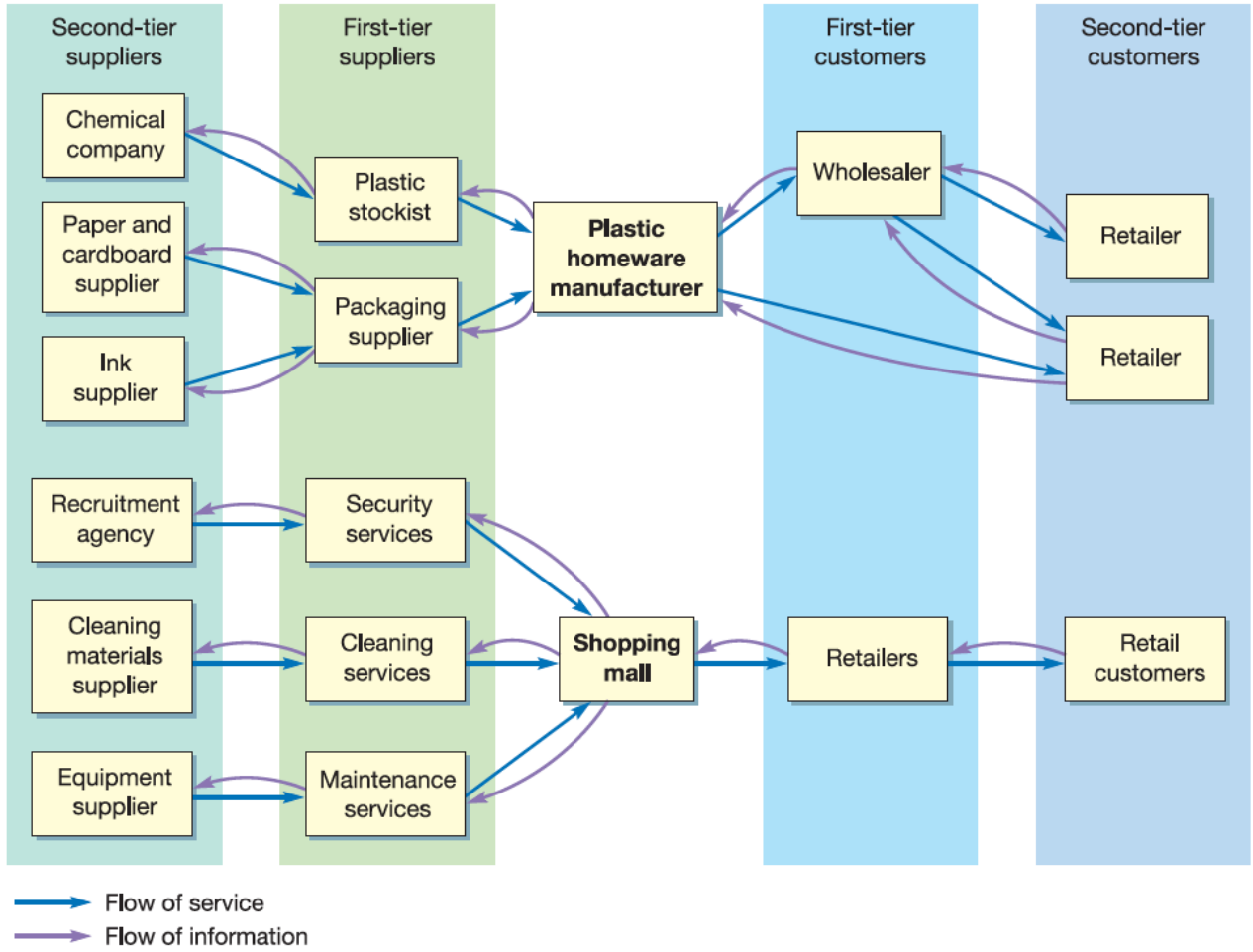
Value Adding Network (VAN) – Watch Manufacturer



Value Adding Network (VAN) – Watch Manufacturer

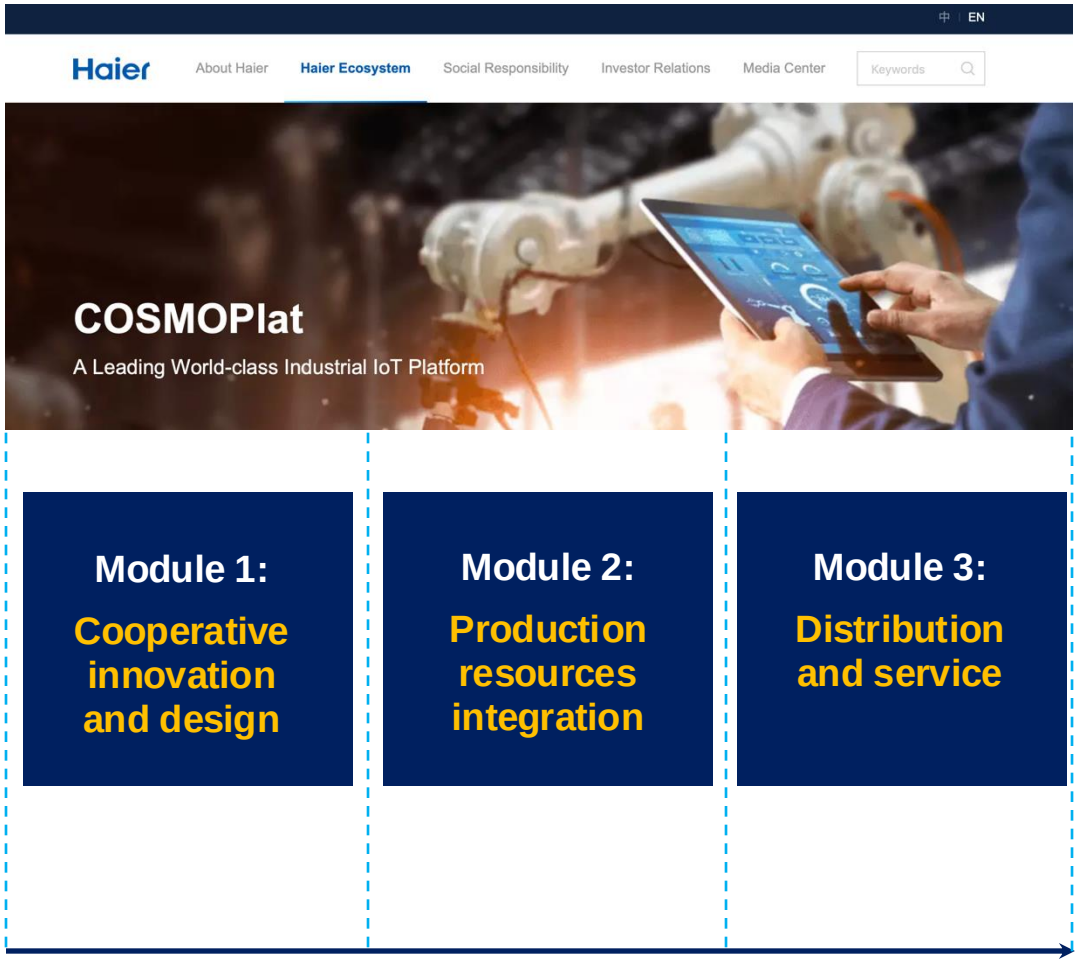


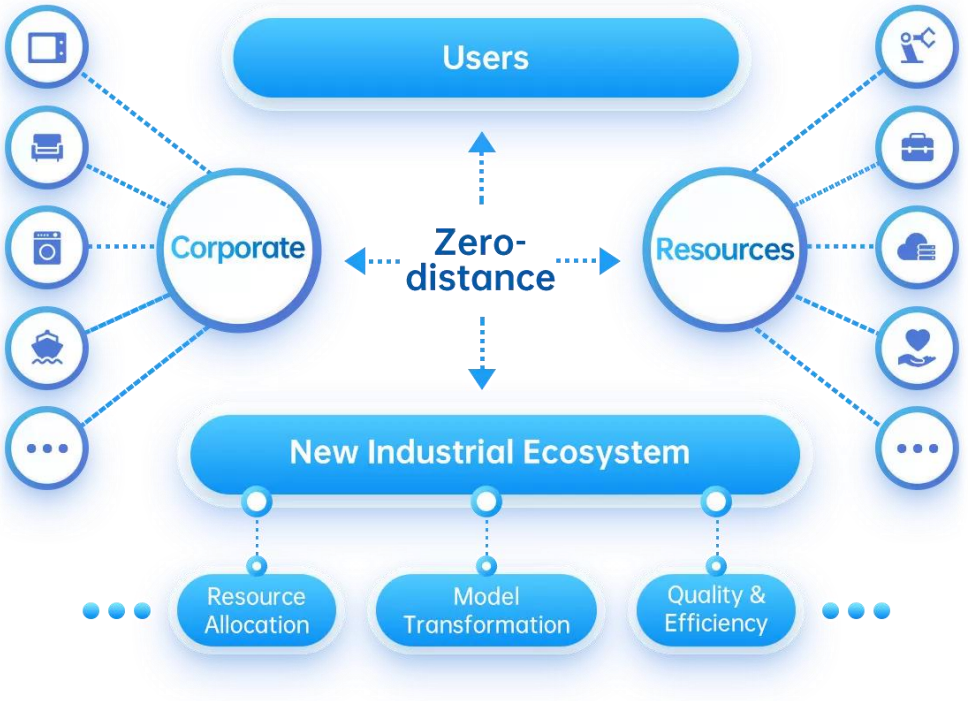
Supply Chain Network Design – More Examples



Supply chain network for a plastic homeware company and a shopping mall.

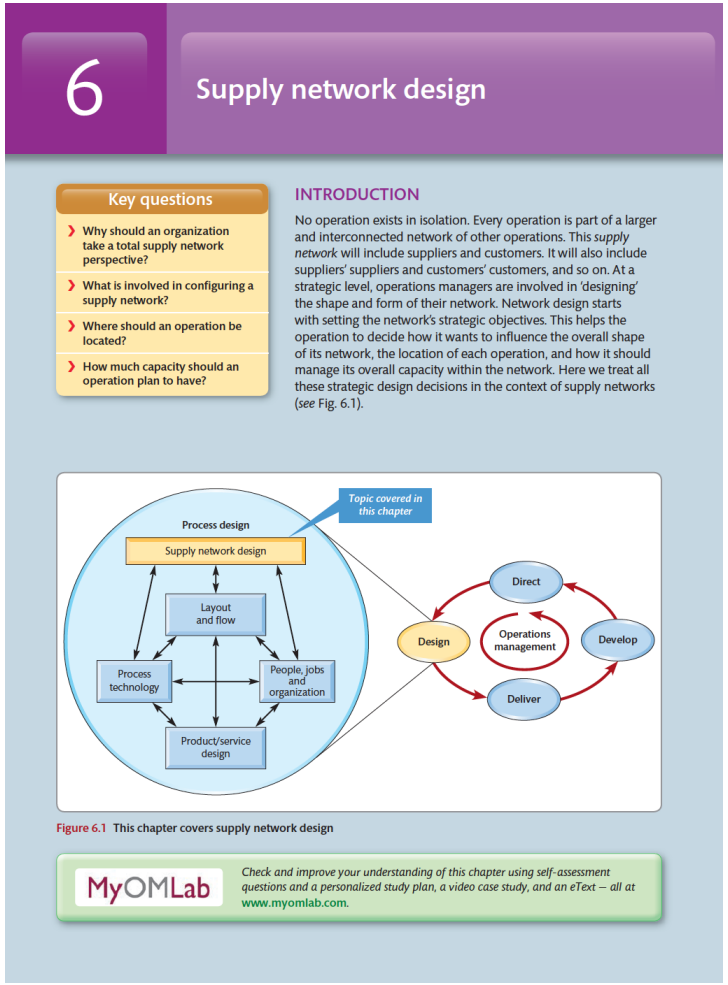
Value Adding Network (VAN) – The Best Supply Chain Platform





Supply Chain Network Design – Book Chapter

5 Min



6 Supply network design

Key questions

- Why should an organization take a total supply network perspective?
- What is involved in configuring a supply network?
- Where should an operation be located?
- How much capacity should an operation plan to have?

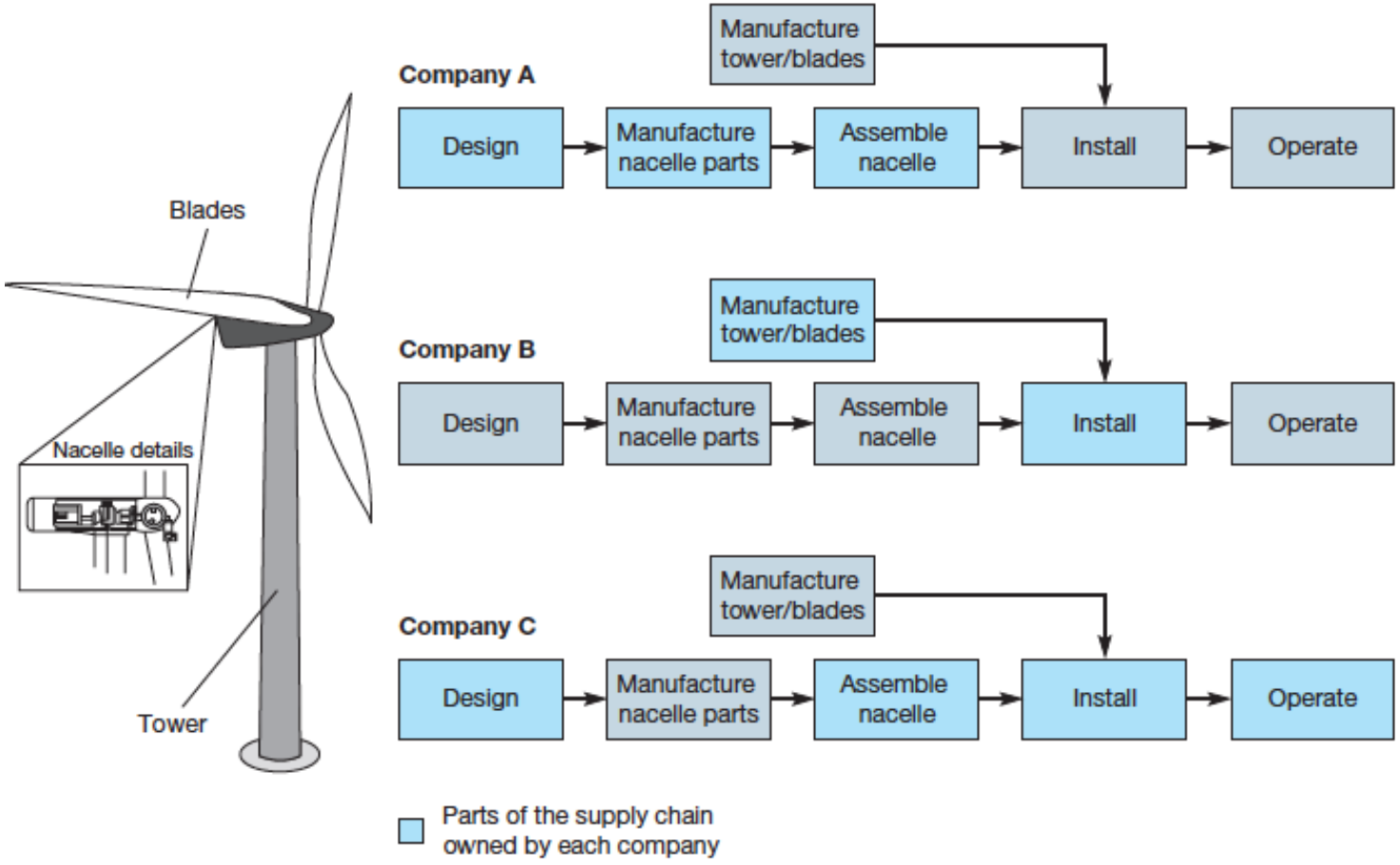
INTRODUCTION

No operation exists in isolation. Every operation is part of a larger and interconnected network of other operations. This *supply network* will include suppliers and customers. It will also include suppliers' suppliers and customers' customers, and so on. At a strategic level, operations managers are involved in 'designing' the shape and form of their network. Network design starts with setting the network's strategic objectives. This helps the operation to decide how it wants to influence the overall shape of its network, the location of each operation, and how it should manage its overall capacity within the network. Here we treat all these strategic design decisions in the context of supply networks (*see* Fig. 6.1).

Figure 6.1 This chapter covers supply network design

MyOMLab *Check and improve your understanding of this chapter using self-assessment questions and a personalized study plan, a video case study, and an eText – all at* www.myomlab.com.

Supply Chain Network – Vertical Integration



Three companies operating in the wind power generation industry **with different vertical integration positions**.

Review of Assignment 1 – Goal & Tasks

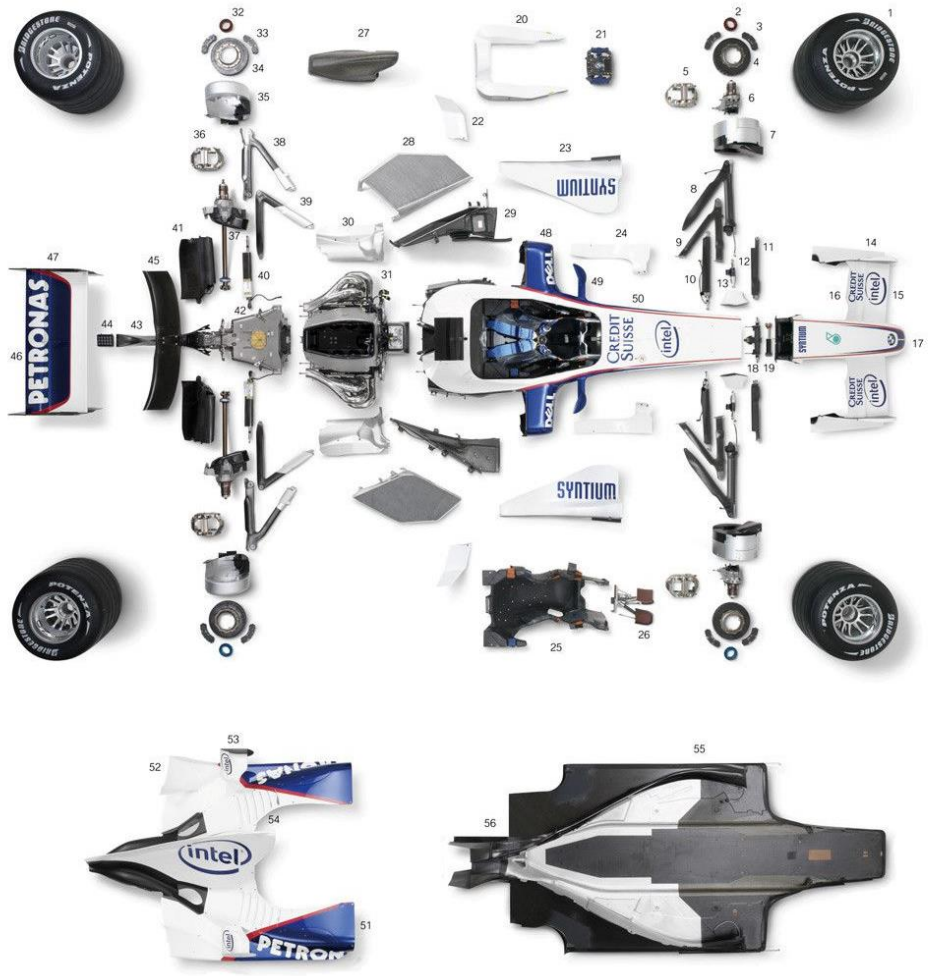
5 Min

Goal: To better understand the company you analyze and the product you manage during next 14 weeks.

1) What is your company history and background?
2) What are the products, product families, and services
3) What are your company's production site(s), suppliers, markets, warehouse, hubs, …
4) What is the vertical integration level of your supply chain (value adding) network?
5) What are your company's primary competitors?
6) What are the current and future (next five years) challenges
7) Present the following important items:
    - Value Adding Network (VAN)
    - Material and information flows
    - Hierarchical description of the Bill of Material (BoM) of your product

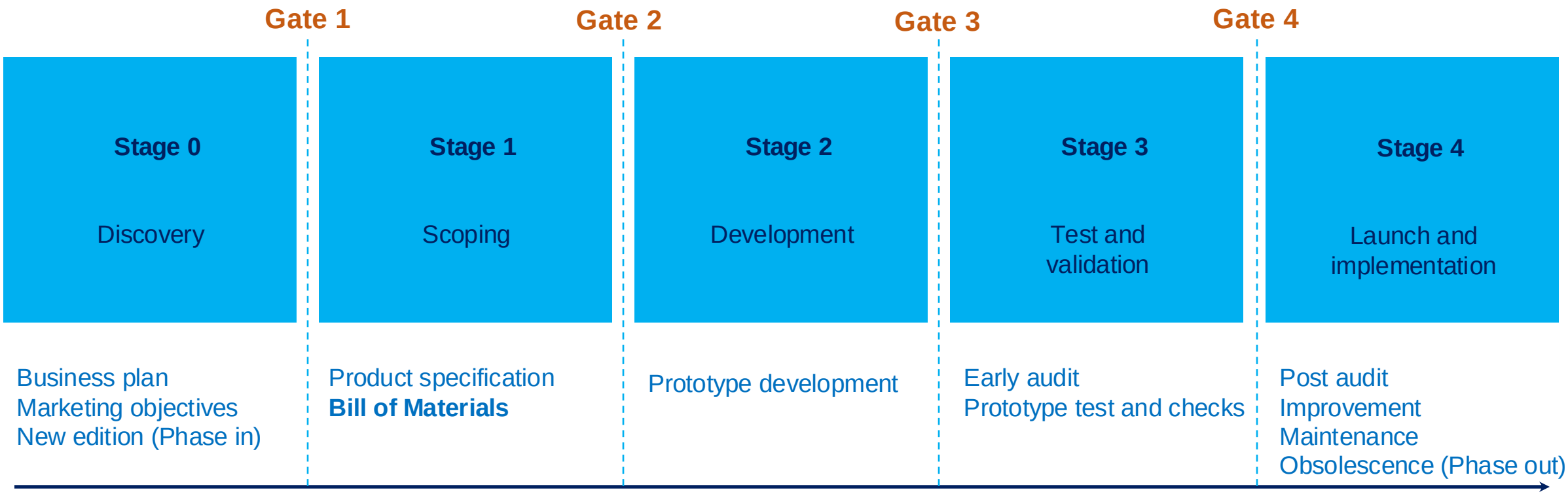
Bill of Materials (BoM)

Production Procedure – F1 Parts



1 Tyre / Rim.
2 Wheel Nut.
3 Brake Pads.
4 Brake Disc.
5 Brake Caliper.
6 Upright.
7 Brake Duct.
8 Front Lower Wishbone.
9 Front Upper Wishbone.
10 Front Pushrod.
11 Front Track Rod.
12 Side Damper.
13 Fairing.
14 Front Wing End Plate.
15 Front Wing Main Plane.
16 Front Wing Flap.
17 Nose Cone.
18 Steering Housing.
19 Front 3rd Element.
20 Headrest.
21 Steering Wheel.
22 Bullwinkle.
23 Main Turning Vane.
24 Forward Turning Vane.
25 Seat.
26 Pedals.
27 Airhorn.
28 Cooler.
29 Cooler Duct.
30 Engine Heat Shield.
31 Engine.
32 Wheel Nut.
33 Brake Pads.
34 Brake Disc.
35 Brake Duct.
36 Brake Caliper.
37 Drive Shaft / Upright.
38 Rear Lower Wishbone.
39 Rear Upper Wishbone.
40 Rear Pushrod.
41 Rear Toe Link.
42 Gearbox.
43 Rear Crasher.
44 Rain Light.
45 Rear Lower Main Plane.
46 Rear Upper Wing.
47 Rear Wing End Plate.
48 Sidepod.
49 Mirror.
50 Monocoque.
51 Engine Cover.
52 Batman.
53 Earwing.
54 Top Exit.
55 Floor.
56 Diffusor.

Product Development – Stage Gate Concept



Bill Of Materials (BOM) – Handout

3 Min

Week number								
Item: X	1	2	3	4	5	6	7	8
Quantity				100				150

FIGURE 12.3
A master schedule for end item X

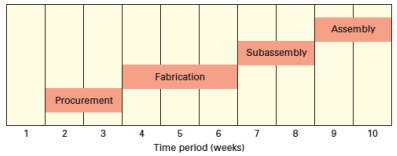


FIGURE 12.4
The planning horizon must cover the cumulative lead time

The quantities in a master schedule come from a number of different sources, including customer orders, forecasts, and orders from warehouses to build up seasonal inventories.

The master schedule separates the planning horizon into a series of time periods or time *buckets*, which are often expressed in weeks. However, the time buckets need not be of equal length. In fact, the near-term portion of a master schedule may be in weeks, but later portions may be in months or quarters. Usually, plans for those more distant time periods are more tentative than near-term requirements.

Although a master production schedule has no set time period that it must cover, most managers like to plan far enough into the future so they have some general idea of probable upcoming demands for the near term. It is important, though, that the master schedule cover the *stacked* or **cumulative lead time** necessary to produce the end items. This amounts to the sum of the lead times that sequential phases of the production or assembly process require, as illustrated in Figure 12.4, where a total of nine weeks of lead time is needed from ordering parts and raw materials until final assembly is completed. Note that lead times include move and wait times in addition to setup and run times.

Cumulative lead time
The sum of the lead times that sequential phases of a process require, from ordering of parts or raw materials to completion of final assembly.

The Bill of Materials

A **bill of materials (BOM)** contains a listing of all of the assemblies, subassemblies, parts, and raw materials that are needed to produce *one* unit of a finished product. Thus, each finished product has its own bill of materials.

The listing in the bill of materials is hierarchical; it shows the quantity of each item needed to complete one unit of its parent item. The nature of this aspect of a bill of materials is clear when you consider a **product structure tree**, which provides a visual depiction of the subassemblies and components needed to assemble a product. Figure 12.5 shows an *assembly diagram* for a chair and a simple product structure tree for the chair. The end item (in this case, the chair, the finished product) is shown at the top of the tree. Just beneath it are the subassemblies, or major components, that must be put together to make up the end item. Beneath each major component are the necessary lesser components. At each stage moving down the tree are the components (parts, materials) needed to make one unit of the next higher item in the tree.

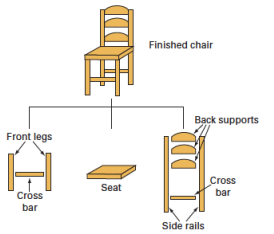
Bill of materials (BOM)
One of the three primary inputs of MRP; a listing of all of the raw materials, parts, subassemblies, and assemblies needed to produce one unit of a product.

A product structure tree is useful in illustrating how the bill of materials is used to determine the quantities of each of the ingredients (requirements) needed to obtain a desired number of end items. Items at the lowest levels of a tree often are raw materials or purchased parts, while items at higher levels are typically assemblies or subassemblies. Product-structure trees for items at the lowest levels are the concerns of suppliers.

Let's consider the product structure tree shown in Figure 12.6. End item X is composed of two Bs and one C. Moreover, each B requires three Ds and one E, and each D requires four Es. Similarly, each C is made up of two Es and two Fs. These *requirements* are listed by *level*,

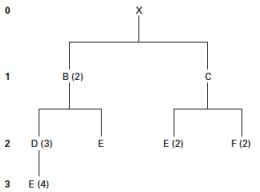
Product structure tree
A visual depiction of the requirements in a bill of materials, where all components are listed by levels.

FIGURE 12.5
Assembly diagram and product structure tree for chair assembly



Bill of Materials		
Level		Quantity
0	Chair	1
1	Leg assembly	1
2	Legs	2
2	Cross bar	1
1	Seat	1
1	Back assembly	1
2	Side rails	2
2	Cross bar	1
2	Back supports	3

FIGURE 12.6
A product structure tree for end item X



beginning with 0 for the end item, then 1 for the next level, and so on. The items at each are *components* of the next level up and, as in a family tree, are *parents* of their respe components. Note that the quantities of each item in the product structure tree refer only t amounts needed to complete the assembly at the next higher level.

EXAMPLE 1
eXcel
mhhe.com/stevenson12e

Use the information presented in Figure 12.6 to do the following:

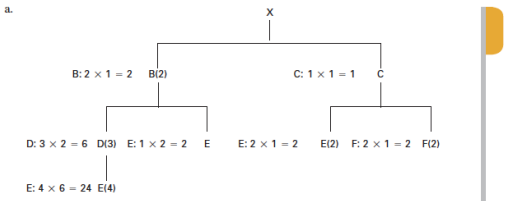
a. Determine the quantities of B, C, D, E, and F needed to assemble one X.

b. Determine the quantities of these components that will be required to assemble 10 X taking into account the quantities on hand (i.e., in inventory) of various components

Component	On Hand
B	4
C	10
D	8
E	60

SOLUTION

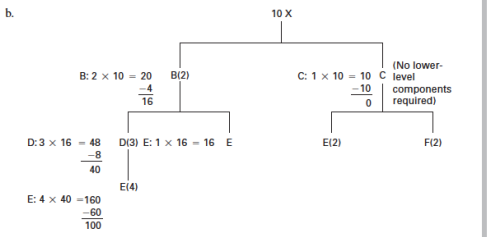
a.



Thus, one X will require

B:	2
C:	1
D:	6
E:	28 (Note that E occurs in three places, with requirements of 24 + 2 + 2 = 28)
F:	2

b.



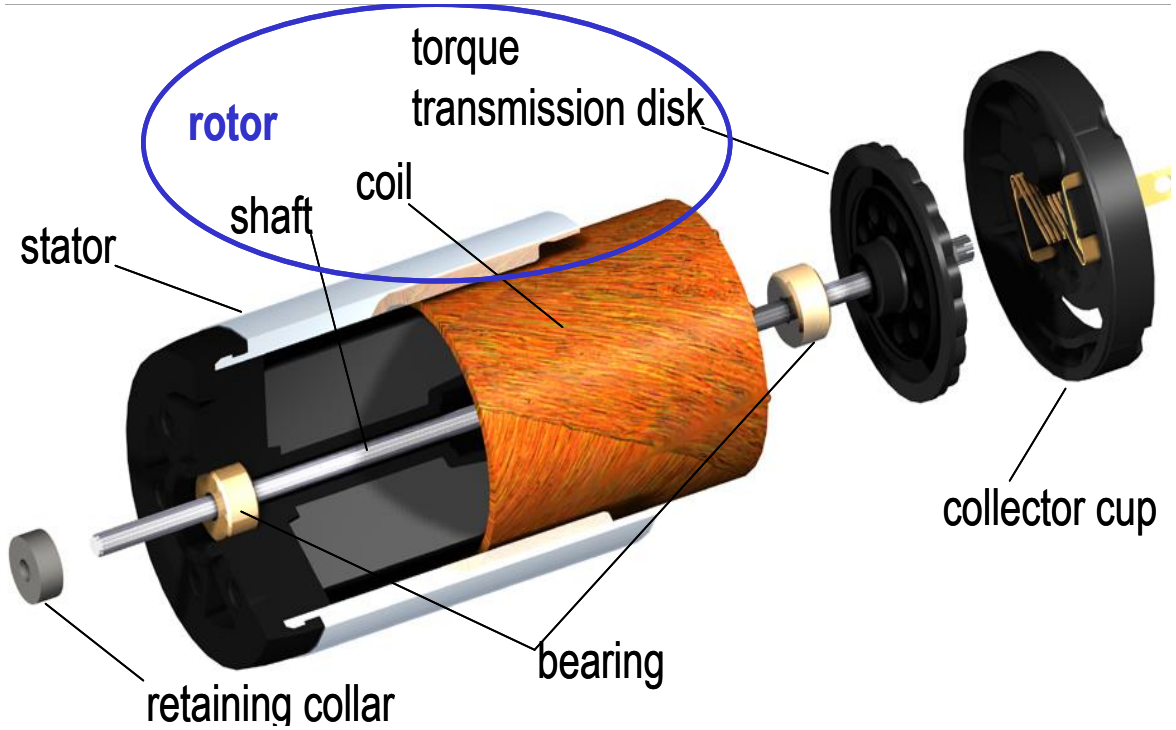
Thus, given the amounts of on-hand inventory, 10 Xs will require

B:	16
C:	0
D:	40
E:	116
F:	0

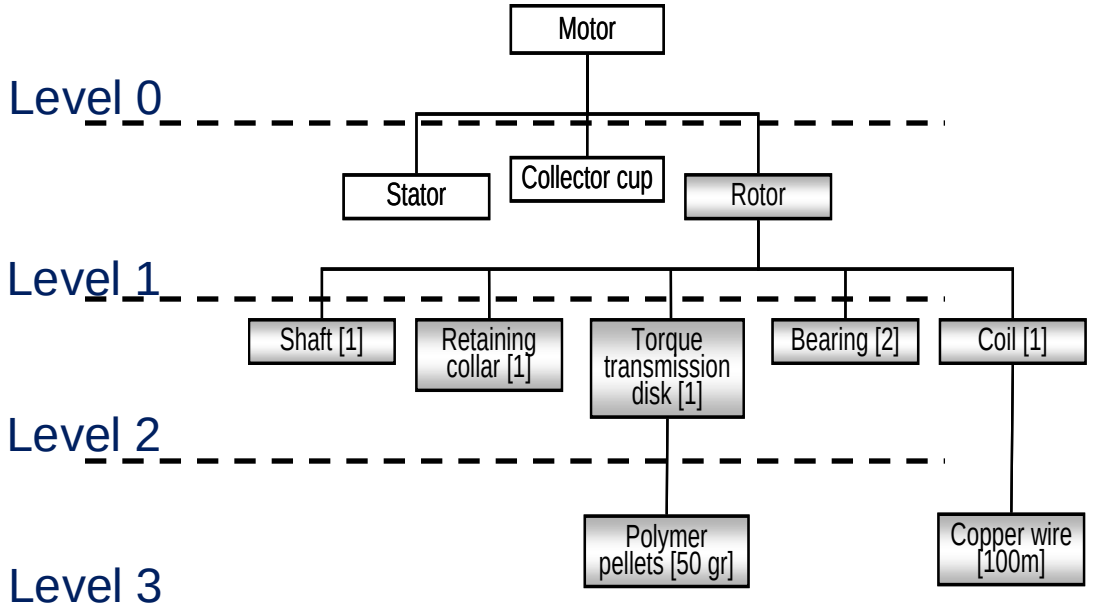
Determining total requirements is usually more complicated than Example 1 might suggest. For one thing, many products have considerably more components. For another, the issue of *timing* is essential (i.e., when must the components be ordered or made) and must be included in the analysis. Finally, for a variety of reasons, some of the components/subassemblies may be on hand (i.e., currently in inventory). Consequently, in determining total requirements, the amounts on hand must be *netted out* (i.e., subtracted from the apparent requirements) to determine the true requirements as illustrated in Example 1.

Bill of Materials (BOM) – Micro Motor

Bill of Materials (BOM)



Electrical ironless micro-motor



Electrical ironless micro-motor

Bill of Materials (BOM) – Apple Airpods

Bill of Materials (BOM) – Apple Airpods

Ear bud

Charging case

Battery - 93mWh (2x)

Microphone

Audio Codec

Battery – 1.52mWh(1x)

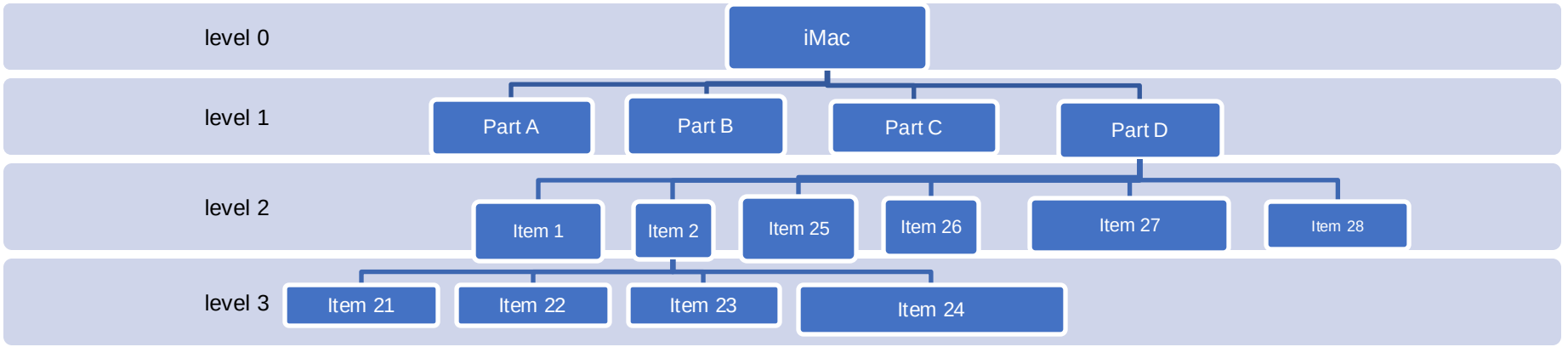
USB Cable

Antenna

Exercise 1: Bill of Materials of iMac

5 Min

- What is the Bill of materials (BOM) of iMac in your view?
  - Develop your hypothetical BOM, it could be like the blow chart;



Review of Assignment 1 – Goal & Tasks

5 Min

Goal: To better understand the company you analyze and the product you manage during next 14 weeks.

1) What is your company history and background?
2) What are the products, product families, and services
3) What are your company's production site(s), suppliers, markets, warehouse, hubs, …
4) What is the vertical integration level of your supply chain (value adding) network?
5) What are your company's primary competitors?
6) What are the current and future (next five years) challenges
7) Present the following important items:

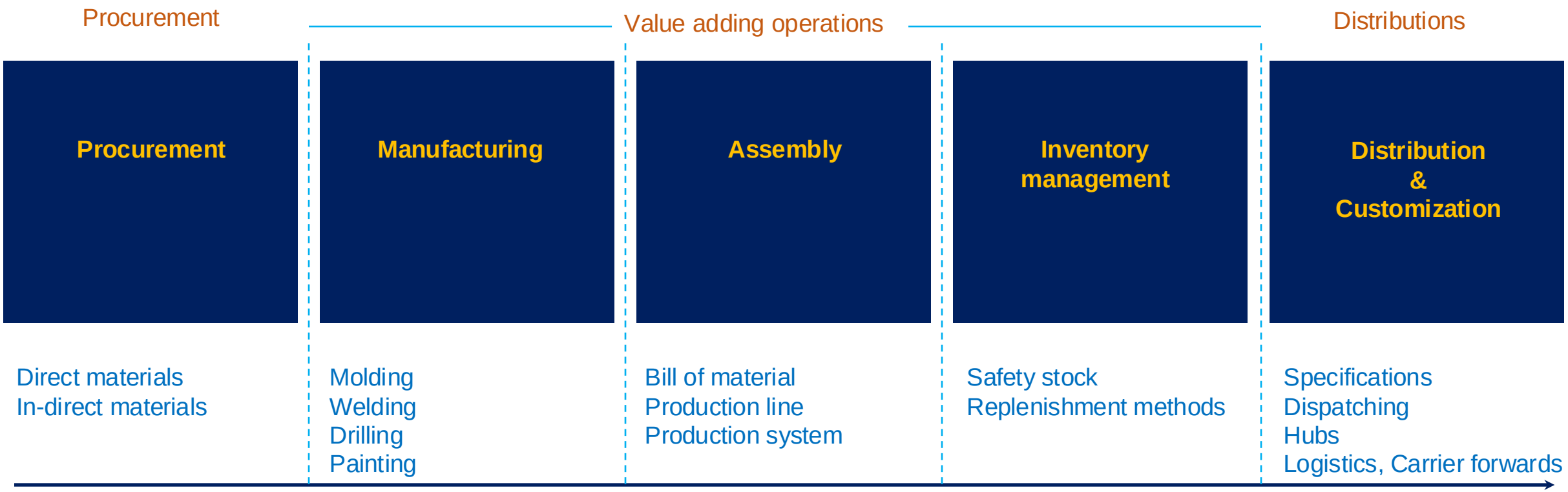
    Value Adding Network (VAN)

    Material and information flows

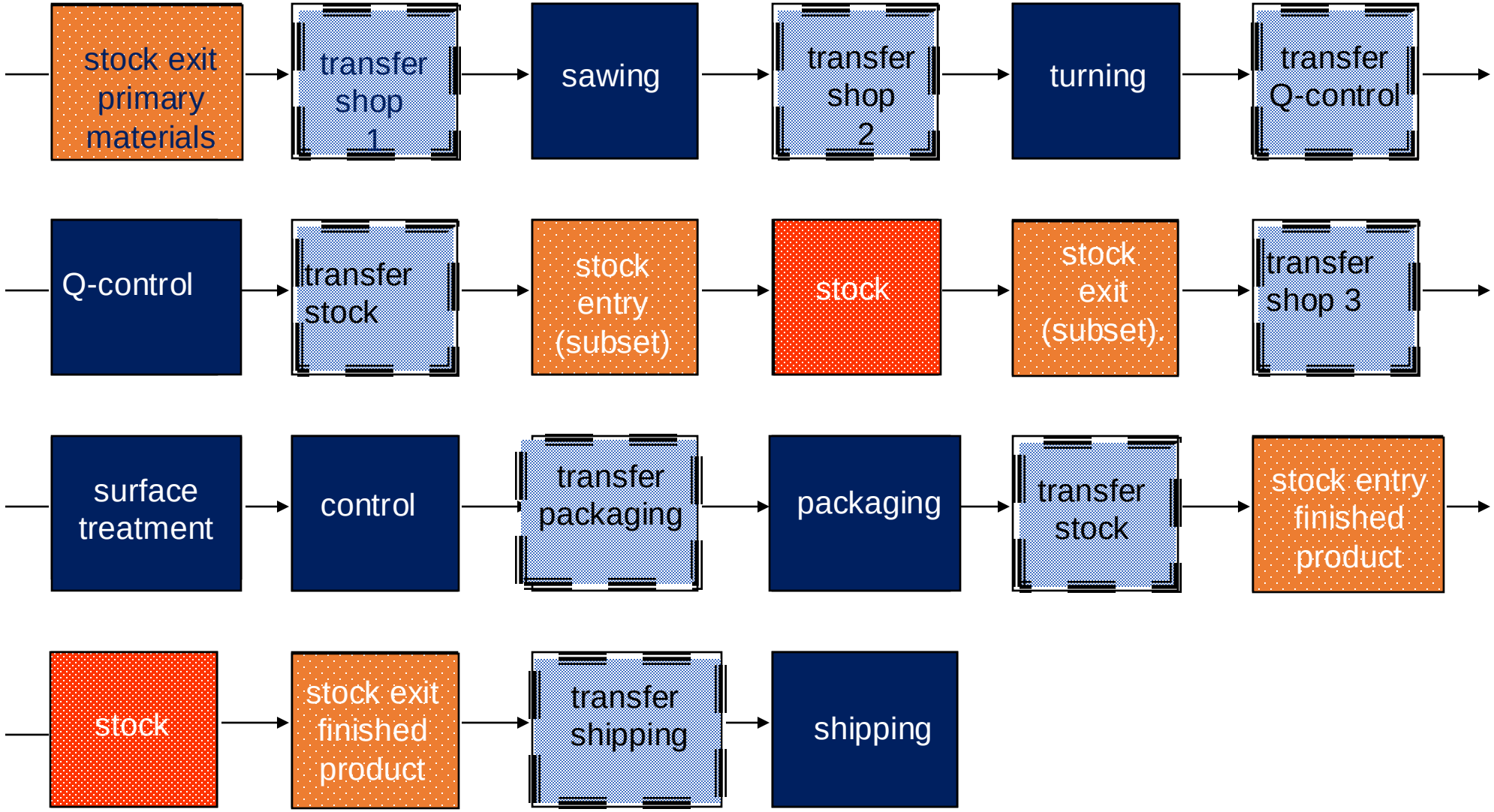
    Hierarchical description of the Bill of Material (BoM) of your product

Value Adding Activities

Production Procedure – Value Adding Activities

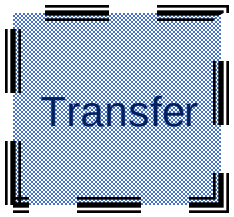


Production Procedure – Series of Activities



Production Procedure – Value Adding Activities

Transformation activity, adding value and modifying the material characteristics.

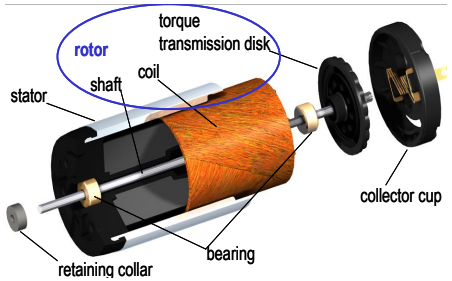


Transportation activity, not adding any value but modifying the location of the material.

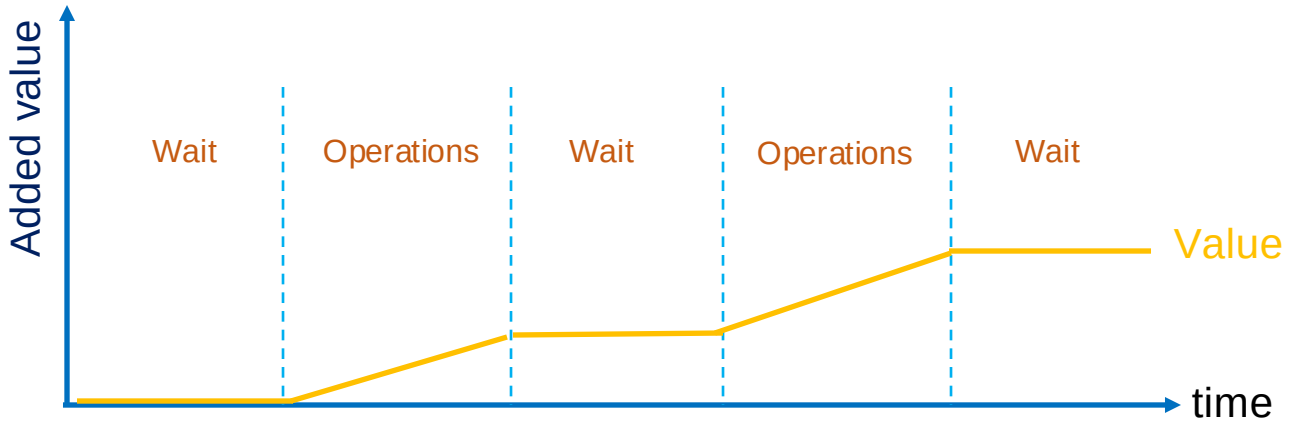
Data modification activity, not adding any value but acting on the administrative status of the material.

Waiting activity, not adding any value; no modification of the material characteristics, location or administrative status.

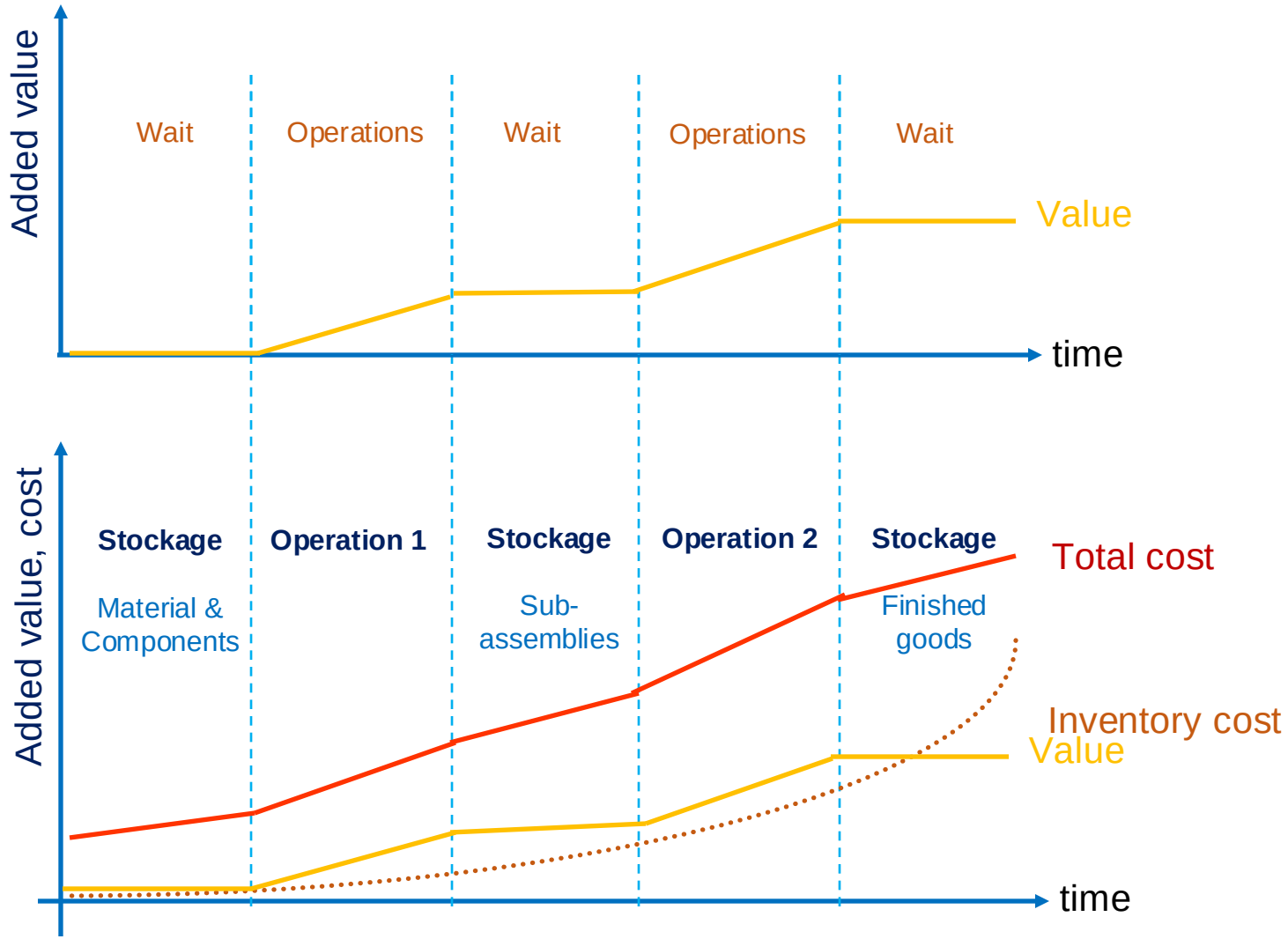
Production Procedure – Micro Motor

Supply	Production – Step 1	Production – Step 2	Production – Step 3	Sales
- Shaft  - Copper wire 	- Shaft machining - Coil winding	- Stator assembly - Collector cup man. - Rotor assembly	- Motor assembly 	
3 weeks	2 weeks	2 weeks	2 weeks	
Sep 2020	Oct 2020	Nov 2020	Dec 2020	Jan 2021

Production Procedure – Value Adding Activities



Production Procedure – Value Adding Activities



Exercise 2: Cold-pressed Juicing Production Process

5 Min

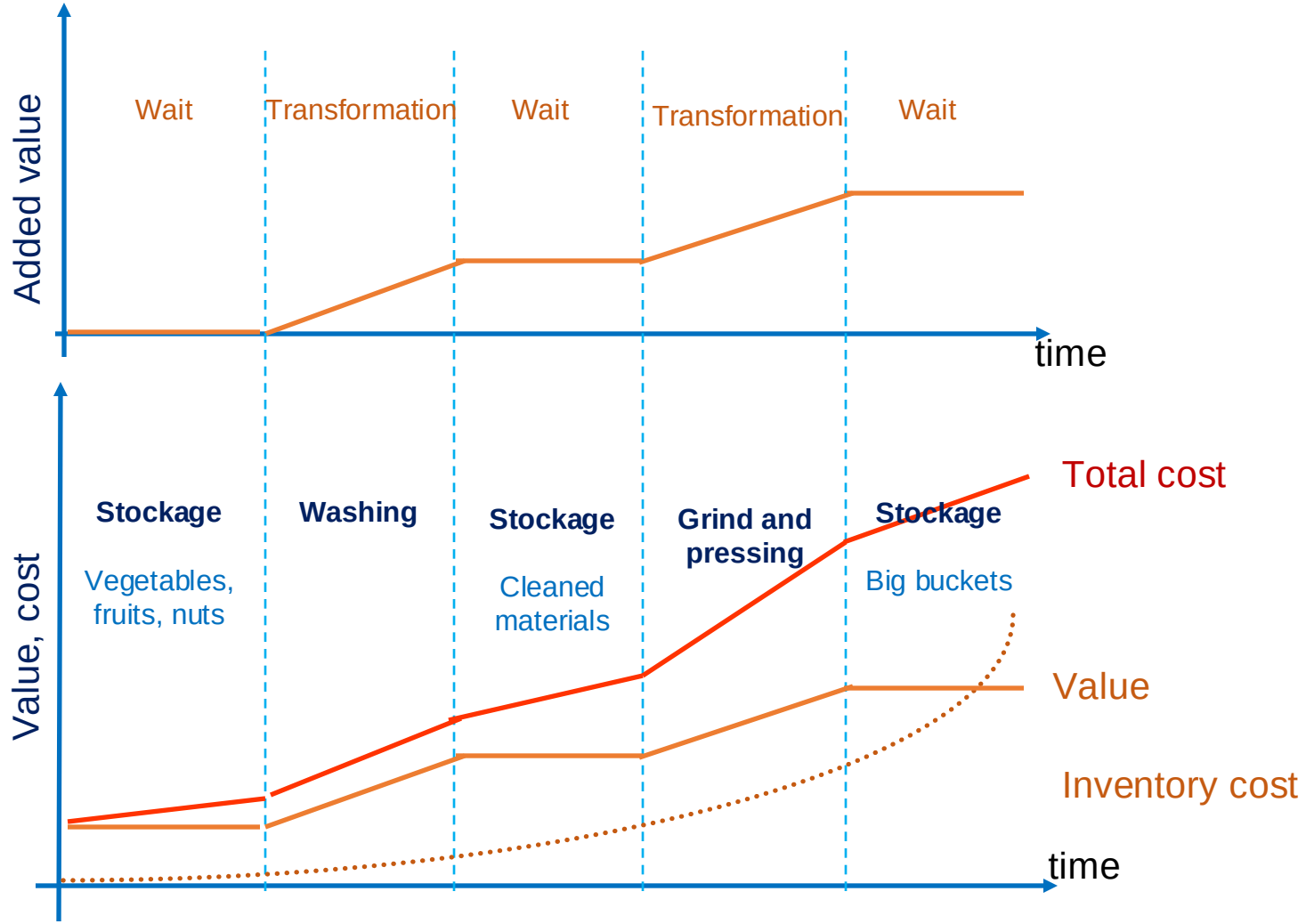
What would be the production process diagram (value adding activities) of cold-pressed juicing production based on added value and time?

Hint: production steps are marked on the photo.

Exercise 2:

5 Min

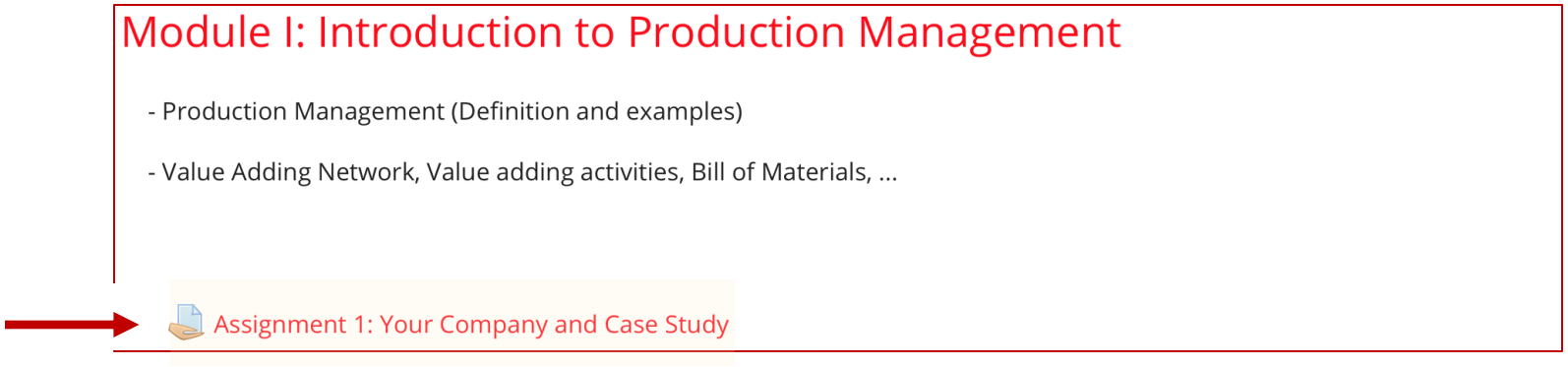
Cold Press Juicing – Value Adding Activities



Learning Points – Summary

- Supply Chain Management & Business Processes
  - Supply Chain Model
  - Dynamics & Flows (material and information)
  - The focus of our course
- Value Adding Network
  - Big picture
  - From product to system of systems
  - Supply Chain Network Design
- Product development
  - Bill of Materials (BOM)
  - Value Adding Activities

Assignment 1 – Your Company and Case Study



1) Download the Assignment 1 from Moodle

2) Work within your group and discuss about the case study and your report

*** Submission deadline (report):** Sep 20th; 11:55 AM.

Review of Assignment 1 – Goal & Tasks

15 Min

Goal: To better understand the company you analyze and the product you manage during next 14 weeks.

1) What is your company history and background?
2) What are the products, product families, and services
3) What are your company's production site(s), suppliers, markets, warehouse, hubs, …
4) What is the vertical integration level of your supply chain (value adding) network?
5) What are your company's primary competitors?
6) What are the current and future (next five years) challenges
7) Present the following important items:

    Value Adding Network (VAN)

    Material and information flows

    Hierarchical description of the Bill of Material (BoM) of your product

Production Management (ME-419)

Module 1 – Introduction Coaching Rooms

Amin Kaboli

Week 1 – Session 1 – September 13th, 2024

Please Follow Your coaches to Your Designated Rooms

Coaches

Saria

GCA 330

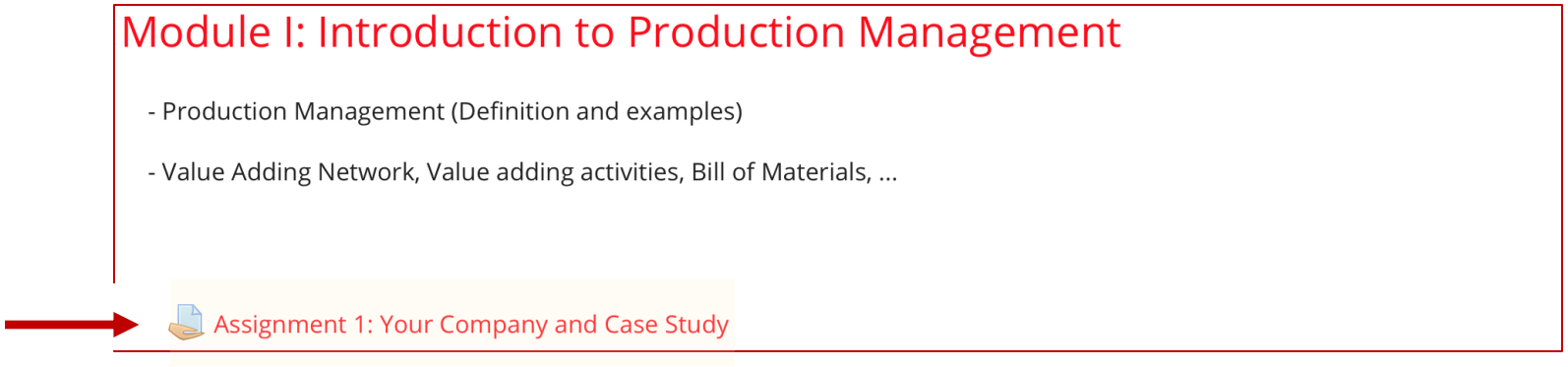
Joao

GCA 331

Xavier

GRA 332

Assignment 1 – Your Company and Case Study



1) Download the Assignment 1 from Moodle

2) Read and review the case study within your group

3) Get to know your company and the product that you will manage over the upcoming 13 weeks

The Art of Giving and Receiving Effective Feedback

Feedback is a gift

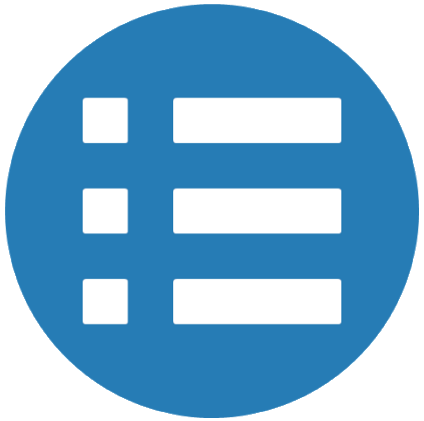
Feedback/comments are always welcome

Giving Effective Feedback

Respectful

Ask for permission

May I share my observation



Fact-based

Share facts/ your feelings

What I observed/felt is that …

Constructive

Stay focused on growth

What I suggest is that …

Concise

Be to-the-point and short

Max three key points

Open

Be open to any reaction

I respect your feeling …

Receiving Effective Feedback

Receive the gift

Be open and receptive

I appreciate your feedback

Listen

Listen to listen!

The goal is to listen not to answer, no interruption (zip it)

Understand

Focus on THE message

The goal is to understand, ask questions, clarify, repeat key points, …

Decide

You always have a choice

Thank you, I have never seen it this way

OR

Thank you, let me reflect and get back to you?

Follow up

Reach a common understanding

There are many ways to follow up: revise the work, set up a meeting, …