

IE: The Big Picture



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What is IE?

- Industrial engineering is concerned with the design, improvement, and installation of integrated systems of men, materials, equipment and energy.
- It draws upon specialized knowledge and skill in the mathematical, physical and social sciences together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems.

Source: American Institute of Industrial Engineers, 1960s

What is IE?

- Industrial engineering is a branch of engineering which deals with the optimization of complex processes, systems or organizations.
- Industrial engineers work to eliminate waste of time, money, materials, man-hours, machine time, energy and other resources that do not generate value.

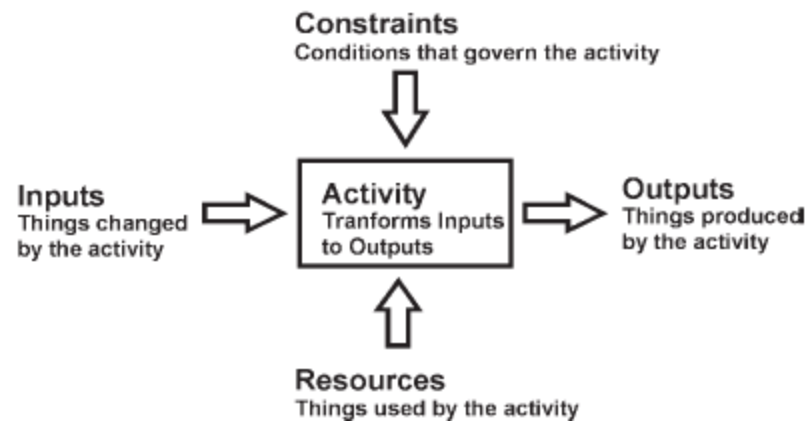
What do IEs do?

- Industrial engineers figure out how to do things better.
- They engineer processes and systems that improve quality and productivity.
- They work to eliminate waste of time, money, materials, energy and other commodities.

Source: Institute of Industrial and System Engineers

Anatomy of a business unit

- Five main aspects:



Source: Maynard, p 141.

IE Specialties

- We incorporate the human factor
 - That is why, teamwork, communication and interpersonal skills are important.
- We have good analytical and mathematical skills
- We can work at any industry
- We understand the "big data"
- We can customize our careers based on our interests
- Our job is not routine

Your tools (Method studies)

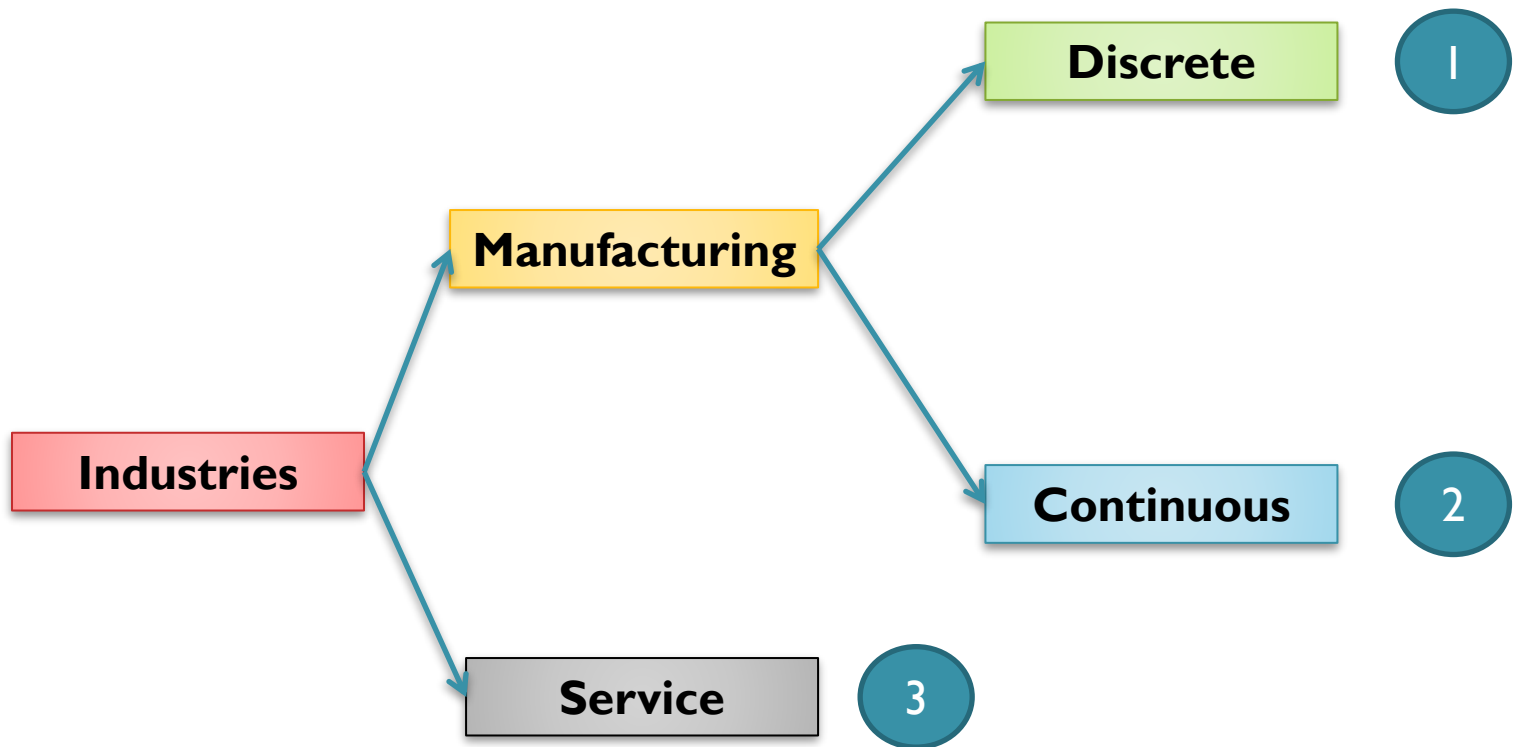
- Statistics
 - Minitab, SAS
- Optimization
 - MATLAB, Excel Solver, Heuristics
- Analytical skills
- Simulation
 - Arena, Promodel
- Programming (mainly mathematical)
 - Python, MATLAB



What else competences you need to have?

- You need to have excellent general knowledge
- You need to be proactive
- You need to know the organization from all aspects

Types of Industries



Examples of different industry types

- Discrete Manufacturing
 - TVs
 - Computers
 - Printers
 - Clothes
 - Shoes
 - Cars
 - Furniture
 - Carpets, etc.



Examples of different industry types

- Continuous Manufacturing
 - Refinery products
 - Chemicals production
 - Some fertilizer plants
 - Power stations
 - Synthetic fibers
 - Sanitary waste water treatment, etc.



Examples of different industry types

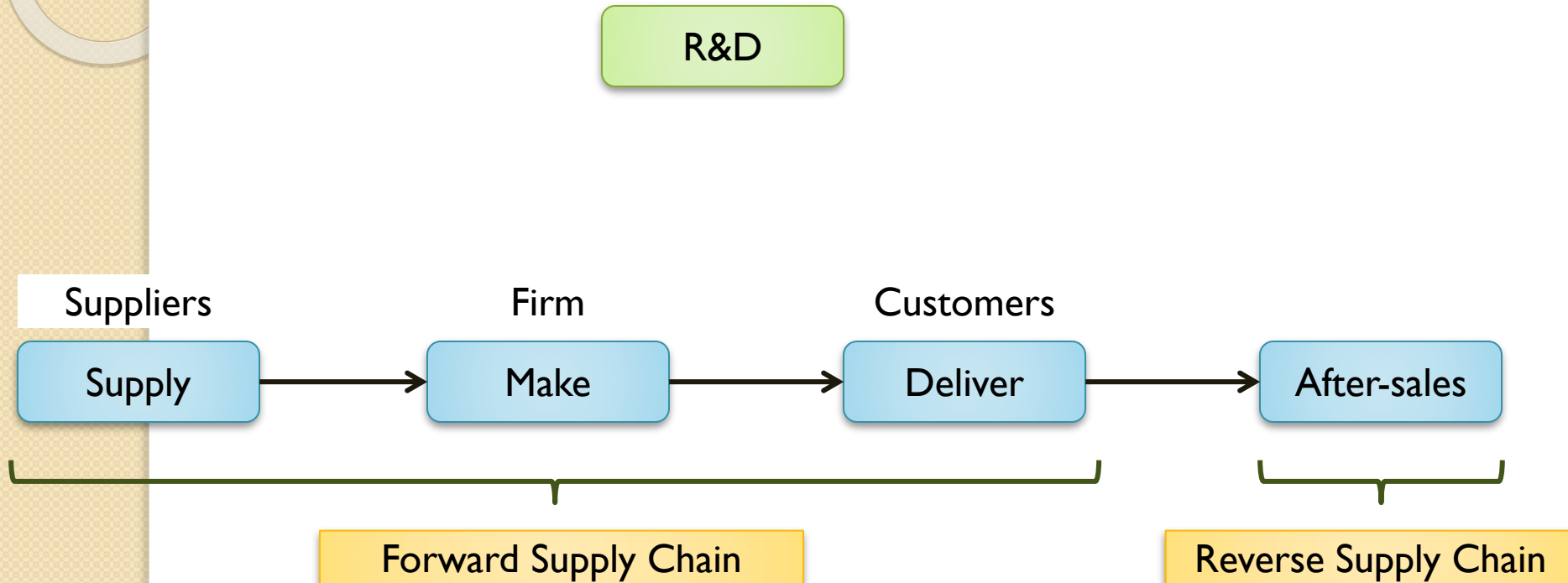
- Service Industries
 - Banks
 - Insurance companies
 - Governmental organizations
 - Consulting firms
 - Hospitals
 - Tourism agencies
 - Law firms, etc.



Levels of decision making

- Strategic
 - Shapes the future of the business
 - Effect is typically 3 to 5 years, but can be much longer also
 - Whole organization is involved
 - Top management does this type of decisions
- Tactical
 - Aim is to support strategic decisions
 - Effect is usually 1 year or less
 - Various units involved
 - Middle management involved
- Operational
 - Daily operations
 - Junior management involved

Overall view



General (I)

- System analysis and design
- Risk management
- Facility location
- Facility planning and layout
- Defining performance measures
- Decision making procedures (AHP, etc.)
- Firm's strategy (SWOT analysis, etc.)
- Cost analysis

General (2)

- Databases, SAP
- Profitability calculations
- Quality control / Quality assurance
- Organizational learning
- Anticipation and diffusion of innovations
- Workplace design and ergonomics
- Payback time calculations

General (3)

- Lifecycle cost analysis
- Different costing systems (like Activity Based Costing)
- Continuous improvement
- Lean Six Sigma
- Maintenance management

Research and Development

- Product design and specifications
- Forecasting revenue potential



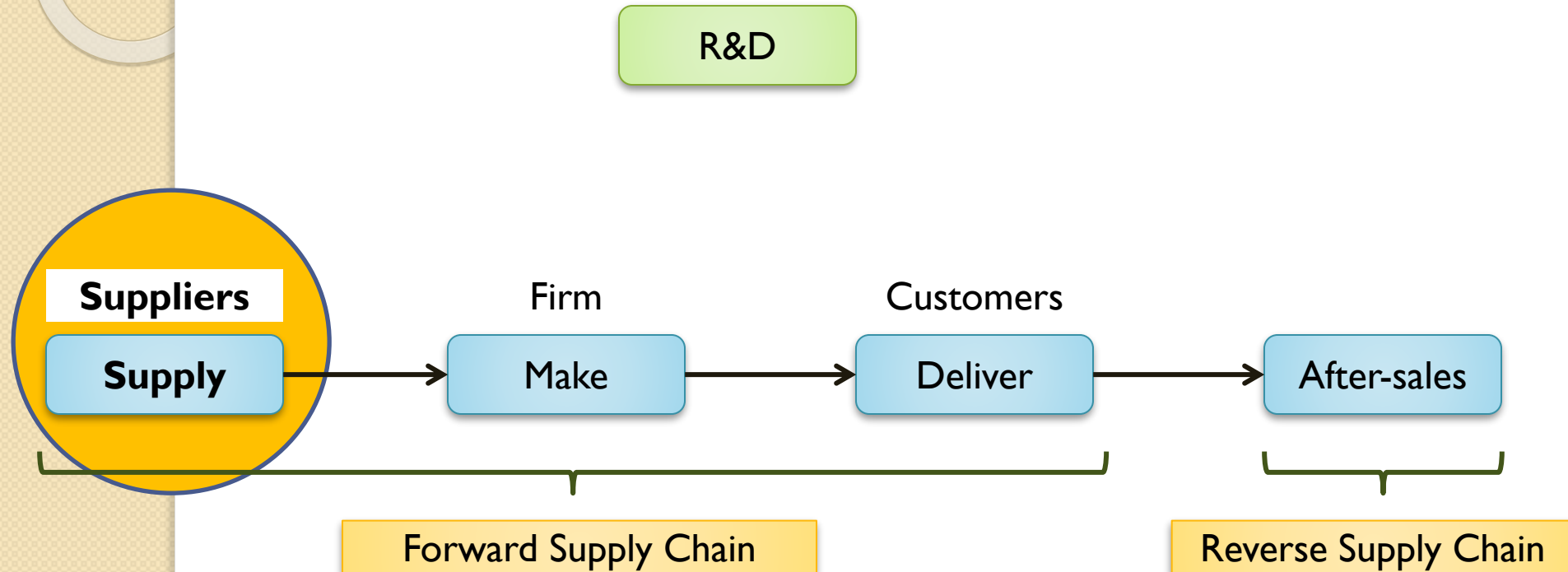
Supply Chain General

- Supply Chain Management
- Bullwhip effect
 - Reducing and Buffering against variability
- Customs and Duties
- Resilience in supply chain
- Inventory control

Services General

- Pricing and promotion
- Simulating operations (queuing models)
- Risk management
- Project management
- Resource planning

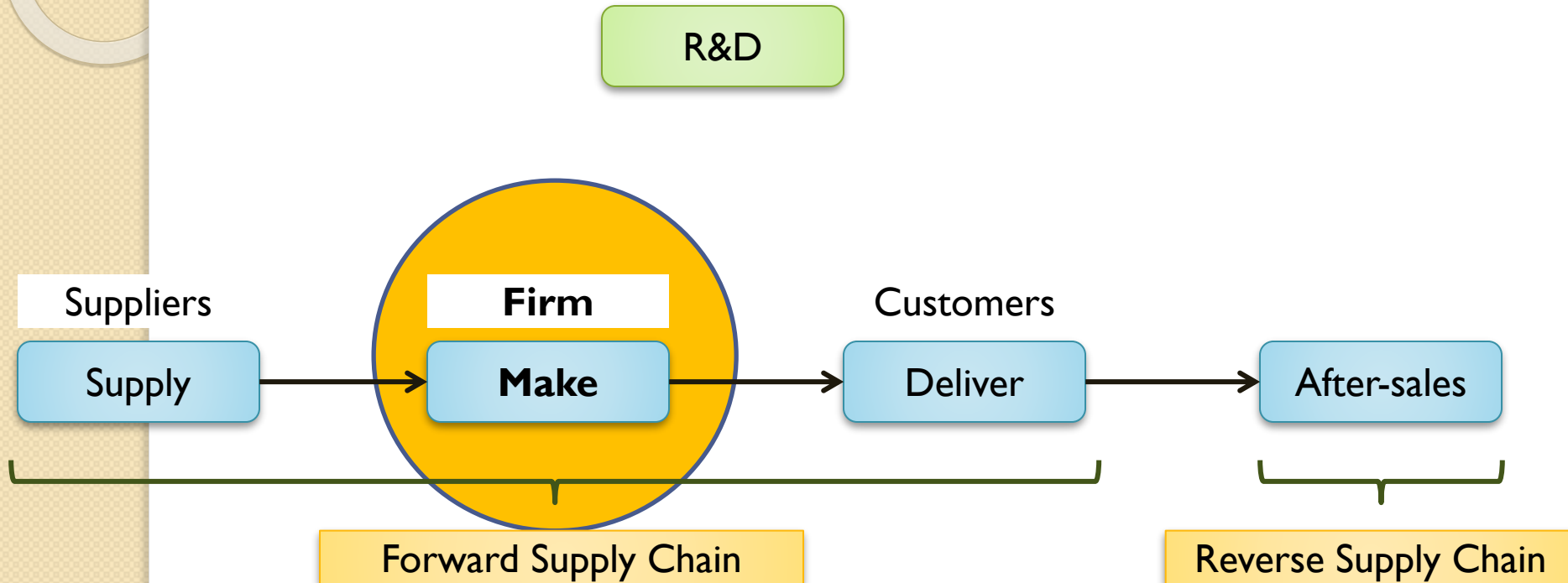
Overall view



Supply

- Supplier management process
- Supplier selection
- Order quantities
- Order timing
- Level of relationship
- Level of raw material inventory
- Forecasting raw material needs
- Procurement terms (FOB, etc.)
- Outbound logistics optimization
- EOQ, MOQ

Overall view



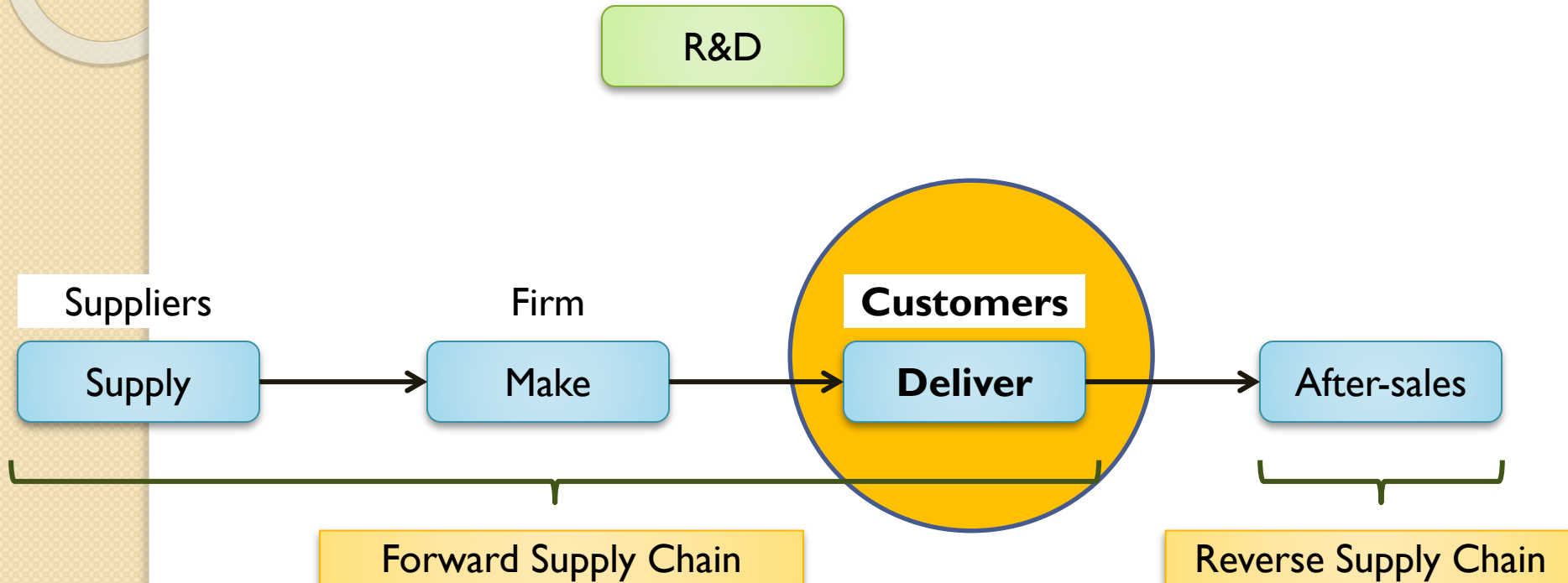
Make (I)

- Inbound logistics optimization
- Optimal inventory level (WIP, FG)
- Setup time reduction
- Forecasting demand
- Manufacturing flow management
 - Capabilities, push/pull, MTS/MTO, etc.
- Time study, work analysis
- Job descriptions
- **Quality control**
- Personnel Planning

Make (2)

- Scheduling
- Production planning and control
- Optimal product mix
- Value Stream Mapping
- Process mapping (swimlane, etc.)
- Green manufacturing
- Optimization of processes
- Assembly line balancing
- Value adding activities

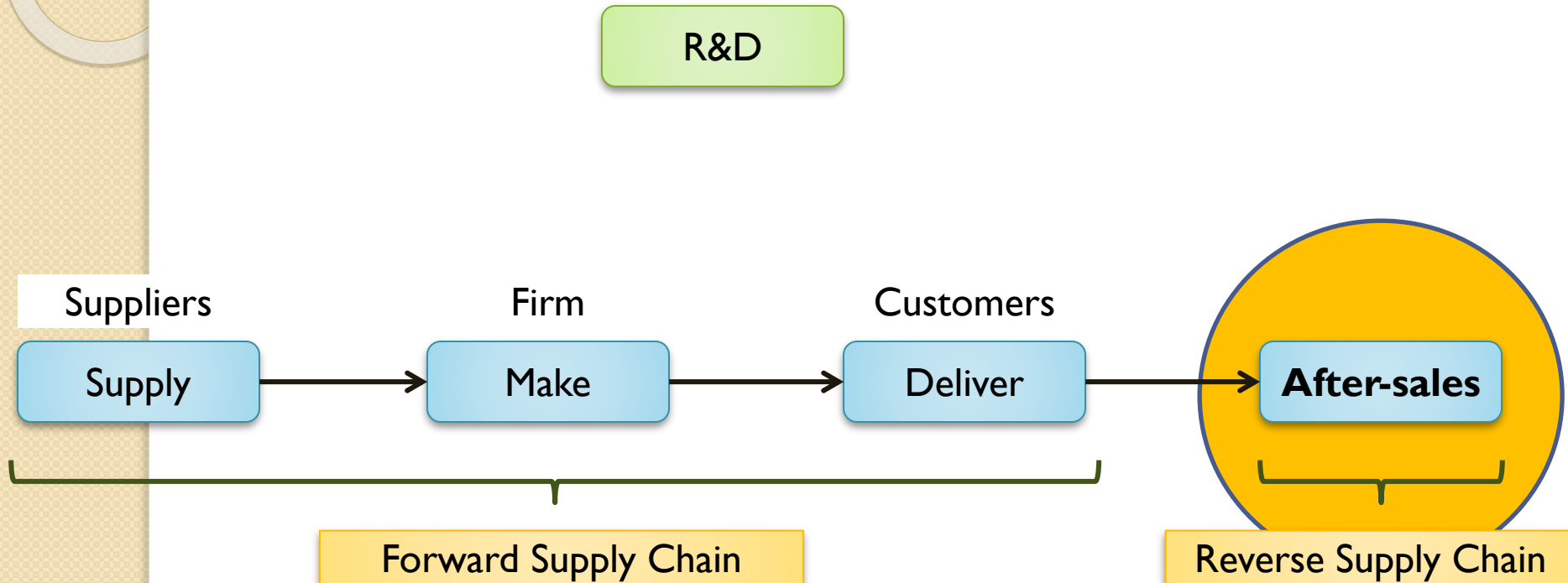
Overall view



Deliver

- Outbound logistics optimization
- Customer management process
- Level of relationship with customers

Overall view



After-sales services

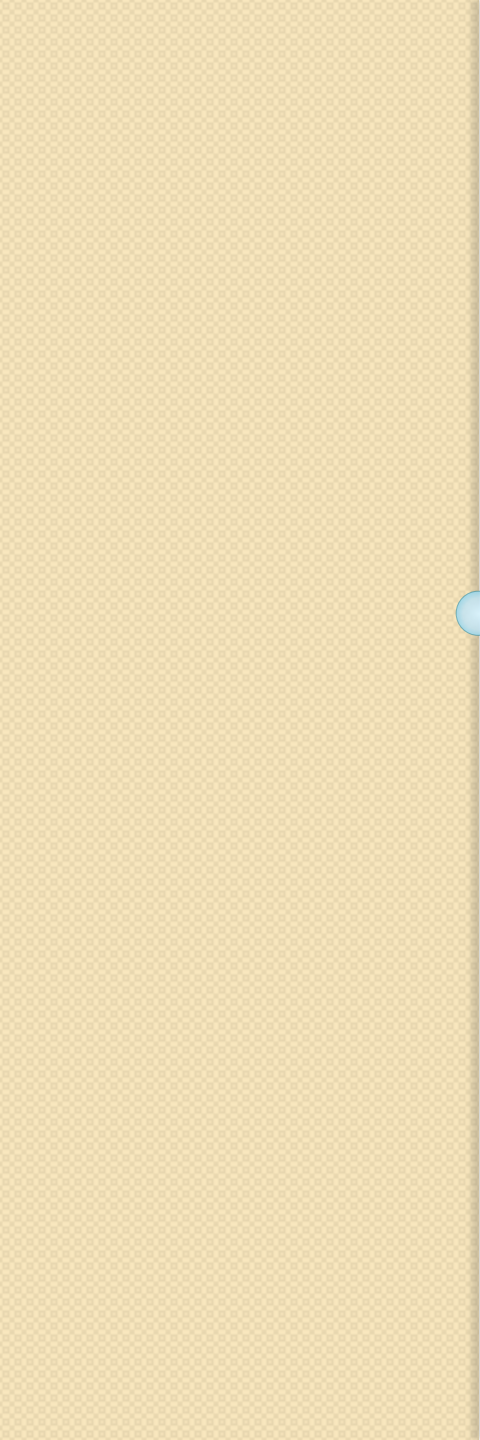
- Reverse supply chain management
- Spare parts
 - Forecasting spare parts is interesting!
- Product disposal
- Returns
- Guidelines for handling these

Or if you choose academic career:

- Plan well your bachelor's and master's studies
- Try to have as higher GPA as you can
- Try to convert you master's thesis to an article and publish it in a journal
- You may be asked to submit:
 - GRE/GMAT results,
 - TOEFL/IELTS results,
 - Transcripts,
 - Published/Unpublished materials,
 - Reference Letters

Typical start-level jobs

- Warehouse officer
- Production officer
- Project Engineer
- Supply Chain Analyst
- Product Development Engineer
- Data controller
- Quality Engineer
- Logistics Administrator
- Systems engineer



THANKS FOR LISTENING!

Any questions or comments?

How Ergonomics & HSE will be helpful to you?

- To broaden your general knowledge
- Give understanding of Ergonomics and workplace design
- Give understanding about the roles of the HSE team
- Familiarize you with the related terminology