

D-Lab

D Lab: Supply Chains



- Introduction
- Class objectives, syllabus, requirements and expectations
- SC overview
- SC examples
- SC and developing countries

Class Objectives

- Introduce concepts of supply chain design and operations with a focus on supply chains for products destined to improve quality of life in developing countries
- Objectives are to develop an understanding of the challenges in the design and planning of supply chains, to learn applicable modeling skills and problem-solving tools and to have the opportunity to apply these skills in a real-world project.
- What are your objectives?

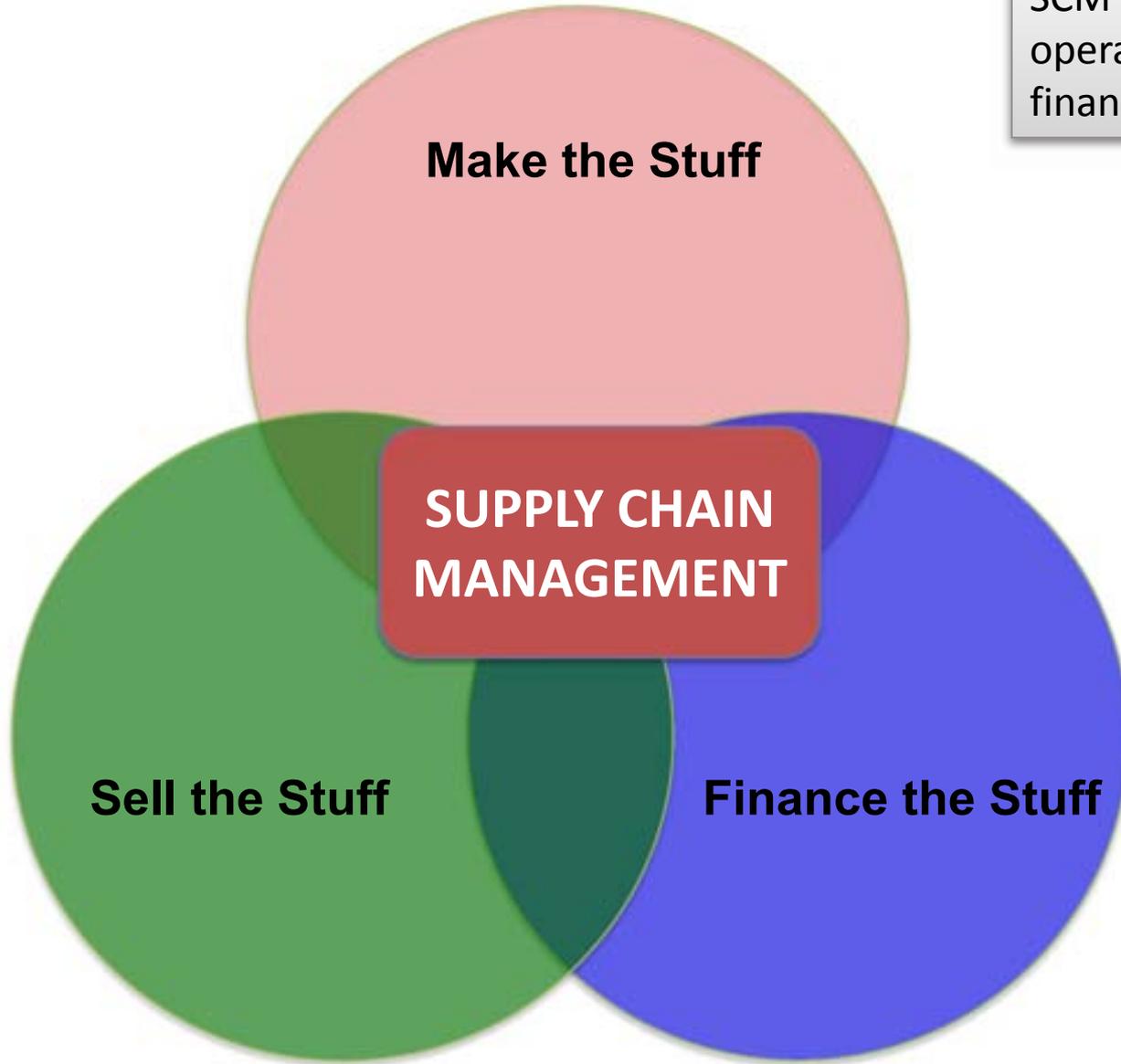
Requirements and Expectations

- Come to class prepared
- Individual assignments: problem sets & a series of short write-ups
- Group assignment: term project
- Group size: 2 - 4 students
- Participate in class; provide feedback on how to improve

Supply Chain Management

- Supply chain is two or more parties linked by a flow of resources – typically material, information and money
- SCM entails the management of activities surrounding the flow of raw materials to the finished product or service enjoyed by the end customers, and back, in the case of recycling and returns.
- **SCM: Buy, Make, Move, Store, Sell**

SCM spans the functions of operations, marketing and finance



Supply Chain Management

- SCM is a set of approaches utilized to **efficiently integrate** suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the **right quantities**, to the **right locations**, and at the **right time**, in order to **minimize system-wide costs** while satisfying **service level requirements**

Projects 2012: D lab supply chains

- Natural Dye Crayons
 - Sourcing of raw material
 - Capacity assessment
 - Distribution channels
- Ag Waste Charcoal
 - Cost modeling and process analysis
 - Right level of centralization vs. decentralization

Projects 2012: D lab supply chains

- EssMart
 - Design of distribution system
 - Assortment planning
 - Inventory planning
- Freedom Chair
 - Cost modeling and process analysis
 - Amount of local content
- Moringa Oil
 - Assessment of demand and possible market channels

Projects 2013/sp: D lab supply chains

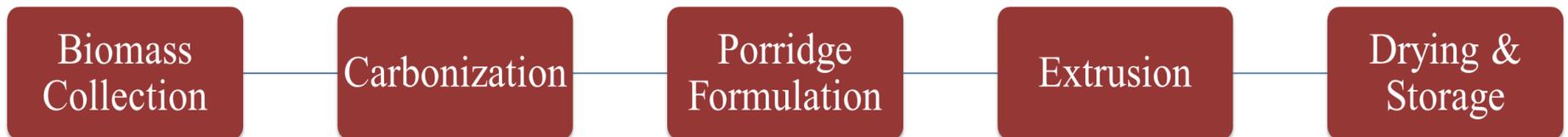
- Pure Home Water
 - Bottleneck analysis of supply chain
 - Examination of micro-finance options for distribution and marketing
- SolarClave
 - Evaluation of sourcing and manufacturing options
 - Identification of opportunities for design improvement

Projects 2013/sp: D lab supply chains

- Barefoot Power
 - Determine best way to handle warranty claims
 - Where and how to do repairs?
 - How much inventory, who holds it and where?

Projects 2013/Fa: D lab supply chains

- TEWDI Charcoal
 - Built a spreadsheet model to:
 - Determine production capacity, given space constraints
 - Model return on investments from improving production technology
 - Optimize labor allocations and assignments

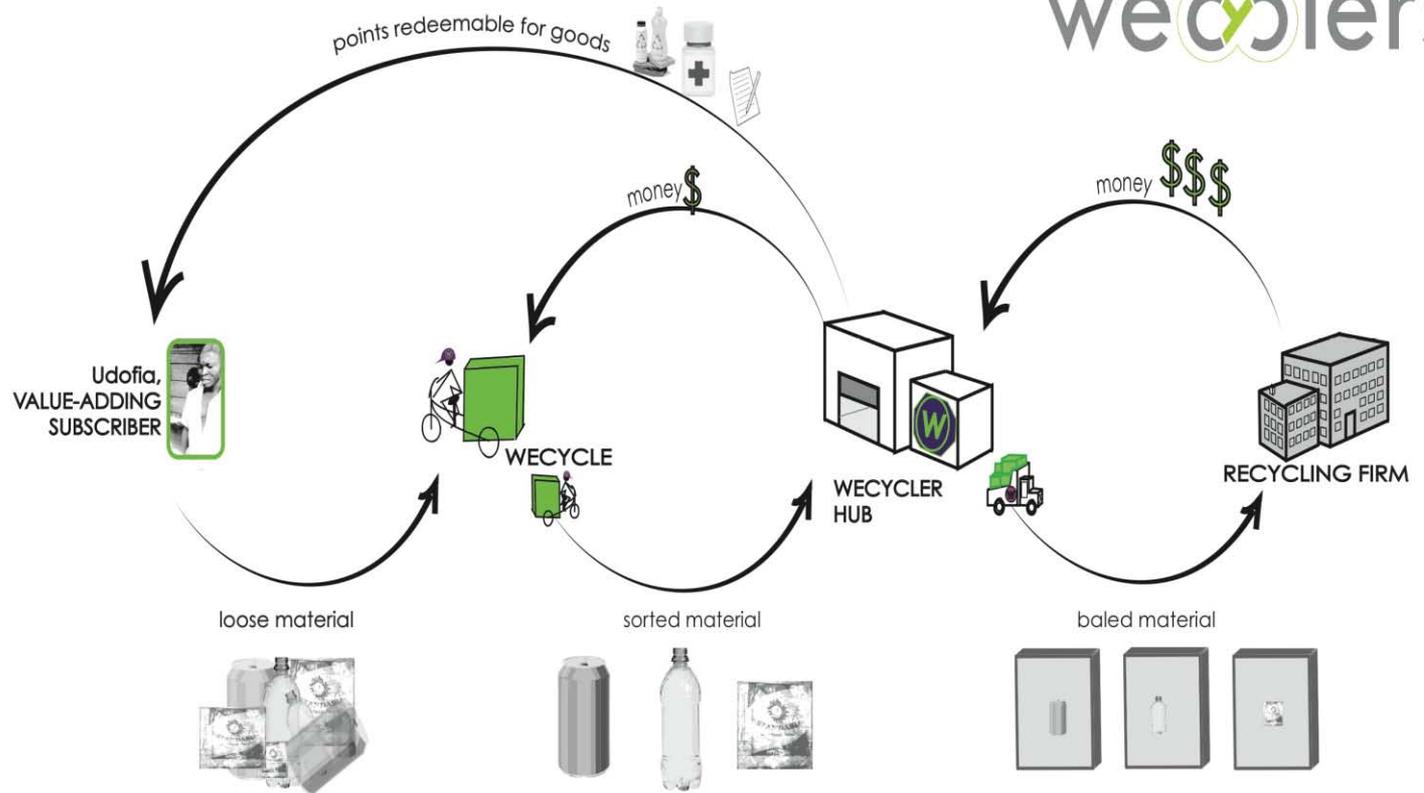


Projects 2013/Fa: D lab supply chains

- Wecycler
 - How it improve SC performance as firm scales
 - Mapping of SC
 - Root cause analysis of missed productivity targets
 - Proposed treatments to address issues and improve productivity

- GOODS OFFERED IN EXCHANGE FOR POINTS**
- social goods
 - medical necessities
 - educational materials

- RECYCLABLE MATERIALS COLLECTED**
- aluminum cans
 - PET bottles
 - water sachets

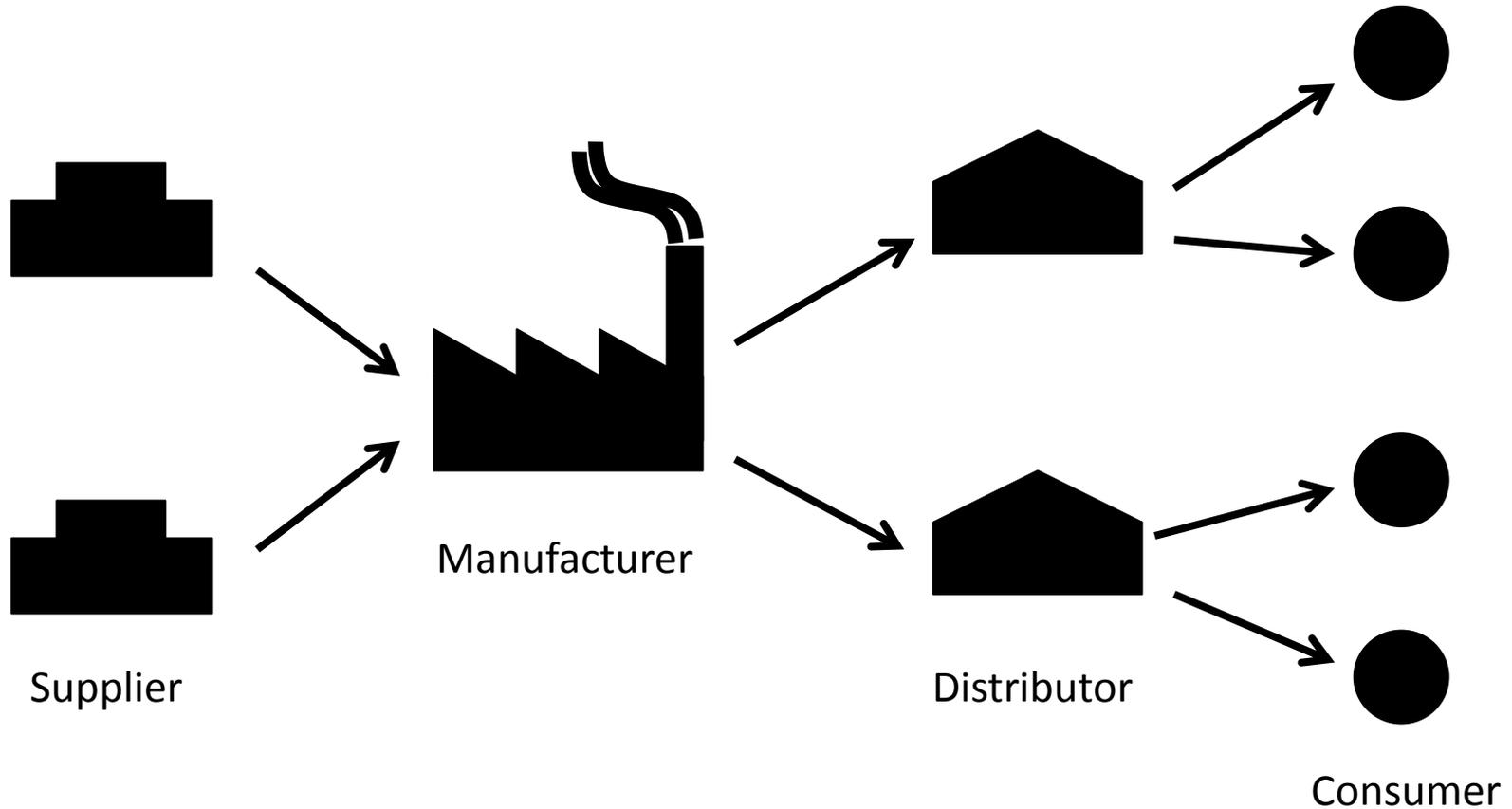


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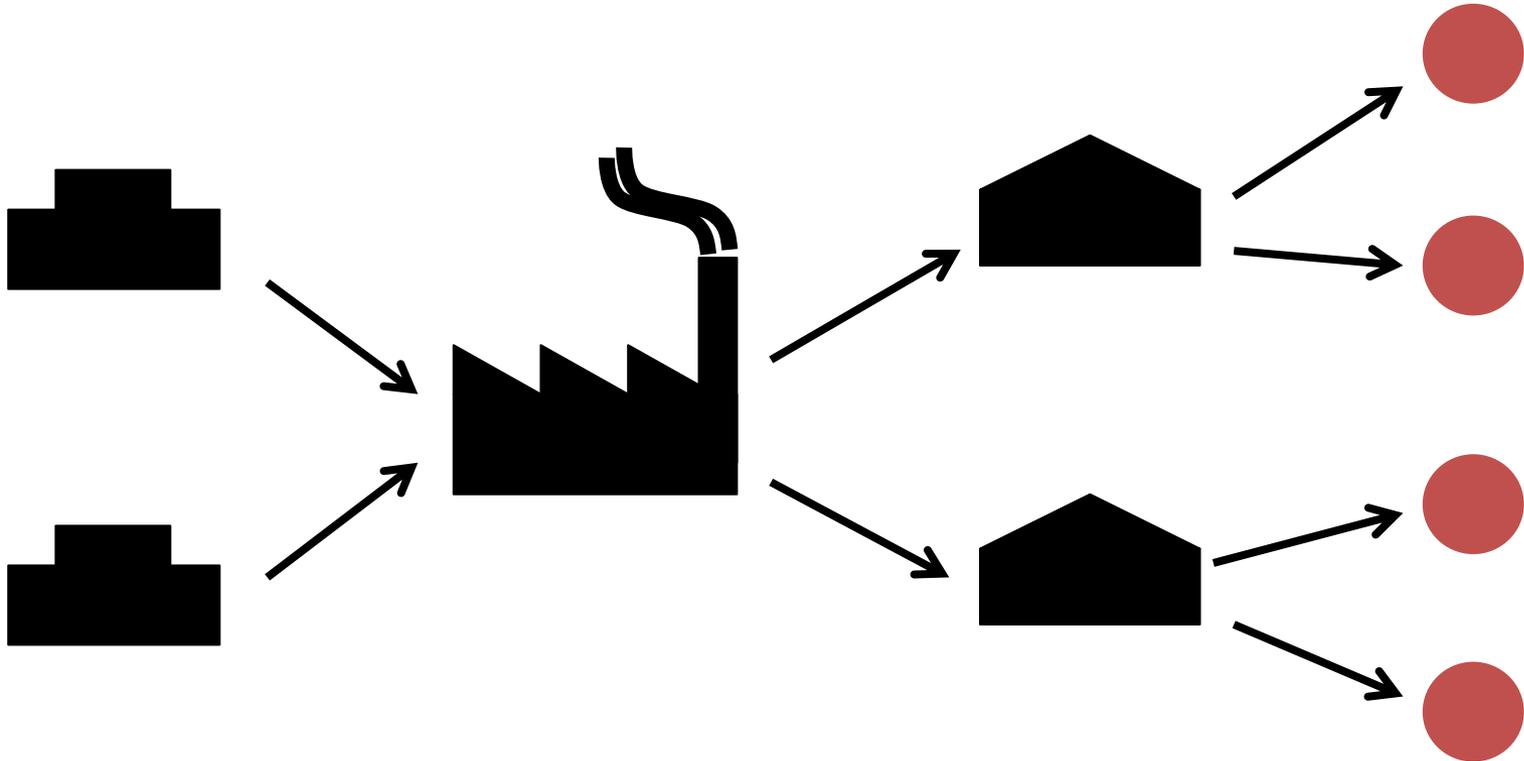
Potential Projects

Name	Area
Air Liquide	Frugal oxygen SC for supporting hospitals
ARTI Charcoal Project	Charcoal Briquettes: modeling new production line
Wecyclers	Better route planning; better customer retention
Ghonsla	SC for insulation panels; transportation improvement

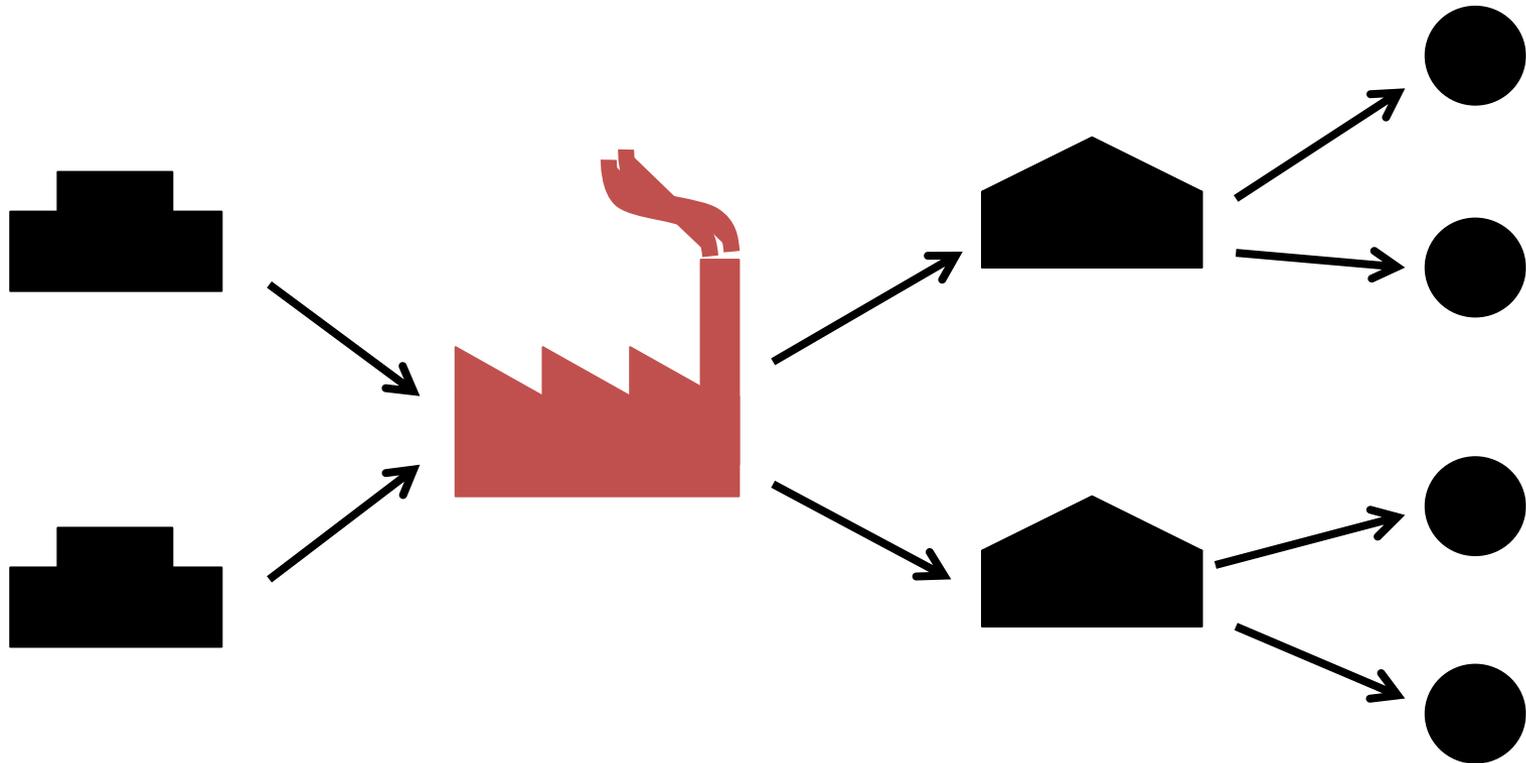
Overview of the Course



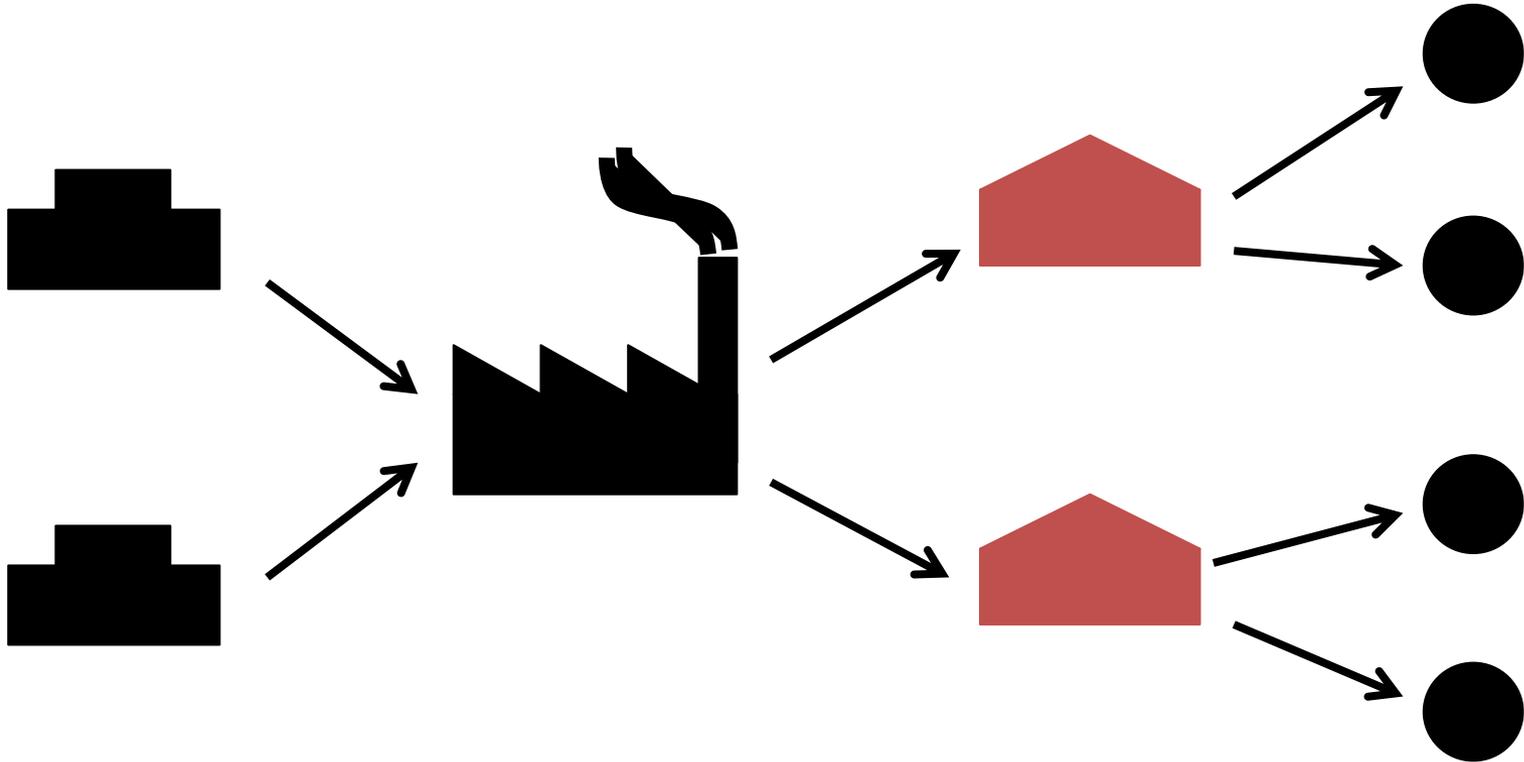
Demand Estimation



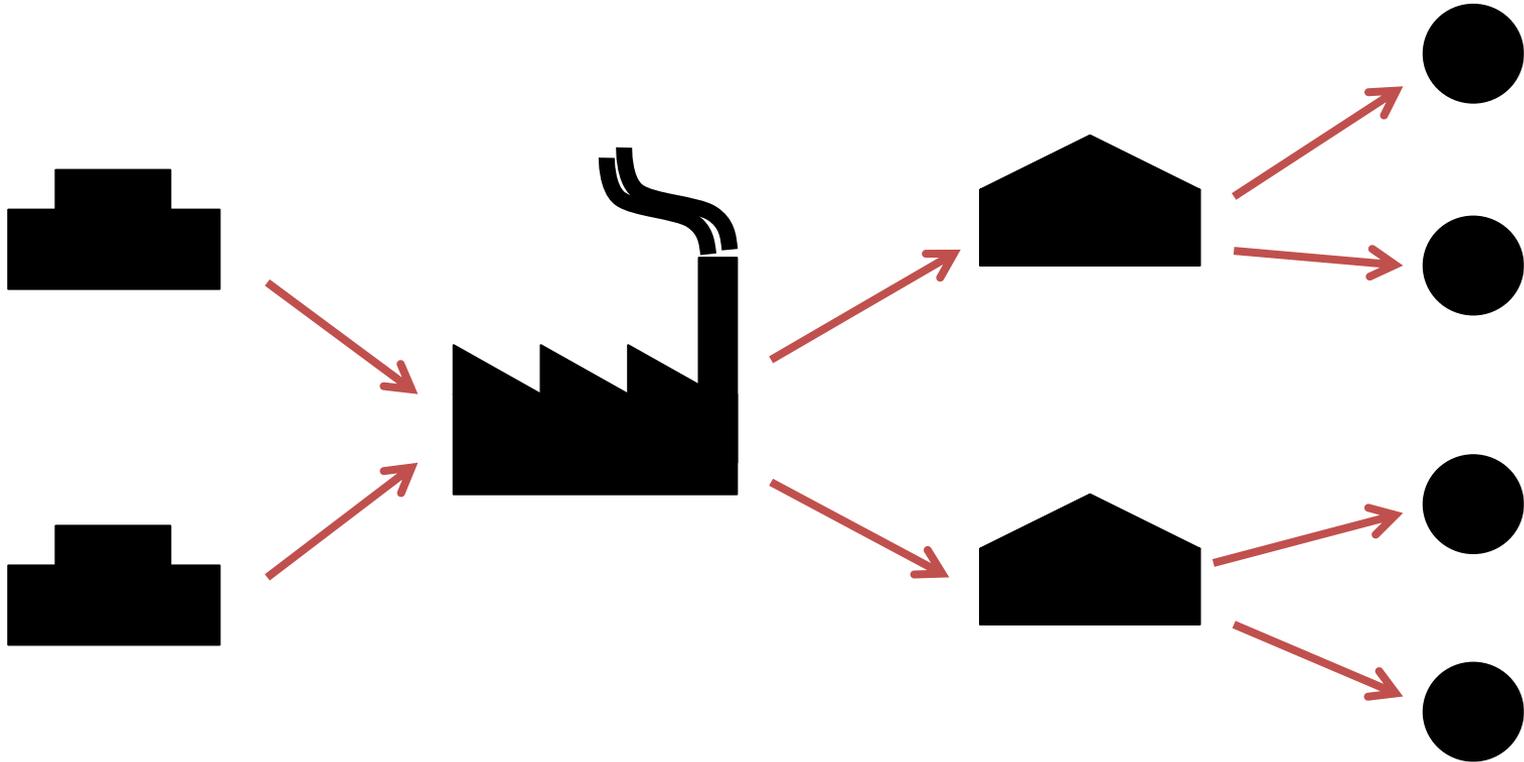
Capacity Planning, Process Analysis, and Production Flow Control



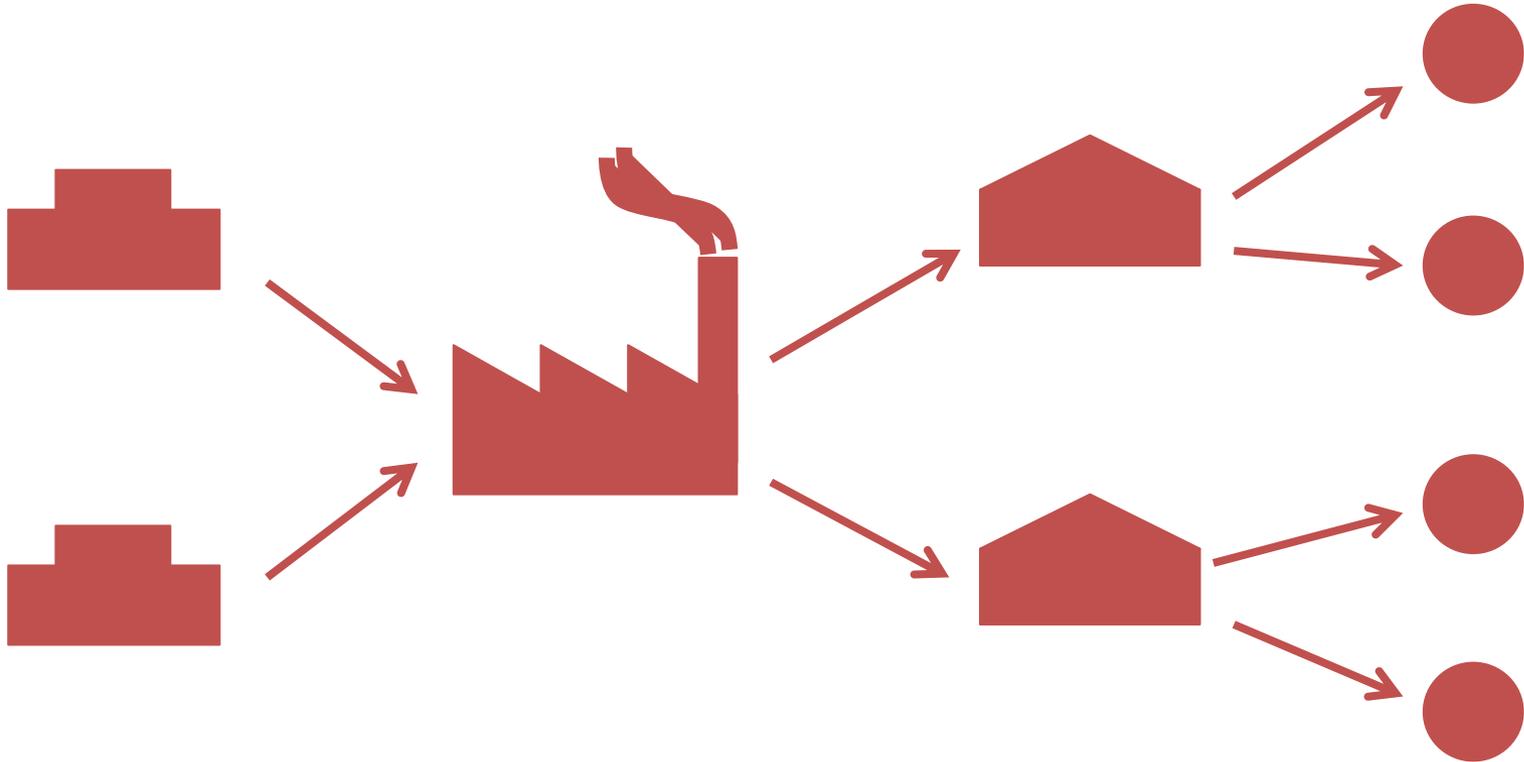
Inventory Management



Supply Chain Contracts

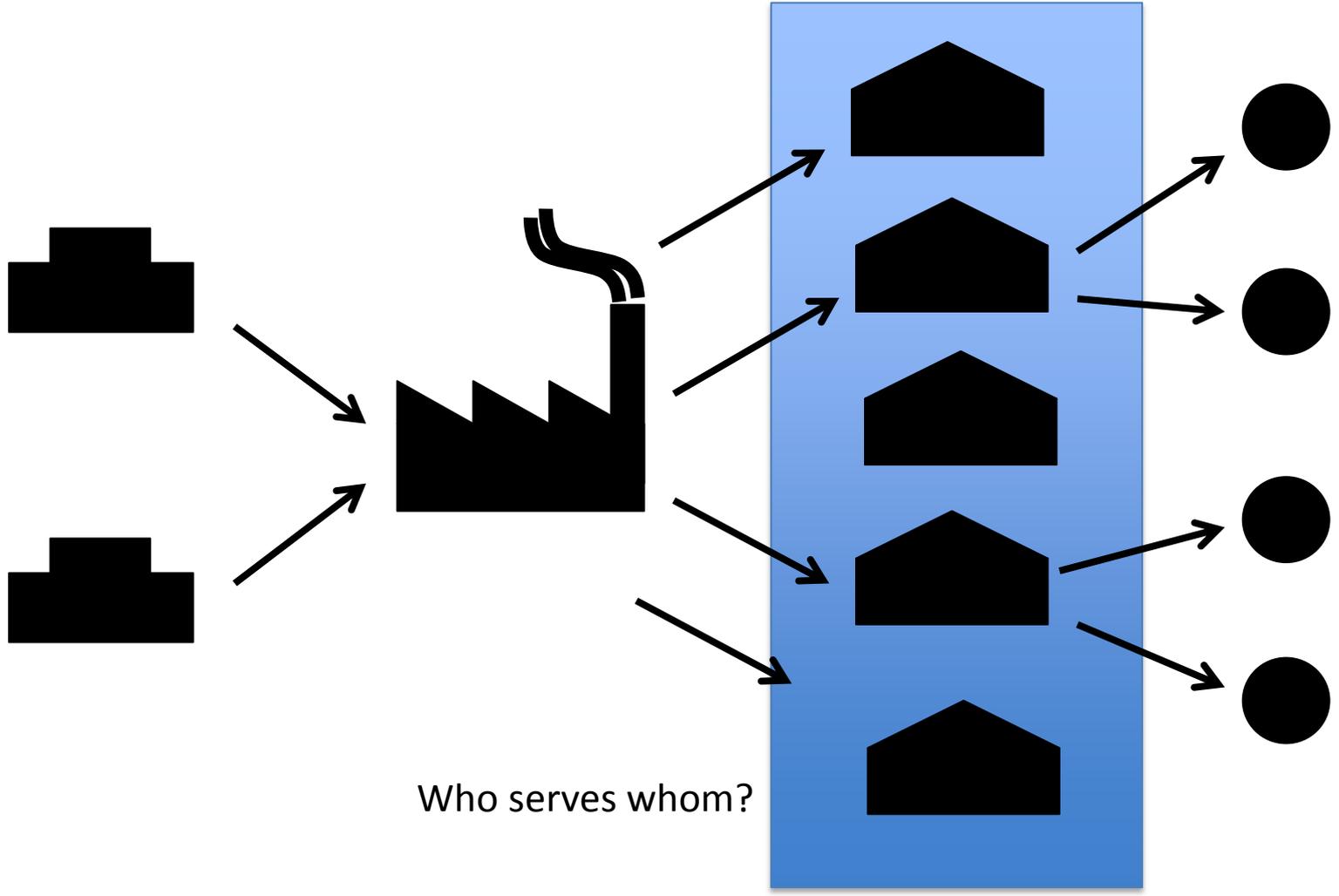


Lean Production System



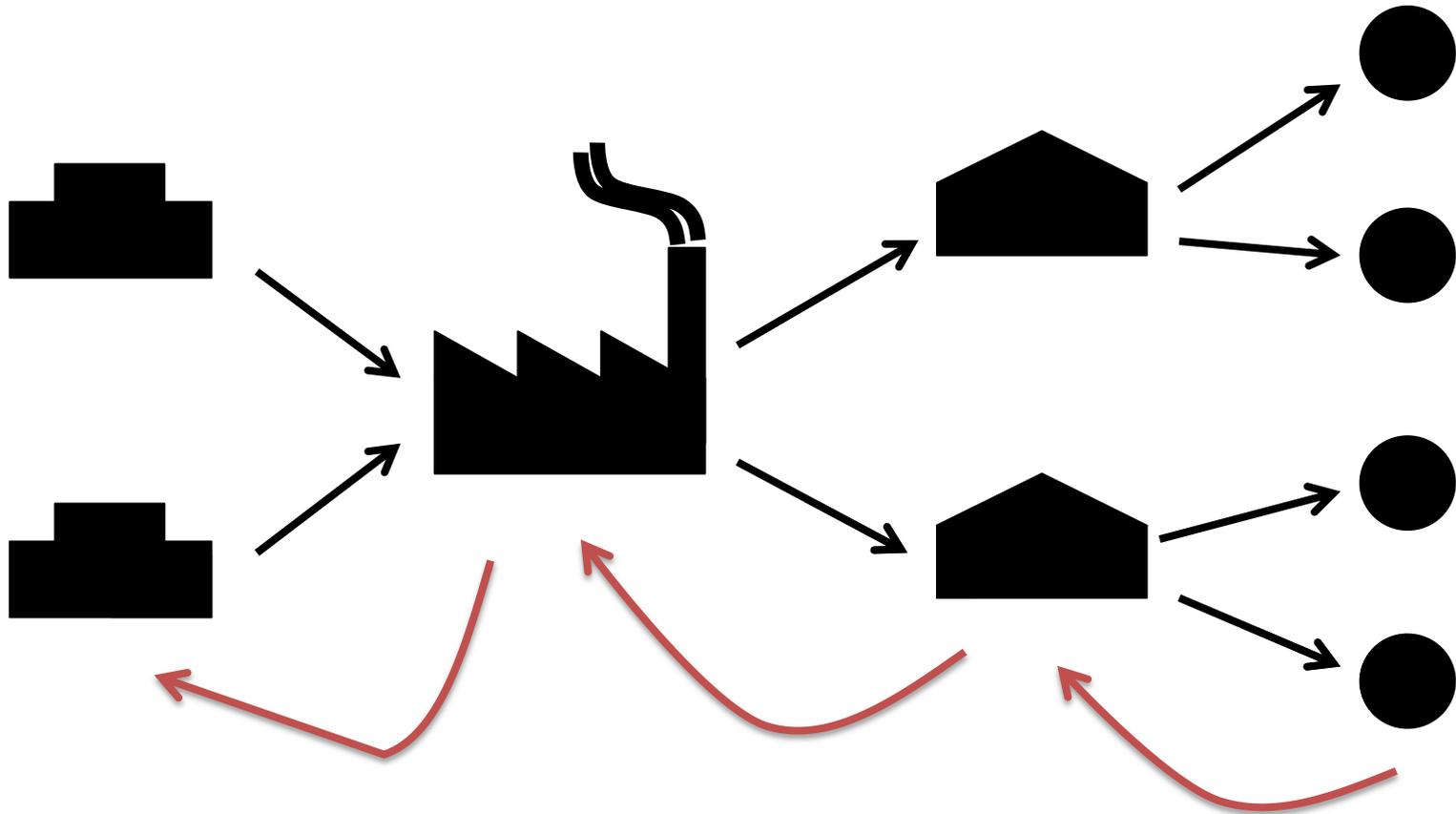
SC Design

How many locations and where?



Who serves whom?

Reverse Logistics and Recycling



Common reasons for system slack

- Uncertainty in input or output processes, or in demand
- Time lags & capacity limits
- Scale economies
- Predictable variability in supply or demand
- Conflicting objectives or incentives
- Need for immediate or short service times

Supply Chain Example

Facts about Kerosene

- Over US\$ 10 Billion is spent each year on kerosene for lighting homes in poor countries
- Nearly 4 million women suffer from severe burns from open fires and kerosene lighting each year
- 1.6 million deaths per year in developing countries are caused by indoor air pollution due to traditional fuels



Barefoot Power

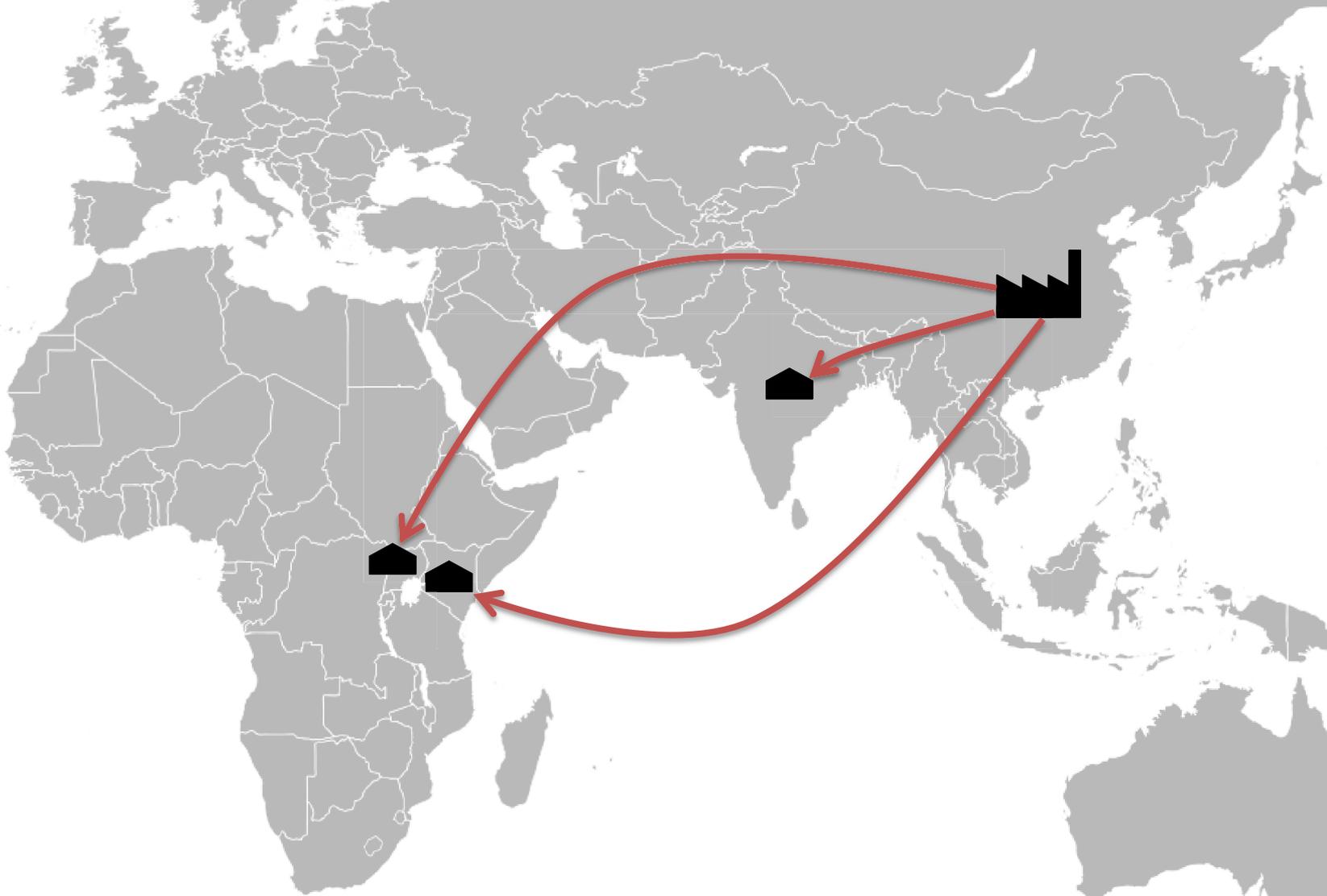


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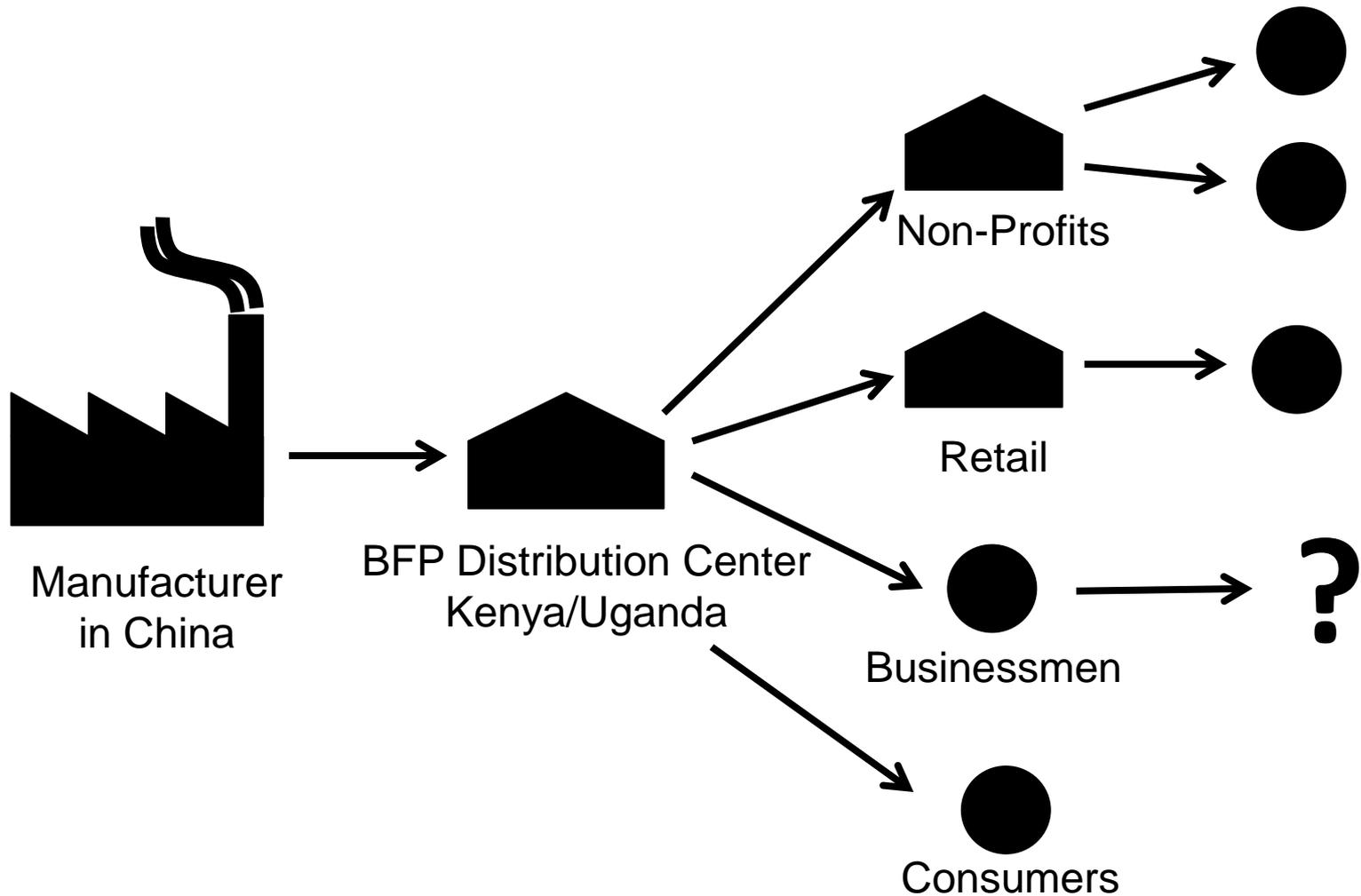
Price: \$20-\$30

Price: > \$100

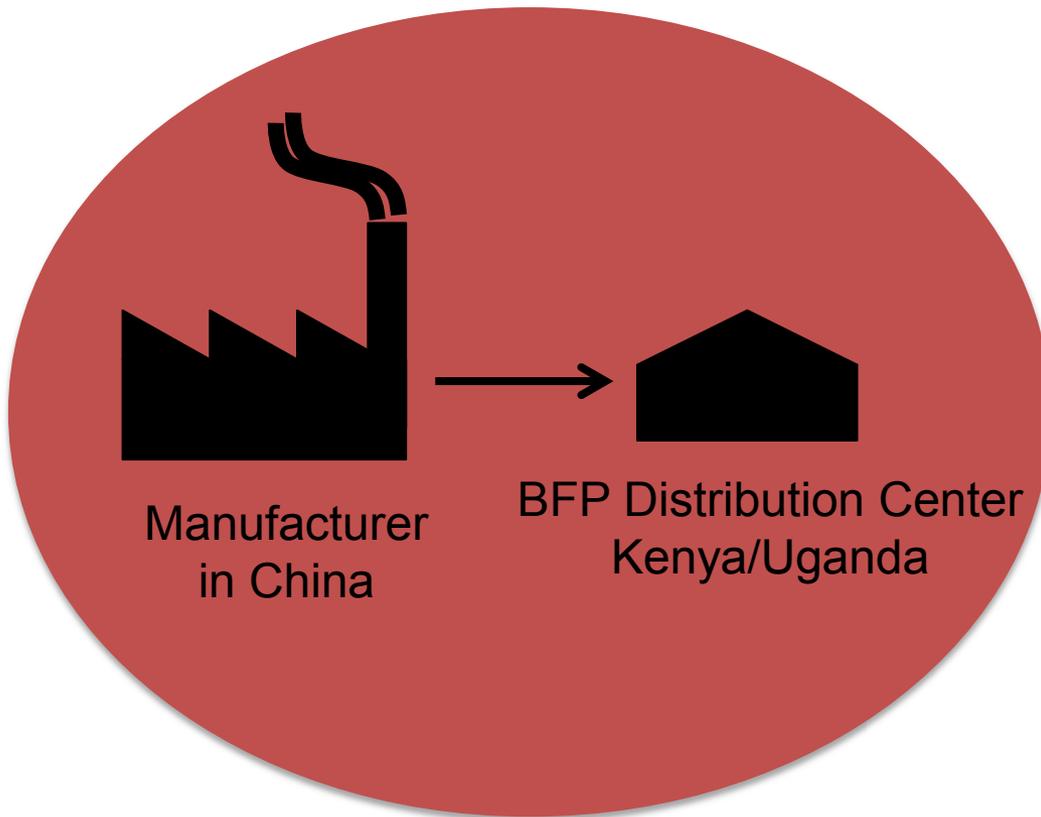
BFP's Supply Chain



BFP's Supply Chain



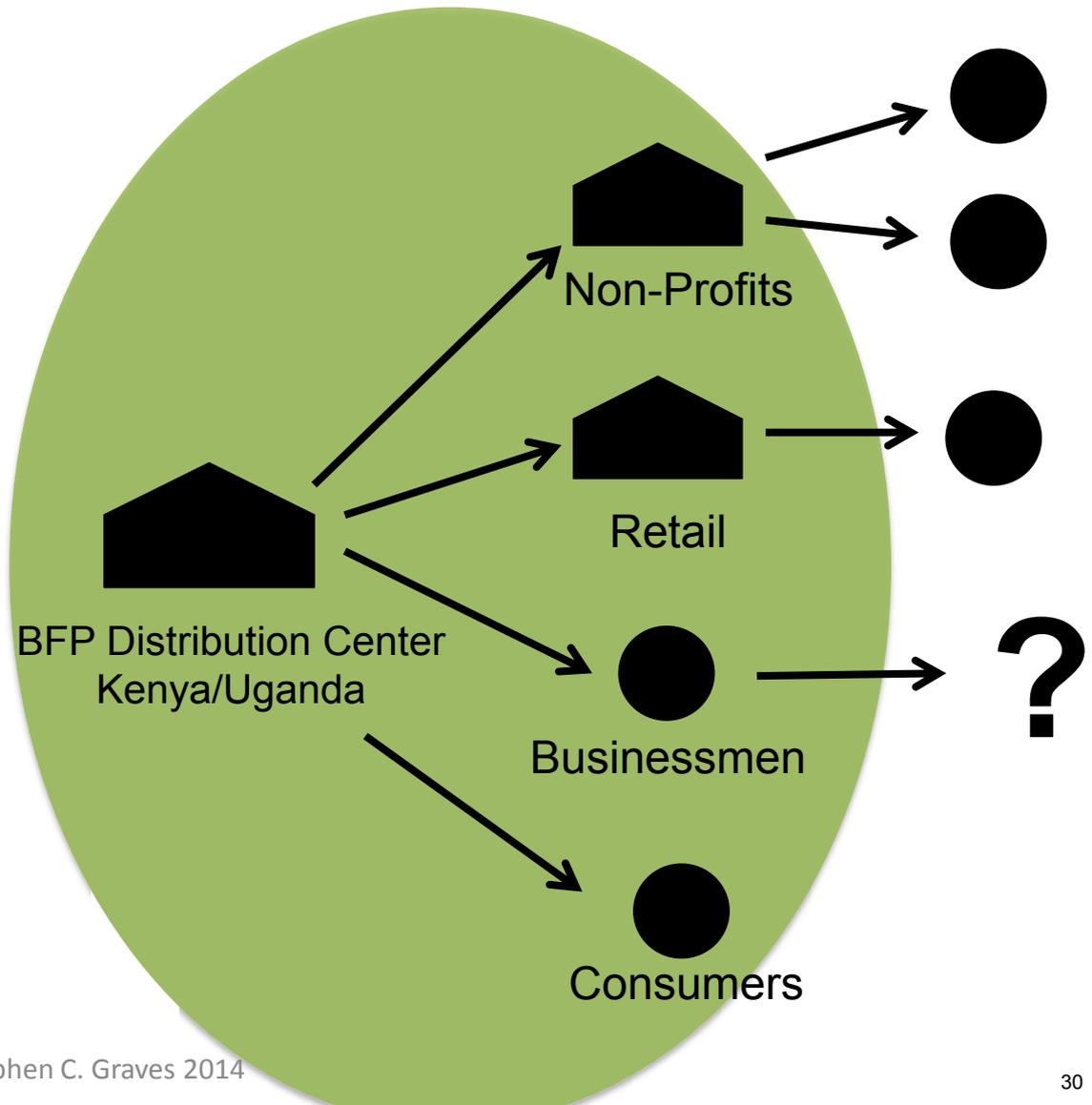
BFP's Supply Chain - Manufacturing



- Slow
- Products transported by ship
- Large volume of products
- High transportation costs
- Little uncertainty
- Plenty of information and visibility
- Known costs

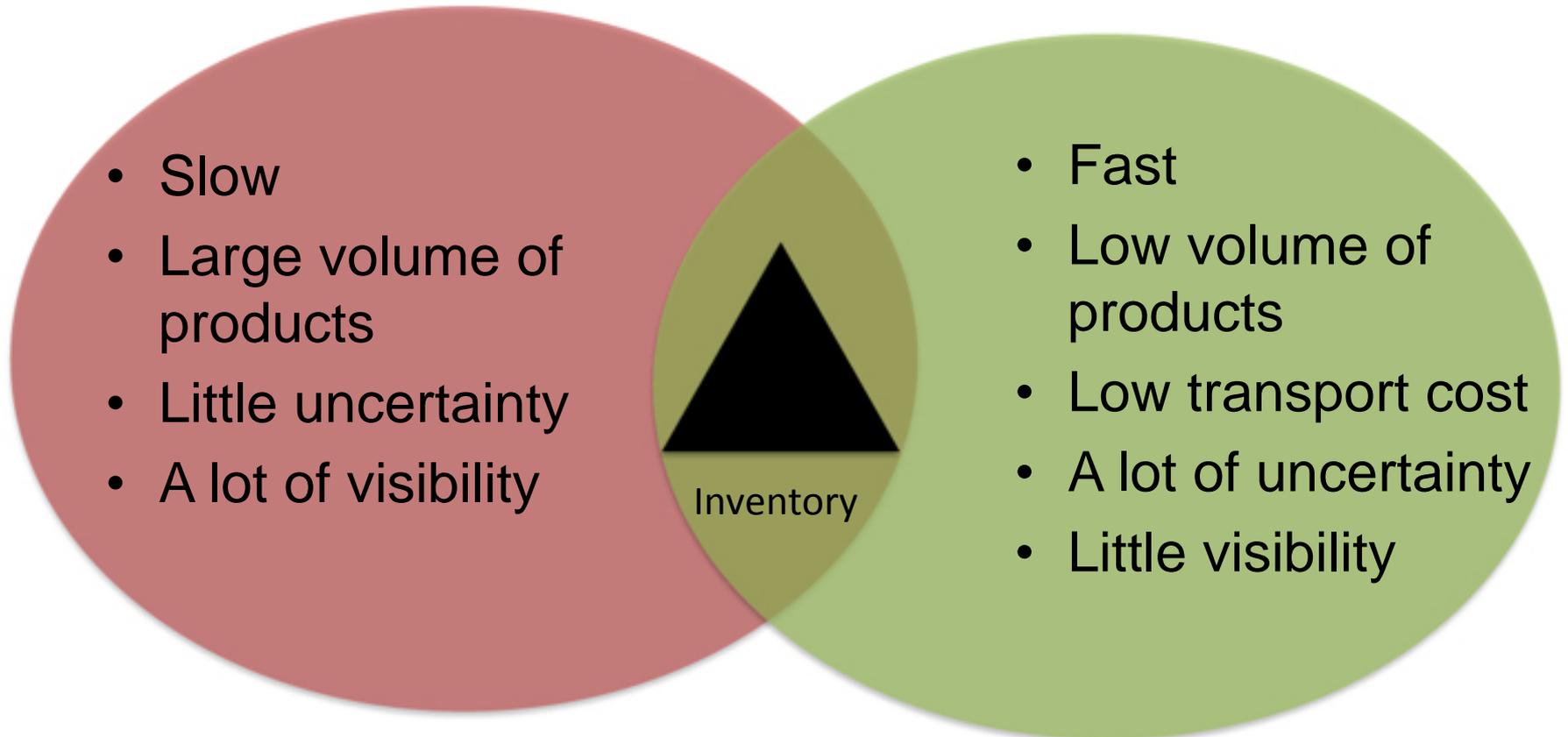
BFP's Supply Chain - Distribution

- Fast
- Products transported by truck or bike
- Low volume of products
- Low transport cost
- A lot of uncertainty
- Little information and visibility
- Unknown # of tiers
- Unknown costs



BFP's Supply Chain

- How can we couple these two “systems”?



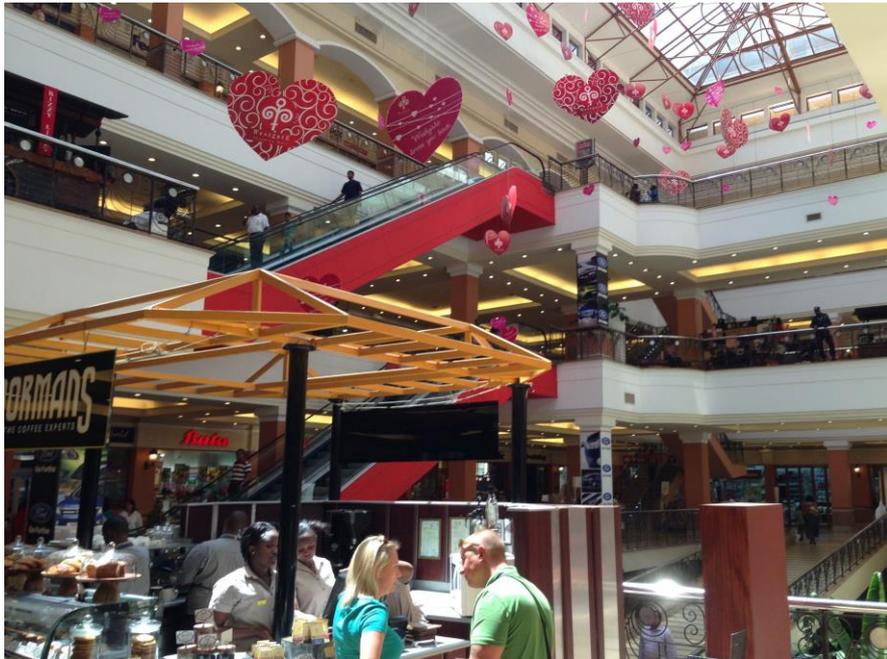
Challenges in Emerging Markets: What's different?

Uncertainty

- Lack of information
- Lack of Visibility
- Currency fluctuations
- Supply Chain disruptions



Contrasts: Modern vs. Traditional



Market in Kenya



Market in Kenya

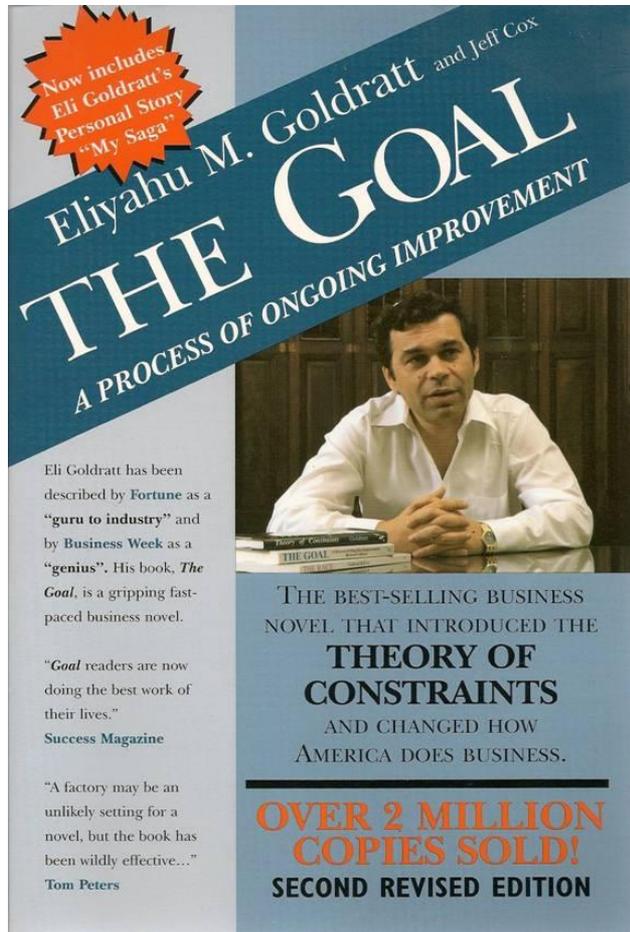
SCs and developing countries: what's different?

- Delivered cost is of primary importance for consumer goods
- Lead times longer, more uncertain
- More uncertainty in demand, in supply
- SC disruptions may be more common
- Information and logistical infrastructures are much less developed
- More tiers across SC; more hand-off's
- Service aftermarket (ie repair parts and service) may not exist
- Financial credit may be less common

Assignment for Monday

- Pick a product that you own, or use, or consume.
- Describe its supply chain as you know or imagine it, going as far upstream as possible to raw materials.
 - Where and how was it made?
 - Where were its components made?
 - Where were the raw materials sourced from?
 - How long did this take? How many steps and movements?
- What type of **slack** might there be in this supply chain, and where, and for what reasons?
- What do you imagine are the key challenges in the planning and operation of this supply chain?
- Please submit a 1 page write up addressing these points.
- **Slack** --- is meant to convey an allowance in the system to accommodate uncertainty in the supply chain, or inflexibilities, or to take advantage of economies of scale or scope

Start reading “The Goal”



The Goal: A process of ongoing improvement
by Eliyahu Goldratt

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