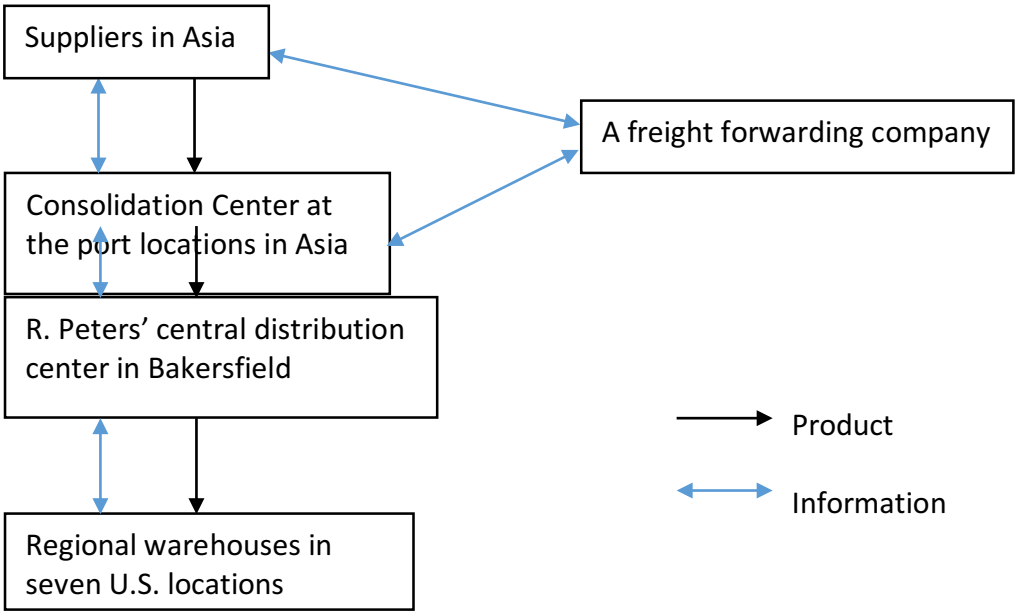
Chapter 1
Question 1

a.



b. Selection of regional warehouses
Selection of suppliers
Selection of shipping modes in the North America
Selection of a freight forwarding company
Selection of the location of the central distribution center

c. Costs for purchasing from suppliers
Costs for inventory management of product in storage
Costs for tax payment at U.S. entry port
Costs for planning and scheduling of staff
Costs for hiring a freight forwarding company
Costs for shipping the products in the North America.

Question 2
1 Economic: the firm's obligation to compensate shareholders who provide capital via competitive returns on investment.
2 Environmental: the firm's impact on the environment and society at large.
3. Social: pertains to fair and beneficial business practices toward labor, the community and the region in which a firm conducts its business.

Chapter 2

Chapter 3

Chapter 4
Question 1
Arrival rate: I = 15 units per hour

The capacity at the Milling stage: (60/6)x2 = 20 units per hour
The capacity at the Lathing stage: (60/3x16+15)x16 = 15.238 units per hour
Since the arrival process is the bottleneck, the arrival rate at the Assembly stage is 15 units per hour. The capacity at the Arrival stage is 30 units per hour.
The productive utilisation at the Assembly stage is 15/30 = 0.5

Question 2
Advice consultant: ~~good~~ / bad
Explanation: when looking at the forces which caused the CODP of Fly Inc. tob e positioned at MTS it seems rather strange to expose the customers to a very long lead time (design, purchasing and production) customers will be dissatisfied as it is highly likely they will miss the parachuting season if they order their product to late. The pros of completely designing your own parachute might be outweighed by the cons of the long lead time. For Fly Inc. i twill also be inefficient as they cannot balance their capacity in the light of seasonal demand. That means in winter the factory can be closed.

Chapter 5

Chapter 6
a. ProParachute = Engineer to order. Parachutes are designed, materials are purchased and products are produced bases on a specific customer order. The CODP lies at the design department.
RecreParachute = Make to Stock. All production orders are initiated by stock levels of final product (reorder point). The CODP lies at the final product warehouse.
b. ProParachute:
Customer specific products – all parachutes are tailor made.
Irregular demand – Fly Inc. never knows when a ProParachute order comes in.
RecreParachute:
Desired short leadtime due to seasonality.
High delivery reliability as customers value Fly Inc. never being out of stock.
Also demand is easy to forecast and stable.
c. Current lay-out: most likely a product layout.
Explanation: when considering the likeness of the products low routing variability (each parachute undergoes the same sequence of process steps) it is highly likely that the machines are arranged in the sequence of the consecutive process steps.
Advice consultant: ~~good~~ / bad
Explanation: a fixed position lay-out is only suitable for large projects as all the resources are required to come tot he ‘product’ rather than the product flows through the resources. In the case of a parachute it is highly inefficient to do so.

Chapter 7
Question 1
Define x as the minimum batch size.
To meet the demand requirement, we have
$(60x)/(3x+15) \geq 18$
$x \geq 45$
The minimum batch size is 45.

Question 2
a. $Pn \leq 4 = 1 - Pn > 4 = 1 - (l/m)^5 = 0.672$
b. Choose M/M/1 model
l = 12 per hour, m = 15 per hour
Ls = l/(m-l) = 4 customers
c. In the current system, Wq = l/(m(m-l)) = 4/15 hour = 16 minutes
After the training, m = 20 per hour
Use the M/D/1 model.
Wq = l/(2m(m-l)) = 2.25 minutes
The expected cost saving per hour is 12x(16-2.25) = $165 per hour

Chapter 8

Chapter 9

Chapter 10
Question 1
Features, Reliability/Durability, Serviceability, Aesthetics.
Explanation of the two most important dimensions:
Performance: Relying on you parachute to function is likely to be the single most important quality aspect.
Reliability/Durability: Similar to the answer above only now over a period of time.

Question 2

a. Internal Failure: scrap and rework
   External Failure: complaints management 1 full-time employee, warranty payments
   Appraisal Costs: 2 full-time quality inspectors, quality-audit by external consultants
   Prevention Costs: annual “quality-day” for all the factory workers
b. Within the concept “cost of quality”, the costs mentioned can be classified as follows:
   Failure cost: scrap+complaints+warranty = 180000 and Control cost: awareness+inspection+audit = 155000.
   Jamma has more failure cost than control cost which according to the concepts for “cost of quality” is to be considered as sub-optimal.
   The P&O proposal is to add additional training cost of 40000.
   The difference between the control cost and failure costs is 25000. By adding 40000 to the control cost the cure seems worse than the problem. Only if the 40000 extra results in a decline of failure cost >15000 there is a break even.
c. Process Capability Index:
   For PAINTPINK it applies that USL = 585nm; LSL = 575nm; X-bar = 576nm and 3s = 2nm. It follows that Cpk = Min{(585/576)/2; (576/575)/2} = Min {4,5 ; 0,5} = 0,5
   This indicatest hat the process has no high capability of providing products within the required specification limits.
   Short term:
   Direct investigation into what causes the problem of this deviation as this is unacceptable, recall of the batch as it might harm the relationship with the

customer. Mixing of batches to smoothen the problem. Trying to bring x-bar nearer to specification and after that reduce variability.
Long term:
Purchasing of more precise machinery.

Chapter 11
The corresponding WIP is given by 2x(15/20)+16x(15/15.238)+(15/30) = 17.75 units

Chapter 12
Suitable in hospitals: 5S, Visual control (Jidoka), Value Stream Mapping (process focus), 5 Why's, Fool-proofing (Poka-Yoke), SMED; transfer batches, Continuous Improvement (Kaizen), Leveled Scheduling (Heijunka).
Not applicable in hospitals: one-piece flow, Pull (Kanban), cellular manufacturing.

Chapter 13
a. - Shortage gaming: if supplier production is less than orders, orders are rationed to secure a better allocation, the retailers inflate their orders, i.e., order more than they need.
- Trade promotions and forward buying: supplier gives retailer a temporary discount, called a trade promotion. Retailer purchases enough to satisfy demand until the next trade promotion.
- Order batching: retailers may be required to order in integer multiples of some batch size, e.g., case quantities, pallet quantities, full truck load, etc.
- Order synchronization: customers order on the same order cycle, e.g., first of the month, every Monday, etc.
- Reactive and over-reactive ordering: Each location forecasts demand to determine shifts in the demand process. Responding to a high demand observation can be a sign of being over-reactive. Unfortunately, it is human to over react.
b. When a customer allows a supplier to manage an item or a group of items for them. The supplier may replenish these items as they seem fit.

Chapter 14

a. Denote z as the number of trucks per week voor Utrecht.
   Cx = (-10x10+2zx30+8x5+1x25)/(19+2z) $\geq$ 5.8
   z $\geq$ 3
   Thus, the minimal number of trucks per week is 3.
b. The following answer uses the total number of trucks each 2 weeks, i.e., 21 trucks as the total weight.
   Cx = (-10x10+2x30+8x5+1x25)/21 = 1.19
   Cy = (-10x10+2x20-20x8+1x45)/21 = -8.33