## Hw 1 Solutions

A)

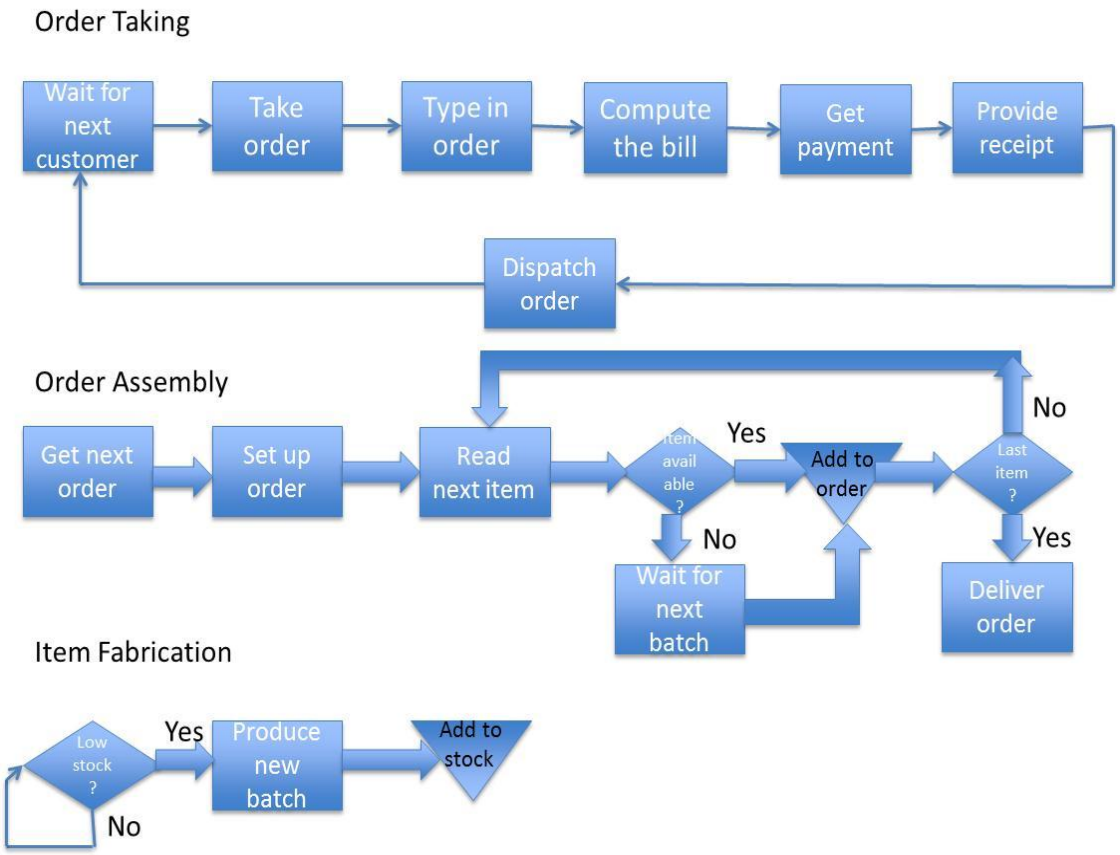
1.1 (a) Raw Materials (that will be transformed to the final product)

(b) Capital (i.e., all the facilities and equipment that is necessary to support the production activity)

(c) Labor (traditionally, this is distinguished in "direct" or "blue-collar" labor, that performs all the manual / basic tasks involved in the production function, and "indirect" or "white-collar" labor that performs more supervisory / managerial and clerical tasks)

(d) Managerial resources (this term implies all the infrastructure that is necessary for supporting the decision processes taking place in the production process; these resources could include (some of) the indirect labor mentioned above, but these days they also refer to all the IT and communication systems that are used by modern companies to monitor and manage their operations)

1.9 A possible organization of the relevant workflow is as follows:




1.14 Such a miscommunication will compromise the company's performance across all the three dimensions that define its strategic position.

Inability to support the engineering plans through the corresponding purchases implies that the company will eventually fail to support effectively the product specifications, and

therefore, the quality attributes intended for this product will be compromised. This is especially true if the aforementioned problems remain undetected until the relevant production batches reach the market.

On the other hand, if the relevant problems are detected and corrected through reordering, then, such wrong purchases will still be disruptive for the overall production process since they will typically result in delays. Hence responsiveness is compromised in this case.

In addition, wrong purchases will also have a negative impact on the operational costs of the company.

2.1 (a) Cycle Inventory: It is maintained in an effort to control *fixed* procurement/ordering or production set up costs. The optimal quantity for this type of inventory is established by the EOQ analysis discussed in class.

(b) Seasonal inventory: This inventory helps the companies address anticipated seasonal peaks in their demand while maintaining a smaller production capacity (and a better utilization of this capacity) than the capacity that would be necessary to produce for these peak demands just within the terms/periods in which they occur.

(c) Safety stock: This inventory helps a company deal with the randomness in its demand. More specifically, by selecting a certain level of safety stock a company can control the probability that any experienced demand unit will be met successfully (without any backlogs or delays). This probability is known as the fill rate (a particular measure of service level) that is maintained by the company. In general, the more variable the experienced demand, the higher the safety stock levels that must be maintained by the company in order to attain a target fill rate.

(d) Opportunistic inventory: This is inventory that is built by a company in an effort to take advantage of provided discounts, price fluctuations of the material, or maybe to protect itself against expected shortages.

The above classification recognizes various types of inventories in terms of the main function that these inventories play in the company operations. Another classification of inventory distinguishes a number of types with respect to its "positioning" in the overall material flow. Hence, we talk about (a) raw material, (b) work-in-process (WIP), (c) finished-product and (d) pipeline inventory. Refer to pg. 29 of your text for more discussion on this classification.

2.3 (a) We said in class that, when applied on the same product, a continuous-review policy -- i.e., an inventory control policy that monitors continuously the inventory position of the underlying product -- is able to maintain the same service level with a periodic review policy while maintaining smaller amounts of safety stock. But lower safety stock implies lower cost for protecting against the uncertainty in the corresponding demand. This is happening because a continuous review policy utilizes more extensive information about the depletion of the considered inventory.

(b) Knowing about an upcoming trip early can help you identify better and cheaper tickets.

2.13 “Zero inventory” is more of a concept rather than a reality. Essentially it implies “zero ***unnecessary*** inventory”, and it was an initiative that was undertaken in the 80’s and a significant part of the 90’s in an effort to uproot a tendency of many companies to try to address various problems and inefficiencies in their operations by building large anticipatory inventories. Such an approach had worked in the past because many of these companies had operated for a long time with minimal competition and they could afford the relevant waste. But as the competition started building up (in the 80’s, Japanese companies were some of the major threats), things had to be reconsidered.

As we discussed in class, to the extent that production and transportation rates are finite, there will always exist some material across the various parts of the supply chain, at least in the form of WIP and pipeline inventory.

2.16 (a) simplification (b) solution (c) implementation (d) perception

4.1 A technology-push product is a product that has resulted from some technological breakthrough in the company’s R&D processes (in class, we talked about how in the 80’s the CD replaced the vinyl record as the main medium for music storage and reproduction, when Sony and Philips came up with that new technology).

A market-pull product is a product that has been developed by the company in response to various market pressures (e.g., these days, environmental and energy-related concerns have increased the pressure on automotive industry for more fuel-efficient engines and also for the development of new types of cars, like the hybrid and the electric car).

In general, for technology-push products the markets need to be created; i.e., the company must introduce the new product concept to the markets and establish its merits. For market-pull technology products, the markets pre-exist and the company must come up with a product concept that will meet their needs and expectations.

4.2 A core competency implies an element in the company operations that defines competitive advantage for it. For instance, a core competency of Dell has been its ability to connect directly with its customer base. On the other hand, a core competency of Apple has been its product design and innovation.

Manufacturing strategy must accentuate and support the core competencies. In fact, in the more recent years, many companies perceive as “overhead” all those operations that are necessary for the product development, production and distribution, but do not connect directly to their core competencies, and try to deal with these operations by outsourcing them to third-party providers; see the case of Dell again, as an example of this trend.

4.4 See Section 4.1.1.4 of your textbook.

B)
a) Product Differentiation (i.e., Quality / Customization – think of BMW or monogrammed shirts)
Cost Leadership (i.e., ability to quote low/more competitive prices by controlling/reducing various aspects of the operational cost -- think of KIA or Walmart)

Responsiveness (i.e., ability to meet demand in a timely manner, but also to stay abreast of market trends – think of internet-based retail companies like Amazon but also more specialized ones, like some of those selling watches or electronic products; also think of various rental companies)

b) Refer to the corresponding slide from the PowerPoint presentation presented in class. As we discussed in class, during the various phases of the life cycle of any given product, the emphasis shifts from quality concerns (during product initiation), to quality plus responsiveness (during the growth phase), to cost leadership (during the maturity phase where the product gets commoditized). The lower part of the aforementioned slide discusses how these strategic requirements impact the operations strategy at each phase.

c) Some of these reasons are the following:

- The basic need to grow by targeting new markets
- The need to access some of these markets that are protected by quotas and tariffs
- The need to better understand the target markets, and to establish a more responsive operation w.r.t. those markets
- To take advantage of cheaper, yet well trained labor
- To take advantage of other types of lower operational costs and maybe lower taxation
- The need to connect to developing trends and some "centers of excellence".
- Etc.

d) Think of the class discussion on market segmentation and the different car types that are sold by the same automotive company in North America, Europe and Asia. Also remember the example of Pizza Hut coming to Athens in late 80's.

e) C.f., http://en.wikipedia.org/wiki/WTO
Quoting from the above site: The **World Trade Organization** (**WTO**) is an organization that intends to supervise and liberalize international trade. The organization officially commenced on January 1, 1995 under the Marrakech Agreement, replacing the General Agreement on Tariffs and Trade (GATT), which commenced in 1948.[5]The organization deals with regulation of trade between participating countries; it provides a framework for negotiating and formalizing trade agreements, and a dispute resolution process aimed at enforcing participants' adherence to WTO agreements, which are signed by representatives of member governments[6]:fol.9-10 and ratified by their parliaments.[7]

f) Combinatorial customization is one of the primary techniques used by modern companies in their endeavors to offer more choice to their customers. More specifically, this concept pertains primarily to "discrete part" manufacturing, i.e., to the manufacture of items that are produced in discrete units as assemblies of a number of components and subassemblies. By establishing a modular structure, the end product can be easily built while picking its components from a number of options for each of these components. Tehn, by providing a few options for each component, the company can provide a broad set of end-product configurations to its customers. Characteristically, as we discussed in class, a product consisting of N components with 2 options each, will have $2^N$ possible configurations.

Products customized along the aforementioned lines are typically assembled to order from components that are maintained in stock.

To support such a practice, a company needs high standardization across its components so that they are easily interchangeable. This standardization implies well structured and disciplined product design practices and similar requirements apply to the manufacturing (fabrication) processes. The practice discussed above also requires effective and more direct contact with the customer base, and a high visibility on the company availabilities in terms of, both, component inventories and production capacity, so that the company can quote realistic lead times and competitive prices (remember the discussion on revenue management provided in class).