System Theory

Case Assignment 1

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1a.

1. The concrete system is all the technology, infrastructure and human resources related to the transportation of goods from location A (usually a factory) to location B (usually a wholesaler). All these elements work together to show a desired behavior. Specific elements in this case can be transportation vehicles such as trucks, personnel working on regulation transportation as well as driving the transportation vehicles. In addition, the products we are transporting are also vital elements of the business. Time schedules can also not be forgotten about. Lastly, customer service can also be seen as an element of the business. There are many more instances, but these were some diverse ones.
2. The abstract system refers to the essential variables that are important for the desired functioning of the distribution department. The essential variables here are:
    - % of orders delivered on time (delivery time)
    - % of orders that are delivered according to quality specifications (reliability)
    - # of complaints about the delivery in a particular period (delivery time & reliability)
    - # of available employees (delivery time & reliability)
    - # of available trucks (delivery time & reliability)

    We chose these essential variables because first off, without enough available trucks and employees (technology and HR), the system would not function in the first place. It is therefore important to track their availability, such that for example when many employees are sick, a negative effect on the functioning of the department can be expected and extra employees can be called in. Second, the number of complaints about a particular period helps pinpoint a specific problem. For example, if there are consistently a lot of complaints during a specific employee's shift, this employee can be evaluated and/or terminated. Lastly, tracking the percentages of orders that are delivered timely and in good condition helps to track whether the department is functioning as desired, as these two essential variables refer to its main goals.
3. The desired behavior of this system is to make sure that there is efficient and reliable transportation of goods between 2 locations, i.e. products are delivered on time and in good condition. In terms of the essential variables, this means that especially the % of orders delivered on time, % of orders that are delivered according to quality specifications, and the # of complaints about the delivery in a particular period should stay within their norm values.
4. A possible disturbance could be that a truck is out of commission, meaning it needs to be repaired by a mechanic in order for it to work again. This disturbance could

negatively impact the essential variables # of available trucks, % of orders delivered on time, and then possibly # of complaints about the delivery in a particular period.

5. Regulating systems refers to making the system show desired behavior despite experiencing disturbances. Desired behavior means that the essential variables stay within the norm values. For example, a regulation for the disturbance described in answer 4, would be to have backup trucks available to replace any broken trucks while they are being repaired.
6. Critical information is information about the current values of the CSF's. This means that critical information regarding CSF's tells you whether the system is currently showing desired behavior, and changes to them will immediately alert you to disturbances. Critical decisions should make sure that the values of the CSF's remain within the norms set for them, which is also the goal of regulation. This means that an organization makes critical decisions that will influence the critical information of the CSF's, and that this is in essence the same as an organization regulating the system against disturbances in order to gain desired behavior.

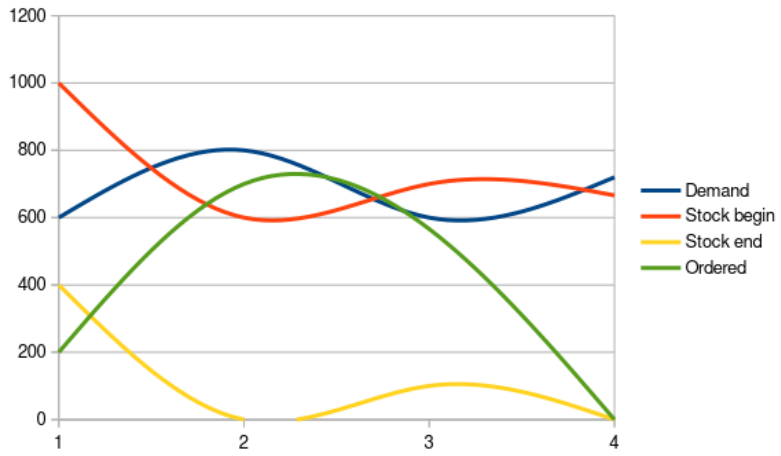
1b.

1. The concrete system is all the technology, infrastructure and human resources related to the selling of product X. All these elements work together to show a desired behavior.
   This will, more specifically, be done in the setting of a store, with a register and personnel (in this case you). Of course items such as cash, credit card, the "welcome"-mat at the entry and the small amount of mold that has begun to build up in the south-corner of the store are all part of the business. Furthermore, opening times and location of the store itself are vital elements of the business. Ofcourse, product X itself and the customers are two more important elements of the business.
2. The abstract system are the essential variables that are important for the functioning of the store. The essential variables here are:
   - # of product X in the beginning of a period
   - # of product X in the end of a period
   - # demand (product X sold + disappointed clients)
   - # orders next product Xs for next period (new begin - leftover stock)
   - # disappointed clients (when product X is out of stock)

   We chose these essential variables because the system's desired behavior centers around having no stock as well as no disappointed clients at the end of a period, creating the essential variables # of product X at the end of a period and # of disappointed clients. Second, in order to keep the aforementioned essential variables within their norm values, it is important to track how much stock is left and how much demand there is during a period, thus creating the essential variables # of product X in the beginning of a period and # demand. Without these, it would be very hard to stick to the organization's main goals of not having any leftover stock and not disappointing any customers, as the amount of newly ordered stock would always have to be a guess.
3. The desired behavior of this system is a thriving shop selling product X where customers will never have trouble coming across no stock, whilst simultaneously not having too many leftover stock at the end of the period. Moreover, satisfactory customer service and a good shop-environment would also be optimal.
   For graphical desired behavior, see graph 1
4. See graph 2
5. An example of a disturbance could be that the supplier of Product X has run out of stock. This is a disturbance because our shop could not achieve its desired behavior " we don't want to disappoint customers during a period and that you don't want to have a stock of Xs at the end of a period". If our shop does not have sufficient buffers we will have to disappoint clients.
6. Regulation in this example would be, as described in the exercise itself, to recalibrate the expected amount of product Xs to sell next period by taking the average of demand over the last ones.
   However, it would be understandable to deem this approach a little surface-leveled. Firstly, the popularity of the shop will surely fluctuate to a certain degree, affecting period-specific demand. Secondly, if the product is seasonal based, this would also be a factor to consider. In addition, holidays might account for more sales at that time of the year. Lastly, it might be worth it to adjust the formula from average demand of last periods to average demand of last periods + 5% to give an error margin

considering it might be more desired to have leftover stock at the end of an period then to have to disappoint customers with shortage of stock.

Graph 1:



Graph 2: