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In a previous article, a member of the Performance Management review team revealed everything about The Goal, where constraints and business-bringing accounting theory were introduced in the context of a novel. In this second article, it reveals five focus steps of the theory of constraints, briefly describes each one, and then goes through two examples that show how these steps can be applied in practice or in exam questions. At this stage, it is worth noting that while the theory of constraints and job-bring accounting was introduced in The Goal, it was later developed by Goldratt. Five focus steps Restrictions theory is implemented within an organization by following the so-called 'five focus steps'. These are a tool that Goldratt has developed to help organizations deal with restrictions, also known as bottlenecks within the system as a whole (rather than any separate units within the organization.) The steps are as follows: Step 1: You are often told the bottlenecks of the system, in exam questions, what is the source of bottlenecks. If not, it is usually quite easy to work. For example, let's say that an organization has a market demand of 50,000 units for a product that has been through three processes: cutting, heating, and assembly. The total time required and the total available time per transaction for each product are: The total time required to make the product 50,000 units can be calculated and compared with the time available to define bottlenecks. It is clear that the heating process is a bottleneck. In fact, it will only be able to produce 40,000 (120,000/3) while things are going on. Step 2: Decide how to take advantage of the system's bottlenecks This includes making sure that the bottleneck source is used as effectively as possible and produces as many units as possible. That is, 'efficiency' and 'use' are the key words here. In 'Target', Alex noticed that the NCX 10 was sometimes immobile and immediately changed this, allowing installations to take place before workers entered breaks so that the machines were always up and running. Similarly, ovens are sometimes left empty for a long time before the completed parts are emptied and new parts are put in. This was because workers were called to work in non-bottleneck machines instead of idle while waiting for the ovens to heat the parts. This was addressed by making sure that there were always workers in the ovens, even if there was nothing to do for a while. Step 3: Submitting to the decisions made in Step 2 The main point here is that the production capacity of the bottleneck source as a whole should determine the production schedule of the organization as a whole. In the previous article, I remember how new bottlenecks appeared at the UniCo plant, because non-bottleneck machines More parts than bottleneck resources can absorb? The period of iding is inevitable and must be accepted if the theory of restrictions is to be successfully applied. To get more work into the system of the constraint, you can cope with overgoing work, long lead times, and what appear to be new bottlenecks when the entire system is clogged. By definition, the system does not require the use of non-bottleneck resources to their full capacity, and therefore they must be idle for some time. Step 4: Raising the bottlenecks of the target system, Alex was initially convinced that the new machine was not an option, a way to increase NCX 10 machine and furnace capacities without investing. Jonah made him and his team think about the fact that while the NCX 10 alone was very efficient in performing and doing the work of three old machines, older machines still had the ability to produce parts. Undoubtedly, older machines were slower but, when used next to the NCX 10, still had the ability to raise production levels. What makes it empty there, covering the factory space, so the manager was happy to charge Alex's plant for his machines. In this way, one of the bottlenecks of the system was raised without requiring any capital investment. This example of raising a bottleneck without cost is probably unusual. Normally, height requires capital expenditures. However, it is important that an organization does not ignore Step 2 and jumps directly to Step 4, and this is usually what it is. If you look closely enough, there is usually unused production capacity. Height should only be considered after exploitation has taken place. Step 5: If a new restriction breaks in Step 4, go back to Step 1, but do not let the inerhalation come to the new bottleneck of the system when a bottleneck rises, eventually a new bottleneck will arise. This can now take the form of another machine capable of processing fewer volumes than the raised bottleneck. In the end, however, the ultimate constraint on the system is likely to be market demand. Whatever the new bottleneck, the message of the theory of restraint: never be indifferent. The system must be one of the ongoing developments because nothing can stand still for long. Now there will be an example of how you can go about exploiting the bottlenecks of a business system - that is, by using them to maximize the business bust. In practice, there may be many options open to the organization, such as those outlined in Target. However, in the context of an exam question, you are asked to show how a bottleneck can be taken advantage of by maximizing the business part through the production of an optimal production plan. These simple policies require an application key factor analysis is otherwise known as limiting factor analysis or the main budget factor. Factor analysis and limitation of job extraction accounting An organization, above 1. Given that most businesses produce multiple product types (or provide multiple types of services), this means that part of the exploitation step involves calculating what is the optimal production plan based on maximizing the bottleneck resource's workflow per unit. In key factor analysis, the contribution per unit is first calculated for each product, then the contribution per scarce resource unit per unit is calculated by working out how much resources each unit requires in its production. In the context of a business accounting accounting, a very similar calculation is performed, but this time the calculated scarce resource is not a contribution per unit, but the bottleneck resource return per job per unit. The business cost is calculated as 'sales price less direct material cost'. This differs from the calculation of both labor costs and variable overheads deducted from the sales price. This is an important distinction, since the main belief in production accounting is that all costs other than direct material costs are largely fixed – therefore, working on the basis of maximizing the contribution is flawed, since doing so is to account for costs that are already uncontrollable in the short term. I can't help but really agree with that belief that in most businesses, it's just not possible, for example, hiring workers on a daily day-to-day and hiring workers if you're not busy. The workforce must be employed within the job and be available for work if there is work to be done. If you are left idle by a machine for a while, you cannot refuse to pay the worker. Example 1 Beta Co produces 3 products in the same factory, e, f and g, details of which are shown below: 320,000 bottleneck watches are available each month. Required: Calculate the optimum product mix every month. Solution: A few simple steps can be followed: Calculate the volume of work per unit for each product. Calculate the return per hour of the bottleneck resource. First, start with the product that generates the highest returns per hour, sort the products by the first place they should be produced. To ensure that it does not exceed the maximum demand for any product, calculate the optimal production plan by separating the bottleneck source into each one in turn. It is notable here to see another step that is often executed between steps 2 and 3 above. This is the calculation of the production accounting rate for each product. So far, the rates have not been discussed, and while I plan to mention it later, I have not seen this extra step insertion point while I am working optimal production plan for products produced in the same factory. The ranking of products that use returns per factory hour will always produce the same ranking produced using the production accounting rate, so it doesn't really matter if you use the return or rate. This is because the cost per factory hour (the denominator of the production accounting rate) is the same for all products. Before taking into account the time taken from this bottleneck resource, it is worth noting that the product E appeared to be the most profitable because the highest work per unit was produced by hand. However, by applying the theory of constraints, the system's bottleneck should be used to produce products that maximize workflow per first hour (Step 2 five focus steps). This means that G products must be produced as a priority to E. In practice, the Step 3 optimal production plan will be followed throughout the entire system, ensuring that no machine is complied with by making more units that can be absorbed by bottlenecks and adhesion of specified priorities. When answering such a question in an exam, it is useful to draw a small table, as shown below. This means that even if you made a mistake along the way, the pointer can follow your logic and reward all possible signs. Every time you desting a product to a bottleneck source, you need to ask yourself how many hours you still have. In this example, there were enough hours to generate a full quota for G and E. However, when you arrive at F, you can see that 270,000 (120,000 + 150,000) of the current 320,000 hours are used, leaving only 50,000 hours of their dese empty. Therefore, the number of F units that can be produced was a balancing figure - 50,000 hours divided into four hours that require each unit - that is, 12,500 pcs. The example above is concentrated in steps 2 and 3 of the five focus steps. Now you want to look at an example of steps 4 and 5 application. I kept it simple, assuming that the organization produced only one product, because what matters here is more principle than numbers. The example also shows once again how to define the bottleneck source (Step 1), and then shows how to raise a bottleneck, but then be replaced by another person. It also shows that it may not always be financially appropriate to raise a bottleneck. Example 2: Cat Co breeds a product using three machines: X, Y, and Z. The capacity of each machine is as follows: The demand for the product is 1,000 units per week. The net present value for each additional unit sold per week increases by US$50,000. Cat Co is considering the following possible purchases (they are not mutually mutually excluding): Purchase 1: Replace machine X with a new model. This would increase capacity to 1,100 a week and increase the cost to $6 million. Purchase 2: Invest in a second machine Y, increasing its capacity per 550 pcs This machine costs $6.8m. Purchase 3: Upgrade machine Z at a cost of $7.5 million, increasing the capacity of such 1,050 pcs. Required: What is Cat Co's best way to act? Solution: First, it is necessary to determine the bottleneck source of the system. Obviously, this machine Z has the capacity to produce only 500 pieces per week. Therefore, there are 3 points of purchase considering the logical options facing Cat Co. It would never make sense to consider buying 1 or 2 in isolation due to the fact that neither x machines nor machine Y are initial bottlenecks. Let's take a look at how the capacity of the business has increased with the available options. From the table above, once a bottleneck is raised, it can ultimately be seen that market demand is replaced by another bottleneck until it restricts production. At this point, it is needed to look beyond production and, for example, think about how the product will increase market demand by increasing its advertising. In order to decide which machines should be purchased, the financial suitability of the three options, if any, must be calculated. Therefore, the company should invest in all three machines if there is enough cash. The Cat Co example shows another visible fact that as one bottleneck increases. It also raises a bottleneck, always making it ineligible financially. If Cat Co had only managed to afford machine Z, z would be better to invest at all because if investment was made alone, another bottleneck would look too fast for the initial investment cost to be compensated. I'd like to end by mentioning rates briefly giving jobs. There are three main rates calculated: (1) return per factory hour, (2) cost per factory hour, and (3) production accounting rate. 1. Return per factory hour = Per unit / product time at bottleneck source per job. As we saw in Example 1, the return per factory hour for each product needs to be calculated. 2. Cost per factory hour = Total factory costs / total time found in bottleneck source. The 'total factory cost' is only the 'operational expense' of the organization referred to in the previous article. If the organization were a service organization, we just call it 'total operating expenses' or something like that. The cost per factory hour is all factory-wide and therefore only needs to be calculated once. 3. Transaction accounting rate (TPAR) = Return per factory hour/cost per factory hour. In any organization, you expect the job export accounting rate to be greater than 1. This means that the rate at which the organization generates cash from the sale of this product is higher than the rate of cost exposure. This follows, then, if the rate is less than 1, this is not the case, and changes follow the need to be made quickly. The result is that at this point, I now you have a better understand of the theory of accounting for constraints and job growth, which you can look forward to target reading as soon as possible and put into practice by dealing with some questions. Written by a member of the Performance Management review team