CUSTOMER MANUFACTURING GROUP

USING THE THEORY OF CONSTRAINTS TO INCREASE SALES

APPLYING MANUFACTURING THEORY TO MARKETING/SALES

Applying The Theory Of Constraints to Customer Manufacturing (marketing/sales) works.

Done correctly, it will increase sales and often lower the cost of selling.

The Theory of Constraints (ToC) and its management application, Constraint Analysis (CA), have been successfully applied to product manufacturing systems to increase throughput for more than thirty years. As has been discussed in other papers[1], marketing/sales can be viewed as a process to manufacture customers, or a so-called Customer Manufacturing process. Again, as described in these papers, this process is surprisingly analogous to the product manufacturing process.

This implies that the management principles that have been successfully applied to product manufacturing can also be successfully applied to Customer Manufacturing (marketing/sales). Indeed, CA is an extremely powerful tool for effectively managing marketing/sales.

However, there are differences between Customer Manufacturing and product manufacturing. Understanding where the similarities and differences lie is important to successfully applying proven management principles, such as Constraint Analysis, to each.

Constraint Analysis – Basic Concepts

Let's first take a look at Constraint Analysis (CA), using a very simple example. The driving concept of the ToC is very simple: *In order to increase the output of any process, you must first relieve the most constrained[2] operation within it. Relieving any other constrained operation does not affect output at all, and only serves to build inventory.*

As an example, suppose you have a manufacturing line that looks like Figure One.

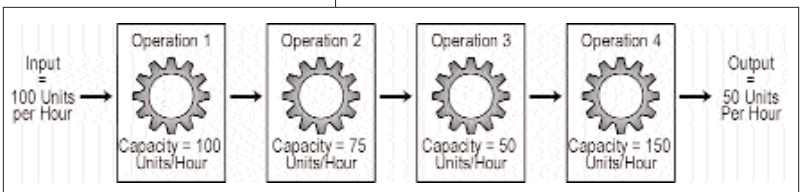

Figure One

Obviously the constraint here – the operation that limits output – is Operation 3. Since every part must pass through Operation 3, the most that the manufacturing line can produce is 50 units per hour. Working to improve the capacity of any other operation in the line will obviously have no effect whatsoever on the output of the process, and will clearly just build up inventory within it.

So assume that you have now expanded Operation 3's capacity to match the system input of 100 units per hour. Now the constraint on the system is Operation 2. Again, working to improve any other operation at this point other than Operation 2 will have no effect on the system's output. If you then improve Operation 2 so that it has a capacity of 100 units/hour, then you need to do an analysis. If the input to the system is constrained to its present 100 units per hour, then the best thing to do is to

[1] For example, see the following white papers available from Customer Manufacturing Group: "Transforming Marketing/Sales Into A System To Manufacture Customer", and "Haven't Found The Secret To Increaseing Sales?"

[2] A constraint or bottleneck is defined as any point where demand exceeds capacity.

reduce the capacity of Operation 4 to 100 units per hour (which will presumably save costs). If, on the other hand, you can increase the input to, say, 150 units per hour, then you now have three equal constraints – Operations 1, 2, and 3 – that need to be worked on in order for the system constraint(s) to be relieved. We'll see how this concept applies to marketing/sales further on.

Another useful concept from the ToC is that of line balancing. (While line balancing may also be considered a component of Lean Thinking, another management principle that can be applied to marketing/sales, it can also be viewed as a step within Constraint Theory.)

Line balancing is often the first action taken in a manufacturing environment. It means to reduce the inputs to each operation in the line to the capacity of the constrained operation, so as to eliminate excess inventory build-up and excess capacity maintenance.

In the example above, the first step that a manufacturing manager would have taken – prior to increasing the capacity of Operation 3 – would have been to immediately reduce the input to the system to 50 units/hour, as there is no sense in inputting more into a system than it can process. We'll also look at how this concept applies to marketing/sales later.

The example above is simplistic – there are few manufacturing processes in the world that can be so easily modeled. Nonetheless, the same principles from ToC – line balancing and relieving the main constraint first – can and have been successfully applied to manufacturing processes around the world. These processes differ from the example above only in the complexity of the process – but not in the CA principles employed in managing them.

Product Manufacturing vs. Customer Manufacturing

Successfully applying historically manufacturing-focused[3] management principles to marketing/sales requires an understanding of the differences between the two types of systems (design/production vs. marketing/sales) as well as their similarities. While there are numerous areas where the two systems are similar, there are four significant differences between product manufacturing and marketing/sales (Customer Manufacturing) that can create problems if you try to blindly apply manufacturing-driven management principles such as CA to marketing/sales.

In order to increase the output of any process, you must first relieve the most constrained operation within it.

If you were to directly apply CA principles to the Customer Manufacturing process, you would simply map out your existing process, balance the process, and then go about relieving constraints in the order in which they constrain the system. Should you try to do this, however, you will quickly run into some deep problems. Both the product and Customer Manufacturing processes are complex and difficult, but there are more dimensions to the Customer Manufacturing process.

1. Defining desired output The first problem you will run into is that the desired output of the process is defined differently. In a product manufacturing plant, the output required is whatever the plant is capable of producing up to the level for which the company has demand for its products. Building more products in a manufacturing plant than the company has sold (beyond some minimum safety stock) is a waste of resources. A company's marketing/sales system (its System to Manufacture Customers [SMC]) does not usually have that limitation. That is, most of the time, a company desires more sales (output) from their SMC than they have.

2. Dissimilar Inputs Another area of difference is that in a product manufacturing plant a single activity may be fed by multiple, dissimilar prior activities and the dissimilar output from each of those prior activities is necessary to complete the new activity (i.e. a door assembly may need a piece from trim, a door handle, the door itself, and a switch). The combination or integrating activity can run no faster than the slowest feeding up-stream activity and balancing the other inputs to the level of the constrained up-stream activity makes sense.

There isn't really an analogous situation in marketing/sales most of the time. (An exception could occur in a complex sale where there is a shortage

[3] The principles discussed here are not manufacturing specific; they apply to any well defined process. They have simply been most famously applied in the manufacturing arena.

of field technical expertise to support field sales people and is a requisite to closing sales. In this case, adding field sales people will not increase sales and capacity balancing akin to a manufacturing floor is directly relevant.)

What generally happens in marketing/sales is that there are dissimilar prior activities whose similar, but not identical outputs feed a common next activity. For example, there may be multiple campaigns going on that all generate leads that then need to be qualified. This is akin to having three "identical" machines feeding to a common next machine in a product manufacturing plant. If the output of the three machines exceeds the capacity of the next machine, then either an increase in capacity of the "next" machine is required or a reduction in output from the three previous machines is indicated.

If you fail to do this, you simply build up work in process in front of the now constrained "next" machine. Output does not increase, but work in process inventory costs do. In a product manufacturing plant, deciding how to reduce the output from one or all of the three "up-stream" machines is straightforward because the output from each of the machines is known to be identical. Therefore shutting one machine down, or reducing the output from all three machines, or some other combination, does not change the quality or the kind of input to the currently constrained "next" machine.

Similarly in marketing/sales, if the constrained activity can't be increased, then a reduction in output from the prior activities is indicated. However, since these prior activities are different in function, although with "similar" output – but of different quality – an analysis needs to be done to determine which one to decrease.

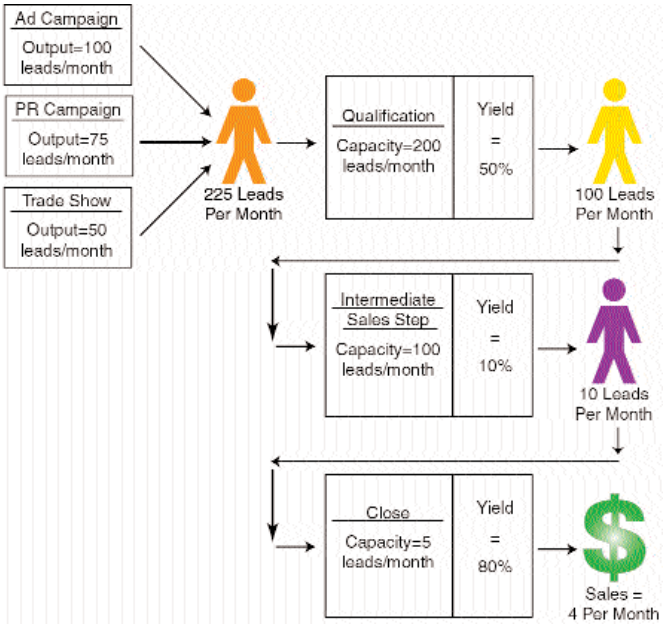

Figure Two

For example, the leads from three different advertising or promotion campaigns (Figure Two) may in fact not be identical in type (and probably aren't identical in terms of "quality"). Therefore deciding how to reduce the output from these upstream activities is more difficult and requires a more in-depth analysis of their "quality" and cost.

3. Balancing with quality specification changes In a manufacturing process, each operation has defined quality parameters. Should the output from a manufacturing operation be of insufficient quality (such as a part that's out of spec), then that output (the out of spec part, in this example) is waste and cannot be used by the downstream activity. That is, an operation either meets its quality spec or it doesn't[4].

And in fact, in most modern manufacturing plants today, yield at almost all stages approaches 100%. When it isn't, the state-of-the-art is such that spending money to increase yield and quality is probably the obviously right thing to do. Therefore, to increase the capacity of a typical, well-run manufacturing operation, you have to actually increase the processing capacity of that operation (such as adding a shift or buying a bigger machine), or add additional capacity (such as adding another machine.)

You would almost never "increase" the capacity of a production operation by lowering your quality standards for the operation. That simply would cause the system output to be defective[5]. And you can't

[4] Rework may be possible, but in most modern manufacturing plants, it has been recognized that the elimination of the rework process is the objective.

[5] Again, it can occur that too tight of a spec has been set for a part and that the spec can be loosened upon further evaluation without affecting next stage or final yield. In well-run production systems, this is a routine analysis that is done to optimize the factory. This is different than what is described next for marketing/sales

significantly increase an operation's capacity by increasing quality in the operation, since quality is nearly at 100% to begin with. Thus, increasing or decreasing actual capacity is the arena in which you work.

However, it is possible to tweak the quality standards in a marketing/sales system to balance capacity. Consider **again** the simple – but common – Customer Manufacturing **process** in Figure Two.

Deciding how to reduce output from upstream activities is more difficult and requires in-depth analysis of "quality" and cost.

In this Customer Manufacturing process, you have another dimension available to you to work on that you do not have in a product manufacturing process. Not only can you increase capacity in any operation (by adding advertising or promotional campaigns, or by hiring more sales people for any sales step), you can also increase or decrease the yield at any step by changing your quality specification.

For example, let's assume you go to a trade show and generate 500 leads. If the definition of "quality" is any lead from the trade show (which is probably not a good definition but rather designed to illustrate the point) then the output from that trade show activity is 500 units. If, on the other hand, the definition of "quality" for a trade show lead is changed to be only those leads who expressed a "hot" interest on the show floor (which is also probably not a good definition of "quality") then the output from the trade show is going to be much lower – maybe only 20 leads. So, what is the output from the trade show? It depends on the definition of "quality."

4. Defining the time span In a product manufacturing process, the raw material input at the very beginning of the process is directly related to – it's actually part of – the finished goods coming out of the end of the process. Put another way, for any particular final output (finished goods), you can unambiguously identify and model the process that creates those goods.

In a Customer Manufacturing process, though, in which we are concerned with the production of customers, it is not so simple, because the time span in which you are concerned with manufacturing those customers has to be specified. Are you concerned with next quarter's sales, or with achieving a market penetration over five years?

The most product manufacturing-like Customer Manufacturing system is one concerned with only short-term goals. Here the definition of "marketing" can usually be shortened from its complete definition to simply demand creation, and this along with sales closing constitutes your Customer Manufacturing system. This is usually a relatively straightforward process to map, and apply CA to.

However, longer-term goals are more difficult, for two reasons. First, the process is itself vastly more complex, including not only promotion and sales, but all other aspects of marketing: research, analysis, strategy, positioning, decision-making, product development, and so on. Thus it is vastly more difficult to map and to identify the input/output/yield relationships. Second, often a lead can be turned into a customer at various times, and the trade-off between these competing courses of action must be understood.

For example, a computer manufacturer may decide to sell a prospect on a current model, and thus preclude additional sales for several years. Or it may decide to sell the prospect on a model that will be available in 18 months, and achieve a different projected lifetime revenue stream from that customer. Which course of action is the better one? That depends on the time-frame in which the Customer Manufacturing system is considered. And it should go without saying that the longer the time period involved, the less precise the data to work with is, and the more qualitative the constraint analysis must be.

So for these four reasons, applying the powerful tool of CA to Customer Manufacturing is a more difficult and specialized discipline than applying the same tools to product manufacturing. But if your process for marketing/sales is truly well defined – as it should be – the principles certainly do apply.

Use of Constraint Analysis to Increase Throughput in a System to Manufacture Customers (SMC)

So how do you go about increasing output (sales) or throughput (the rate at which sales occur) in a marketing/sales system? You use the same tools that your manufacturing

counterpart does, but you apply them a little differently.

Map the process: You can do nothing until you understand your process. And you have one. It may or may not be effective, efficient, or even rational. But you have one that's operating. You have to understand it and use common process mapping methods to capture it.

Constraint Identification: The next step is to identify where the main (top) constraint or bottleneck is in the process. As was described above, adding capacity anywhere in the process except at the point of the top constraint (bottleneck) will not increase sales (output). For reasons also discussed above, this can sometimes be a complex task in the marketing/sales process because constraints may have been created by artificial or arbitrary definitions of "quality", or because the time-span to be considered is non-trivial.

For example, how good does a lead have to be to move to the next step in the marketing/sales process? Do you actually have a lack of leads due to a lack of input, or is the definition or "quality" in terms of a "qualified lead" ill-defined? In many cases it may be either or both. Or, what ROI does a new product have to generate to be acceptable? Do you have a lack of successful new products because poor research and market assessments are being made early in the process, or perhaps the product launch process is not working correctly?

Because the definition of quality can affect capacity, it is more complex to identify the "constraint" in a marketing/sales process, especially if you don't have a good understanding of the process steps and what is going on up-stream and down-stream from each activity.

Nonetheless, identifying the constraint in a Customer Manufacturing process can be done to an acceptable level in almost all cases. And even if the identification does not follow a rigid mathematical formula, it will follow the beliefs and strategy of management. After all, the point of a CA is not to quantitatively enumerate the precise dollar loss that one constraint or another is causing – it is rather to rank the constraints so that you work on the top one first.

Line-Balancing: In a product manufacturing environment the first step prior to increasing throughput (the rate at which products are produced) is usually to "line balance." That is, once the constraint(s) have been identified, balancing the line so that the system runs at the capacity of the constrained activity is usually the best first step.

Line balancing allows the plant manager in a product manufacturing environment to stop building excess inventory and to systematically increase output by relieving constraints in the proper order. This is especially valuable in a typical manufacturing environment where multiple "sub-assemblies" are used to create the final product.

Does line balancing make sense as the first step in an SMC? That depends. One of the reasons for line balancing in a product manufacturing plant is to eliminate the work in process inventory that is making the plant less manageable and which may ultimately be unusable – and is certainly a waste of capital. Work in process in an SMC can have the same effect, but not necessarily. Therefore blindly focusing on traditional line balancing may not be the best approach.

For example, let's assume we have a tele-qualifying call center that is producing more "qualified" leads than there are sales people to handle those leads. Assuming that adding sales people to manage those leads would be profitable, but the sales people are not available, results in three alternative next steps:

1. Continue to process "qualified" leads via tele-qualifying that may become wasted if they are not handled in an appropriate time-frame

2. Reduce the capacity of the call-center, so as to be balanced with the follow-on sales activity capacity

3. Increase the definition of "quality" of leads coming out of the call-center so that the yield actually goes down for that activity (tele-qualifying). In addition to now having both activities balanced, this will cause the yield of the next activity to increase, and thus increase its apparent "capacity[6]" of the overall system.

[6] This is a critical issue. As was discussed above with trade show leads, the definition of a "qualified" lead from the call-center can be adjusted so that the probability of closing those leads when passed on to sales increases. If you increase the "quality" definition so that a higher percentage of those leads result in sales, you will miss some leads that could have been closed even though their apparent "quality" was not as good. However, if you are currently constrained in your ability to follow-up on all the leads you have, one way to reduce the number of leads is to redefine what a qualified lead is before passing it on.

Therefore, in determining whether to, or how to line balance in a marketing/sales system, it is critical to look at the effect on upstream and down-stream yields, because "capacity" is highly "quality" related in an SMC – where that is not so in a typical product manufacturing system. Therefore, while line balancing may still be the best first step, how to line balance can be materially different in Customer Manufacturing than in product manufacturing. Doing so effectively requires a thorough systems analysis.

Up-Stream/Down-Stream Issues: Long ago (prior to 1985), and still today to a limited extent in a product manufacturing plant, non-local upstream and down-stream issues were mistakenly ignored in identifying the cause and relief of constraints (especially at the points where production linked to design.) That is, assuming that the quality or throughput problems in production are purely production related is a mistake that most well managed companies have recognized. Production problems may in truth have been "designed in" far upstream by the design function.

In SMCs, non-local upstream and downstream issues within Sales as well as between Sales and Marketing and between Marketing and Product Development are critical to consider. As was briefly described above in line balancing, it may be that the best approach to balancing a line can be to adjust (up or down) the definition of acceptable output quality of a prior activity.

Imagine that your company has a substantial number of potentially successful new product ideas that all exceed the ROI hurdle-rate necessary for acceptance. Assume further that you currently do not have enough engineers available to work on all of the new product ideas. (Let's assume for the sake of argument that you do have sufficient resources to launch these products into the marketplace, support them, etc. and the true constraint is in getting more development engineers.)

So, if you can't increase the development capacity by hiring more engineers, you need to lower the input to the development function. The best way to do that is to change the definition of "quality" for the input. In other words, you can increase the hurdle-rate necessary to qualify a project to be developed, or possibly identify those products that will take less engineering time and select those first if they have similar projected ROIs.

Recognizing the immense breadth and interplay of all of the upstream elements in the system is a terribly important and difficult issue in Customer Manufacturing.

In a System to Manufacture Customers, especially because the "yields" at prior activities are highly variable, based on the definition of quality, and because the definition of quality can be adjusted, both activity and system "capacity" are especially fluid and making the correct decisions to improve throughput and output is complex.

What to Do First

On the probable assumption that management is primarily interested in increasing sales (output), instead of lowering the cost of selling, then understanding the main system constraint is vital – and complex. However, applying resources other than to this top or main constraint results in wasted effort and resources.

The top constraint(s) can be within your system or part of the environment. If the key constraint on the system is outside of the system itself – such as lack of a growing market – then increasing system yields is the only way to increase sales.

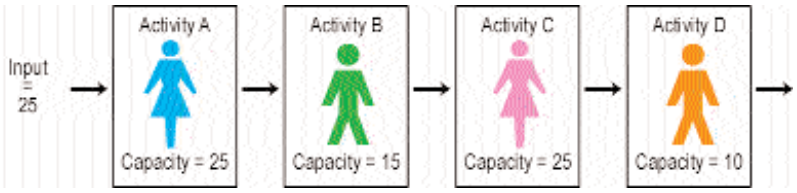

Figure Three

In other words, if the constraint on your ability to sell more is the size or growth rate of the market, then you must increase your market share. To do that you must increase the yield in your marketing/sales process since a scrapped opportunity cannot easily be replaced.

If lack of available market is not a constraint (which it often isn't) – in other words, your current market share is very low, or the market growth rate is high – then yield is simply one way to adjust capacity.

Let's assume that the constraint shown in Figure Three has been identified and is located within the selling activities (as opposed to the

non-local, front-end marketing activities, or in the environment). We must first consider line balancing, but the question is how to balance the line.

If the "yield" at each activity is close to 100%, as would be true in a typical product manufacturing system, then the obvious constraint-relieving solution is to immediately increase the capacity of Activities B and D to 25 since that is the potential capacity of the system at the present time.

If that can't be accomplished "immediately" (and "immediately must be defined and the trade-off involved in using that definition explored), then the next alternative is to increase the capacity of D to 15 and reduce the capacity of activities A and C to 15 as well as reducing the input to 15.

If that can't be accomplished "immediately" either, then the sensible alternative is to lower the capacity at A, B, and C to 10 while also lowering the input to 10. At least in a typical product manufacturing system, that is the straightforward analysis.

But now, let's reconsider this situation from a marketing/sales perspective. In this case the critical assumption, that each operation's yield is close to 100%, is not valid, so changing the definition of "quality" at each step can vary the output at that step as well as the yield of subsequent steps.

In this case, output is still constrained by Activity D. In a manufacturing plant, we'd simply add capacity here. But in a Customer Manufacturing plant (a marketing/sales system), we have to identify the cause of the low 10-unit capacity.

Is it that the incoming "quality" is so poor that resources are being absorbed unproductively (analogous to poor quality raw materials in a manufacturing plant)? Or because perhaps the "workers" in this activity are being given good quality input, but are incapable of producing a better yield (analogous to poor quality machines in a manufacturing plant)? Or is some other reason at fault? Maybe even lack of enough people at this step (analogous to too little capacity in a manufacturing plant.) So it's not automatically a matter of adding capacity – it's a matter of identifying the cause of the limited capacity at the constrained operation, and fixing that problem.

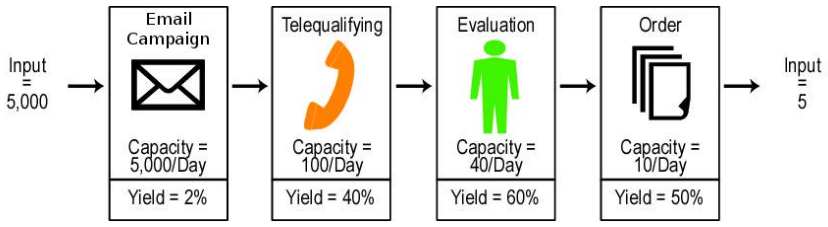

Figure Four

Lets assume that we relieve the constraint at Activity D, and further we relieve the constraint at Activity B so that the system now has a throughput of 25. The question is then how to further improve system throughput. At this point we don't know if, for example, we should next lower the input volume and increase the yield of Activity A by lowering the definition of "quality", or perform some other adjustment.

To further understand this issue and the possible solution set, let's re-look at these activities (Figure Four), but put names on them from a "typical" group of selling activities.

In this system we can produce up to 10 orders per day given how sales people work with the opportunities that come from the Evaluation step assuming a 100% close rate (yield). However, the actual output is only 5. Why is that? Is the close rate low? Is the close rate high, but the time it takes to close lengthy?

In the same light, what is causing the input capacity at the Order step to only be 10? Should we increase that capacity by changing the definition of quality at the Evaluation step, or should we add sales people to the Order step, or should we train the sales people to "close" more efficiently? There are many dimensions to the problem, and in the famous words of all consultants . . . it depends.

Let's assume that the yield (close rate) for the Order step is 50% and that is considered acceptable. (Continuous improvement efforts applied to that work cell and to the quality of what is provided upstream [from Evaluation] on an on-going basis will work to improve that, but for now it is assumed to be within an acceptable range, by definition.) Therefore, since the maximum output from the Evaluation activity that can be accepted by Order activity is 10, then the maximum output of the system is 5.

The capacity of Evaluation is 40, but what is the yield of that activity? Let's assume it is 60%. That provides a maximum output from the Evaluation step of 24, which exceeds the capacity of the Order activity. So running Evaluation at "full capacity" will generate more opportunities than the Order step can handle.

To increase system output (sales) we can increase the capacity of the Order activity or decrease the yield of the Evaluation activity (because the assumption here is that increasing the "quality" of the output of the Evaluation step would increase the close rate at the Order step.)

For example, let's assume that by lowering the yield of the Evaluation step to 25% from 60%, we can provide a "better" interested buyer to the Order step. If by doing that we were to increase the Order "close" rate to 60% from 50%, then the output of our system would increase to 6 units from 5 without adding costs.

Alternatively, you could have added capacity to the Order step so that its maximum input is 24. That would require increasing capacity by 140%. This may or may not be possible in a short time period. If it is, and the cost of selling is acceptable, then this would increase output to 12 from the current 5 at a similar cost per sale. Which choice is "better" depends on the situation and management goals.

This type of analysis needs to be done at each step in the system. It is thus easy to see why applying CA to marketing/sales is a job for experienced professionals working with senior management.

What Does All This Mean to Improving the Output of the Marketing/Sales Process?

Management typically wants to both assure a steady stream of profitable customers over the long term, while simultaneously increasing sales in the short term. As Jack Welch said, "Anyone can manage long term, and anyone can manage short term; it's managing both that's difficult." Therefore, the key issue in marketing/sales process management is determining what to do first based on available data.

A useful analysis must, by definition, look at system-wide issues. That includes all marketing activities (including the front-end activities of segment selection, market research, marketing's interaction with product development, etc.) and sales activities, including those demand creation activities that are often lumped under the over-arching term "marketing."

In virtually every case there will be opportunities to gain short-term increases in throughput by attacking these sales activities, though they may not be the true constraint in the larger system. That is, there is likely to be enough "slop" in the selling activities (again including the demand creation activities often ascribed to marketing) that increases in sales can be realized in every case by working somewhere in the sales area, even though greater (long-term) benefit can actually be accrued by working in the marketing area first. But that doesn't always mean that you should work on the sales and demand creation activities first – it depends on management's goals.

Applying The Theory of Constraints to Customer Manufacturing (marketing/sales) works. Done correctly it will increase sales and often lower the cost of selling. Like most management practices it is hard work. However, if it were easy, there would be no competitive advantage gained from applying it because everyone would have already done it. Applying Constraint Analysis correctly to your Customer Manufacturing process can and does give you a competitive advantage.

More Information

If you would like to perform a constraint analysis on your revenue production process or any portion of marketing or sales, we have a tool that can help you. For more information about it you can download it or contact us.

If you would like to learn more about Customer Manufacturing Group, or for a complimentary subscription to *Customer Manufacturing Updates*, give us a call at (800) 947-0140, fax us at (408) 727-3949, visit our website at www.customermanufacturing.com, or e-mail us at info@customermfg.com.

We have offices in major cities in the United States, and our experts travel extensively throughout the world. If you would like to schedule a meeting when we're in your area, just let us know.