STOCKOUT Costs and

Irritated customers or idle

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Consequences

inventory?

Editor's note: *While operations management professionals can appreciate the tangible inventory issues associated with stockouts, many have considerable trouble understanding the related costs.* APICS *magazine Managing Editor Elizabeth Rennie recently spoke with John Van Vliet, Ph.D., an associate professor in the School of Business Management at Shorter College in Rome, Georgia. Van Vliet is currently working to assign costs to potential stockouts and determine the pros and cons of contending with inventory carrying costs versus the risk of a stockout.*

ELIZABETH RENNIE: Let's begin by talking about the challenges operations management professionals face when it comes to understanding the results associated with a stockout.

JOHN VAN VLIET: A stockout will generate a chain of costly events, and it's hard to assign costs to that chain and hard to know when to stop moving along the chain. For a manufacturer, a stockout can halt a production line or cause items to be set aside for rework. It can also create a rush of activity to find the needed item or material. Assigning a cost to that is challenging, and it kind of depends upon the situation. For a distributor, a stockout obviously generates the cost of processing and ultimately fulfilling a backorder. However, it also means a customer has been disappointed—and trying to assess the impact of the cost of that disappointment also is dependent upon the particular situation. Using a combination of financial data about a company's actual operations and a set of subjective judgments about immeasurable effects, we can take a stab at assigning a cost to a stockout. But we're never confident with that and, my goodness, it's astonishing how high that assigned cost can actually become.

RENNIE: Can you give me an example of something that did astonish you when you actually looked into how much a stockout was costing a company?

VAN VLIET: The worst case would be when a customer goes away, and assigning a cost to that is kind of easy. You just ask, "How much profit did we make on that customer over the past several years?" Well, you don't get that anymore. I had one customer who was very clever. He picked two electric parts distributors and gave us each a set of parts and said, "I will go to each one of you for the items on your list. As soon as you fail to provide me one of those items, I will move that item to the other guy's list. And, therefore, the cost of the stockout was that we lost that customer's business for that particular item. I've also seen folks who've tried to assign cost values to production line stoppages, and those just go through the roof.

RENNIE: So we know that having a stockout absolutely changes customer demand in the future because they might not come back, first and foremost; or, at the very least, they might change their ordering habits.

VAN VLIET: Yes, that's painfully clear. And the sales team will beat you up about stockouts to make sure you know that customers get massively disappointed when we cause them problems. We're supposed to be making problems go away for them, not developing problems for them. And when you think about all of the time, money, and effort we spend trying to attract customers, isn't it silly to say we're going to fine-tune our inventory controls and accept a higher degree of risk of disappointing our customers in order to save a few hundred dollars here and there?

Something else to consider: Sometimes, as inventory control specialists, we spend an awful lot of time looking at very, very small amounts of capital—low-volume items with low price tags. And maybe it's more rational to save a bunch of time by having those items on hand because the amount of capital they consume is really pretty small compared to the amount of time that we would spend managing little bitty items.

RENNIE: Looking at specific types of items, would you say A, B, or C items mean the worst-case scenario for a firm if it experiences a stockout?

VAN VLIET: The definitions of A, B, and C items are often associated with usage rates; so, actually, I think the better question to ask is, "Which items are the real showstoppers?" I'd rather take a look at which items will hurt us the worst. So, for a manufacturer, a fuse on a machine at a process bottleneck is a critical item. If that fuse blows, the process

halts until the fault is corrected and the fuse is replaced. On the other hand, a fuse on a machine in a slack part of the process is less critical. So, if the operations team has properly categorized the inventory parts, we should be able to say to the purchasers, "Here are some items that we must not stock out of, so we will accept a very low rate of inventory turns on these items."

For a distributor, the question really hinges on expectations: What do the customers expect? For example, a customer would be astonished if a plumbing supply distributor ran out of half-inch copper couplings. The customer would be more understanding of a stockout of some sort of a specialized faucet.

What we promise the customer also matters enormously. When I was an operations manager for an electric parts distributor, the sales team had finally managed to win the business of a large [original equipment manufacturer] (OEM). As part of that agreement, we promised to be able to supply a certain number of specific parts to that OEM at any time. Obviously, a stockout of one of those items would've been a killer.

So, if the items can be properly categorized, then we can accept the higher risk of stockouts for less important items—maybe C items—but we couldn't accept the stockout of something that we might call an A-plus item, and that's kind of where I'm going with the thought processes on how to decide which items we have to manage very closely in order to avoid a stockout.

"A customer can be just as disappointed if you stock out of an inexpensive item as an expensive one."

RENNIE: And you feel that those are the inexpensive items, but that does not necessarily mean C items, right?

VAN VLIET: Well, keep in mind that some low-usage-rate items, which are typically categorized as C, could actually turn out to be some of these highly critical items. So, as with the example with that OEM that we had finally managed to land, some of the items that OEM cared about were not particularly critical items to us. They were obviously C items. But because of the promise to that OEM, I kicked them up into the A-plus category.

RENNIE: So a customer can view an item in one way, and you can certainly see it as something else. But really it's all about how the customer views it, and you just have to respond to that.

VAN VLIET: The customer's view is really significant. I have a great example of that. My company sold Rockwell Automation equipment, and that equipment uses a set of specialized heater elements. We were the only source of the heater elements in the area. The sales manager came to me and said, "Hey, John, we're gonna drive customers away from us and from that product line if we ever stock out of these heater elements. We should have plenty of them on time all the time, but we've been stocking out."

He was exactly right. All I had to do was adjust the order controls on those heater elements so that the reorder points were exceptionally high. I wanted us to have nine months of usage or more on hand for every single variety of those heater elements. Given that they were inexpensive, that was easy to do. But that illustrates how we can say, "Goodness, the cost of running out of the heater elements could be really bad news." Given that the price of these heater elements was low and the amount of money that we would have to stack on our shelves in heater elements would be relatively small, it was kind of easy for me to make an arbitrary judgment and lift the order point controls.

When we look at an item and try to figure out if we have to take Herculean efforts to make sure we don't stock out of this item, one of the things that we also want to look at is how responsive the rest of the supply chain is to that item. Again, with that OEM, if the agreement had been, "You give us an order, and tomorrow we're delivering that item," and we discover, "Oh my goodness, we're out of it," but it's relatively easy to get that item in time; well, then stocking out of that would not be quite the disaster. It would cause us the aggravation of jumping around and solving the problem, but we would be able to break the chain of bad consequences if we could get that part and still get it to the customer in time. So, a highly responsible supply chain behind us minimizes the amount of fear we have of a stockout. This means that, when we're assessing a particular item and trying to decide what our reorder point ought to be for that item, the responsiveness of the supply chain really does come into play.

RENNIE: After everything we've discussed, how does a person go about striking the right balance between keeping inventory on hand and risking a stockout?

VAN VLIET: Actually, I'm quite fascinated by this question. Right now, what we tend to do is measure stockout rates and fuss at the purchasers when those stockout rates are too high. Of course, at the same time, we measure inventory turns and fuss at the purchasers when the turns are too low. We've figured out how to help purchasers do a better job deciding how much to order by giving them formulas such as economic order quantities. But perhaps we need some kind of a similar formula—one that includes a factor for the cost

of stockouts—that could help us determine the best order points. It's obviously the order point, not the order quantity, that is the biggest factor in determining whether we're going to face a stockout or not.

The advice that I would give our fellow professionals is to do two things. The first thing, the thing that I did that tended to work, is to rank order the active inventory by the dollar value of the items in the stock. When you do that, you can then establish a cut-off line and say, "We have $10 million worth of inventory, but below this line is maybe half of our inventory items, and it only amounts to $900,000. Well, all the items below that cut-off line really consume only a fraction of the capital that we have devoted to inventory; but each item is a stockout risk, and a customer can be just as disappointed if you stock out of an inexpensive item as an expensive one. They care about not getting their part. So, if you take that set of items below the cut-off line and increase the order points on those items, you've added just a little bit more inventory that you're carrying in terms of pure inventory capital, but that buys enormous stockout insurance for that mass of items below the line.

The second thing they should do is identify the showstoppers. These are the A-plus items, the ones where the stockout would really be horrible, and they have to increase the reorder points for those items. Now, I don't quite know how to do that. I have done it before in an arbitrary way, and then I ran the numbers and figured out how much additional capital that was going to add to our inventory and choked. I said, "Oh, that's no good." But then you go to the biggest culprits—the ones that carry the largest chunk of extra capital—and look at them to see if there's some sort of a way to minimize the risk of a stockout or the consequences.

One of the [other] approaches I took was to go to a customer who wanted us to have a certain number of parts—and some of these were quite expensive—and I said, "Well, based on your usage rates, you're asking me to stock a heck of a lot of stuff that you don't really need. Couldn't we agree on a different level? Or could we agree that you stock some of it?" And so we began to negotiate on how to handle this chokingly large chunk of capital that they were asking us to stash on our shelves.

Finally, what I'm working on right now is trying to figure out some way to incorporate a proper cost of stockout into the reorder point factor; but I'm just not there yet.

RENNIE: You'll let us know when you figure it out?
VAN VLIET: I will, and hopefully your readers will send me some neat ideas.

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