Finding RFID's Break-even Point

RFID tag costs will cut a manufacturer's profit margin but also boost sales by reducing out-of-stocks. Here's a formula for finding the break-even point on tag costs.

Dec. 6, 2004—Five cents has been promoted as the price of RFID tags that will spark widespread adoption of the technology at the retail sector. The Auto-ID Center said this was the price that would allow manufacturers to tag products at the item level. But to achieve ubiquitous RFID tagging at the item level, the cost of RFID tags has to be even lower than 5 cents.

Consumer products goods (CPG) manufacturers sell many low-value products with razor-thin margins. They make money on the volume sold. Adding a 5-cent tag to a 50-cent pack of gum would leave the manufacturer with no profit. The manufacturer could pass the cost of the tag onto the consumer by raising the price of the gum to 55 cents, but that might not be easy to do in a competitive market. So manufacturers will have to swallow this additional cost and try to offset it by using RFID in the supply chain to save money.

The benefits of RFID tracking for retailers are more clear and measurable. But the benefit for the product manufacturer, who must pay for the tags, is less clear. So how does the manufacturer determine the break-even price of the tag for each product? I've developed the following formula, which, while simplistic, gives a good indication of what the break-even price is likely to be.

Let's say I am a manufacturer. I sell a quantity of a certain item to a retailer store, and each individual item has a certain profit margin in dollars. So . . .

Total profit = quantity X profit margin

Now let’s say one of my major retail customers hits me with a mandate to put an RFID tag on each individual item I ship, and I can’t increase the price of the product. So my profit margin is reduced by the cost of the tag.

Total profit = quantity X (profit margin – tag cost)

My retail customer says it will buy more of my product because the tag will eliminate, or greatly reduce, out-of-stocks at the retailer's stores. With OOS representing the percentage increase (converted to a decimal) in sales due to a reduction in out-of-stocks, the equation looks like this:

Total profit = quantity X (profit margin – tag cost) + (quantity X OOS) X (profit margin – tag cost)

But will the improvement in sales from reducing out-of-stocks be enough to offset the reduction in profit margin that comes with having to tag each item? To find out what the break-even point is of putting on the RFID tag, I need to do some math. I take my new total profit equation and make it equal to my original (pretagging) total profit equation.

(Profit margin – tag cost) X quantity + (profit margin – tag cost) X quantity X OOS = profit margin X quantity

If the equation is true and the two sides are equal, then I am breaking even. So let's isolate the tag cost to find out at what point I start to benefit from putting RFID tags on my products. First, divide both sides by the quantity. We get:

(Profit margin – tag cost) + (profit margin – tag cost) X OOS = profit margin

Subtracting the profit margin and adding the tag cost to both sides of the equation, we get:

(Profit margin – tag cost) X OOS = tag cost

Now, let's get rid of the parentheses by multiplying OOS times the tag cost and the profit margin:

Profit margin X OOS – tag cost X OOS = tag cost

We can then isolate the tag cost by adding tag cost X OOS to both sides of the equation:

Profit margin X OOS = tag cost + tag cost X OOS

And we can simplify the equation this way:

Profit margin X OOS = tag cost X (1+OOS)

Then we can isolate the tag cost by dividing both sides by 1 + OOS:

Tag cost = profit margin X OOS/(1+OOS)

So the break-even cost of the tag (in dollars) is the profit margin (in dollars) multiplied by the percentage increase (converted to a decimal) in sales due to a reduction in out-of-stocks divided by one plus the percentage increase (converted to a decimal) in sales from reducing out-of-stocks. This assumes that the only benefit to the manufacturer is the increase of sales due to the reduction of out-of-stocks at the retail store. It does not factor in any internal savings from RFID tracking.

A tag cost greater than the break-even value results in a loss, and conversely, a tag cost smaller than the break-even value results in a profit for the manufacturer. When you plug in real numbers, it quickly becomes apparent that the tag cost must be much lower than 5 cents for manufacturers to break even on many products. (Of course, an RFID system involves more than just the cost of the tag, but the goal here is to explore the relationship between tag costs and the promised increase in sales due to a reduction in out-of-stocks, since this is one of the biggest incentives for manufacturers to implement RFID.)

The simplistic equation above tells suggests that increased sales due to a reduction in out-of-stocks will not be enough to offset tag costs. For example, plug a tag cost of 5 cents and sales increase of 5 percent due to a reduction in out-of-stocks, into our formula above and this is what you get:

$0.05 = profit margin X 0.05/(1+0.05)
Profit margin = $1.05

The manufacturer will break even only when the profit margin exceeds $1.05. Few products in the grocery section of retail stores have margins that high. On the other hand, a product with 20 cents of profit margin and the same 5 percent increase in sales due to a reduction in out-of-stocks will require a 0.9524-cent tag cost to break even.

Tag cost = $0.20 X 0.05/(1+0.05)
Tag cost = $0.009524

So the 5-cent tag might be the industry's goal. But even if that goal is achieved, we are still a long, long way away from an RFID tag that can be cheap enough to put on most items in the grocery store.

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