

# Necessary But Not Sufficient

An excerpt from the upcoming business novel by Eli Goldratt

## Chapter 12

July 31, 1998

Lenny is on his way back to the airport from Moore-Plastics Inc., a client of Intelogic. It is late afternoon and he has been driving for the last two hours. As usual, he refused to take a limousine. He likes to think while driving, it helps his concentration. And he has had a lot to think about.

The direction of the solution, as pointed out by Scott, is still intact. They'll have to add something to their ERP system. Something that will cause their system to generate more value, bottom-line value, even for mid-range companies. But, it's not an additional module that can be purchased; it is more involved than that. This was a hectic week but now he has it all figured out. Scott will be amazed. And pleased.

Lenny glances at his watch; he is making good time. In less than an hour he'll be on the plane and two hours later at home. But he doesn't feel like it. Since his divorce, and his wife getting custody of their daughter, Lenny's gotten used to being alone. As a matter of fact he likes it. But not tonight. Not when he has so much to tell Scott, and the weekend is so long.

He takes his cell phone and calls Scott. He gets Scott's voice mail. Not good enough. He dials Scott's private home line – a number only very few people at BGSoft have access to.

"Hello?" the voice of Scott's youngest child is heard.

"Hi Cindy, how are you darling? What's new with your virtual city? Did you add a lot to City2000?"

"Lenny," she sounds pleased. No wonder, kids love Uncle Lenny, especially those interested in the really clever computer games. "I added a university and you wouldn't believe how many people want to come to live in my city. There is no more land for buildings. What do you think, should I build another city not too far away?"

Lenny laughs. Cindy inherited her father's ambition; she always goes for more. "I'm sure you can. The question is whether that is the right thing to do. The investment might be very high. Have you thought about better exploiting the northeast part?"

Cindy would love to spend the next hour talking with Lenny, but her mother takes the phone. "Hi Lenny. Are you all right? I expect Scott will be home around 7:30. Can he call you back?"

"Hi Diane, how are you? I'd like to come over tonight and discuss some things with Scott. Do you mind?"

"On the contrary. Join us for dinner?"

"I'm afraid not. I'm landing too late, a little after eight. Thanks any-

way."

"Don't thank me, just come. We'll wait with dinner. We're having a special dinner. I cooked it myself, so don't even think of eating any of that airline food."

Lenny groans at the thought of Diane's cooking, but he knows better than to argue with her. Besides, he'll get to spend time with the kids. "Thanks Diane, see you soon."

Scott himself opens the door. He seems much more relaxed than the last time they met.

Smiling at Lenny, he says, "And here is the missing person, come in. I told them not to worry about you."

Lenny looks puzzled.

"You'd better find some good excuse for Roger and Mary Lou," Scott warns him. "They've been trying to reach you for the last three days. Mary Lou decided that you were kidnapped. What is the idea of permanently shutting off your cell phone and not bothering to call in?"

Scott leads the way to the kitchen. "By the way, where have you been?"

"Working on something that you said is urgent and important. Do you want to hear?"

"After dinner," Diane kisses Lenny's cheek. "Kids! Dinner!"

It's after ten when Scott succeeds to shake the kids off Lenny. They sit down by the pool, Lenny with beer, Scott enjoying a Remy Martin. It's a lovely night, not too hot and with plenty of stars to stare at.

"Well," asks Scott, "The last thing I knew is that you put three people to work calling a whole bunch of Intelogic's clients. Where have you been since then?"

"Do you want addresses or do you want to know what I found?"

Scott gestures with his glass, "Touché. Lay it on me in whatever way you want."

"Good. So, as you know, I started this week with a visit to Intelogic."

Scott, who for the past two days has been chased by a desperate Roger and then by a worried Mary Lou, restrains himself from interrupting with "and then you disappeared into limbo."

Lenny, apparently unaware of the turmoil that he caused, continues. "I learned a lot. Mainly that Intelogic doesn't know why their software is bringing bottom line benefits. No, that is not accurate. The situation is much more grotesque. Their developers think that they know, the sales people repeat what development claims like parrots, but none of them bother to see what actually happens with their own clients.

"Can you imagine that they didn't ask themselves the most basic questions? Like, what is the average return on investment their clients get on their software?"

"Lenny why are you surprised? The same is true for us as well. Just a month ago we didn't really connect between our product and the client's bottom line."

"But they are emphasizing bottom-line value," Lenny argues. "They should know better. Never mind. Let me continue. I met with

their VP of sales, a funny guy. He doesn't know much about their product but he tries to compensate with his jokes."

"You mean that he laughed at yours?"

"Come to think of it, he didn't tell me even one good joke. Anyhow, I told him that as part of the due diligence I wanted a list of all their clients. He was not surprised. Then I added that the list has to specify, for each client, the actual, or at least the expected, return on investment. He almost fell out of his chair." Lenny starts to giggle.

"I would too," Scott says flatly.

Lenny smiles and continues. "Like any one from sales this funny guy is quick on his feet. He said he had prepared a list of their best references for me. Then he hands me the list. Eight customers! That's all. From the hundreds they've sold to? Of course I sat on him until I got the full list. I called the eight companies myself. And the long list I faxed back to the office to check."

"I've seen it," says Scott. "I also looked at the questions that you prepared for them."

"Only two simple questions," Lenny is proud of the first market survey he ever initiated. "How frequently do you run Intelogic? And, do you think you make more money from using the software? That's all. Have you seen the results of those calls?"

"No. I wanted to leave something for you to surprise me with."

"Good. Anyway, I took the list of eight names and called them all. That was very enlightening. All eight claimed they use Intelogic and like it. Only five of them say they are making money by using the software. Out of these five only three have impressive results."

"What about the hundreds of

phone calls that we did?"

"Didn't change the picture much. They produced another four companies who claim substantial results."

"So let me guess," Scott speculates. "The rest of the week you spent visiting all of them. Just like that. You don't know that such visits should be scheduled weeks in advance?"

"Actually, that's what the funny guy said as well. But ignorance is bliss," Lenny grins. "I asked him to call them, explain the purpose of my visit, and tell them the time I'd be arriving. There was no problem. All these plants are happy with Intelogic and even happier to brag about their results. But I must admit that I dropped one. The plant in Malaysia. So I visited only six plants."

"In three days? Not bad considering the distances."

"Not bad at all. But let me tell you the more interesting parts. All six plants are using the software in a different way than Intelogic intended! Also, they all claim that it took them a significant amount of time to implement it – not because of technical problems, but because somehow they needed to achieve consensus on how to use it. Are you listening?"

Scott laughs. "Oh yes, I am. I'm not surprised though."

"You're not?" Lenny is puzzled. "Well, I was. I couldn't believe my ears. They actually told me, all six of them, that they had to re-think the entire way they run their operations. They had to change some of their most fundamental rules."

"Of course," says Scott smiling. "That's exactly what I expected."

That is too much for Lenny. "I don't see how you could expect it, unless you are a magician."

Scott pretends to smoke an imaginary pipe. "Elementary, my dear Watson. Just common sense."

Lenny smiles. "So, once again,

one of your famous analyses. Okay, let's hear it. But slowly please."

"Don't you want to finish telling me what you discovered?"

"No."

Scott swirls his brandy and takes a taste. "When does a new technology bring value?" He starts with a rhetorical question. "We expect that a new technology will bring benefits, when and only when, the new technology diminishes an existing limitation. It is simply common sense."

"Maybe to you. What do you mean?"

"If the new technology does not diminish any limitation whatsoever, there is no possible way in which it can bring benefit. Do you agree with that?"

Lenny, searching for any crack in Scott's arguments is not in a hurry to agree. But every example that he can think of validates Scott's argument.

Once Scott realizes that Lenny actually agrees he continues. "At the same time, if something is a limitation it means, by definition, that diminishing it brings a benefit. Otherwise it is not a limitation. That is why I claimed that a new technology will bring benefits, when and only when, it diminishes an existing limitation. Can I continue?"

"Please do."

"Now let's establish the other pillar of my argument. It is also obvious that the mere fact that we are dealing with a new technology tells us that we have been living with an existing limitation for quite some time. Now ask yourself how could we live with this limitation? It must be that our customs, our habits, our measurements, our rules, recognize and consider the existence of that limitation."

"Now you have lost me."

"I didn't. But if you insist, I'll give you an example. Suppose that

Mary Lou gives me a letter for signature, a letter that has to be sent to, let's say, twenty people. And I find some major mistakes that I mark on the letter. Twenty years ago, when we still used typewriters and carbon copies, I would not have expected the letters to be sent out within the next hour. Not even from Mary Lou.

"I would not have asked her to send the letters within the next hour and I would not consider it as bad performance on her part. That is what I mean by my statement: our habits and measurements recognize and accommodate the existence of that limitation."

When he sees that Lenny is still thinking, Scott adds. "The fact that our habits or rules accommodate the limitation should not be confused with us, as human beings, realizing that a limitation is actually a limitation." When he sees that his last comment hasn't helped to clarify things he immediately explains. "For example, twenty years ago I didn't regard typewriters as a limitation. Not at all. As a matter of fact, if somebody had told me that a time would come when I myself would be able to make the corrections to the letter and have twenty copies in less than five minutes I would have laughed in his face."

"I see," says Lenny. "Carry on."

"Now we install some new technology. Let's assume successful installation occurs; the limitation has been diminished. But what happens if as part of the implementation of this new technology we neglected to address the rules? What happens if we still operate with the old rules, the rules that assume the existence of the limitation?"

"In this case, the rules themselves will impose a limitation," Lenny says.

"Exactly. And then what benefits

will we gain from the new technology?"

"I don't know," Lenny answers. "It depends on the technology and what it does. But I see your point. If we don't also change the rules we can be assured that we will not realize the full benefits."

Scott looks at the sky still pretending to smoke his imaginary pipe. "You see Watson, technology is a necessary condition, but it's not sufficient. To get the benefits we must, at the time that we install the new technology, also change the rules that recognize the existence of the limitation. Common sense."

"Scott," Lenny says quietly. "You forgot one point. Without changing the rules we are not going to get the full benefits, I grant you that. But maybe we are getting ninety-nine percent of the benefits? In that case, what you said is interesting, but immaterial."

He finishes his beer. "So, to convince me that new technology is not sufficient, you still have to show that without changing the rules we lose significant potential benefits. And I don't see how you can provide such proof." He stands up and walks into the house for another beer.

After two minutes Lenny is back, a frosty glass in his hand. "I found the real flaw in your arguments," he grins at Scott. "Who said that we do not change the rules? Whenever we implement a new technology we change some rules. Take your example. Today you do expect that the letter will be corrected and sent almost immediately."

Scott is still relaxing on the lounge chair looking at the stars. "Do you remember when we had just started?" He reminisces. "We had a wonderful product, one of the first commercially available MRP packages. You wrote most of it yourself,

and I sold more than half of the first fifty copies. It was new technology. Powerful new technology. And it was so much easier to explain than what we have now.

“The limitation that our package addressed was clear to all our prospects. Do you remember how difficult and time consuming it used to be to manually calculate the ‘net requirement’? They had to take each order, and first determine what is already available in finished goods stock. Then they had to look at the making of the product, see what purchased components and materials are required. Deduct from it what is already in process on the shop floor and only then did they know what additional quantities had to be released to the shop.

“Remember how many people they needed for that work? In a plant of three hundred people they had at least twenty in material management. It was so much work that the rule was to do ‘net requirement’ only once a month. It was an unwritten rule, but it was the same rule in almost every plant. Do ‘net requirement’ only once a month. Even though it inflated the inventories. Even though it slowed the reaction time to new orders. There was no other way. For most plants, once a month was the practical maximum.

“And then we came with our new technology, with the computer and our MRP package. And what took twenty people several days, could be done over night. What a technology. Do you remember?”

Lenny knows that Scott is setting him up. But the feeling of nostalgia is strong enough to cause him to sigh, “of course I remember.” In a harder tone he adds, “what’s the point?”

“What’s the point?” Scott says, still talking to the stars. “The point is that most of our customers were

not so thrilled about the outcome. Yes, less manpower was needed to do the calculations, but more people were needed to maintain the data accurately on the computer. The disappointment was so large that our industry came up with the famous ‘class A users,’ the companies that were displayed as the model of how to do it right. Those companies that had taken the actions to maintain over ninety-eight percent data accuracy, that had done the ‘proper’ education on dependent and independent demand, on economical batch quantities and all that crap.

“Looking back, it was so ridiculous. Our customers didn’t get enough benefits. Do you know why? Lenny, think. It was not because their data were not accurate enough, or because they didn’t do enough technical education.

“You knew almost every one of our clients at that time. The ones that were constantly complaining about bugs and the few ones that were very happy with the results. The few happy ones that were reporting large reduction in inventories and substantial improvement in due-date performance. So tell me,” Scott presses, “why so few got real benefits?”

When Lenny doesn’t reply, Scott provides the answer. “Because even with our system they still ran ‘net requirement’ only once a month.”

“You’re right,” Lenny bursts out laughing. “I can’t believe it.”

Scott summarizes. “Technology removed the limitation but the rule was left in place. Lenny, don’t laugh. We were part of it. We didn’t recognize it either. If we had, we could have sold many more systems. We were as stupid as everyone else.”

Lenny calms down. “How come nobody pays attention to the obvious?” he asks.

Scott doesn’t have an answer. “I

don’t know,” he says. “But the same is happening again with our new ERP technology. What is the limitation that our ERP system diminishes?”

“I would say that it provides much better visibility into operations,” Lenny answers.

Scott smiles, “Lately, I’ve become allergic to this phrase. Let’s say that the limitation that we diminish is the need to act without having all the information.”

“Using our system the client has at his fingertips all the needed information,” Lenny agrees, “no matter how big or diverse his operation is. We provide an enterprise-wide system.”

Scott continues. “Our ERP technology substantially diminishes that limitation. But, what about the rules, the habits, the measurements?” After a short pause Scott provides his answer. “I suspect that many of the rules our clients currently use, are still based on the old limitation. Take for example what we saw at Stain Industries. Maggie was impressed that they got rid of the local efficiencies. The rule that they have to strive to make every resource work all the time, regardless if what is produced is needed now down-stream. Let’s face it, such a rule was probably necessary when they operated without having all the information. But now it is just preventing operations from getting the benefits.”

“Well, as usual your analysis is on the nose. Every place I visited that they got bottom line results also changed the rules. They don’t attempt to reach high efficiencies on every work center. They don’t behave as if releasing work orders early is the way to achieve early finish, and they don’t even think that the larger the batch, the better it is.”

Scott is pleased. But there is another question that bothers him.

“What did they replace those rules with?” Scott asks.

“What I’ve seen is that they replace those rules with one form or another of drum-buffer-rope,” Lenny replies. “I don’t mean just the mechanism; I mean the whole management approach. Some don’t know the name, but still that is basically what they are doing.”

“Something like what we’ve seen at Stein Industries?”

“Basically yes. More sophisticated. Less effective. No one is coming close to Gerry’s performance, but then nobody is using a separate control system, a buffer management approach.”

“Why not?”

“Because Intelogic does not provide adequate time buffers.”

“I want to understand. What you are telling me is that our crude MRP module with the change that you introduced for Gerry, is working better than all those sophisticated APS systems? It is hard to believe.” Scott is pleased but puzzled.

“Actually it is very simple, once, you hear the complaints about the fact that the schedules are unstable,” Lenny explains. “Even if for one whole week they follow the schedule on the nose, still the schedule they re-generate next week is disjointed. Then you realize how important it is to confine the optimization to only the constraint. Doing more than that doesn’t help. It hurts. It destabilizes the schedule.

“That is what Dr. Deming tried to teach us. That trying to optimize within the noise not only doesn’t help, it hurts. As long as the system is vibrating within the limits of its noise any tampering just increases the fluctuations.”

Scott doesn’t pretend to understand this statistical rule. Instead he concludes, “So we don’t need to pur-

chase an APS company, we...”

“I didn’t say that,” Lenny cuts him off. “We still need an APS.”

“But why?”

“Because we need it to schedule the bottleneck,” Lenny states.

“I thought that wasn’t a big deal, that bottleneck scheduling can be done manually.”

“It’s not always as easy as in Gerry’s plant.” Seeing that Scott would like to hear more he elaborates. “Take Irrigtech for example, one of Intelogic’s customers that I visited. They have two complicating factors that made their life miserable. Their bottleneck is a work center with fifteen similar but not-exactly-identical machines. Their capabilities overlap, but they are different. Some can handle only small parts, some cannot process softer metals, etcetera, etcetera. The other factor is that most products go through the bottleneck work center more than once. This combination is pretty tricky to handle manually.

“Another kind of complication I’ve seen is even more difficult to handle manually. For example, take a company that deals with a special type of plastic. Imagine that in one work center you add the color. To move from producing one type of black parts to a different black part takes maybe five minutes; you just have to adjust some gadgets. But to move from producing black parts to producing white ones might take five hours. You have to almost disassemble the machine and clean it, otherwise instead of white parts you’ll get gray. This is what they call ‘dependent set-up times’.

“Of course they prefer to first produce all the parts of the same color before they move to produce parts of another color. That is not yet the problem. In their case it gets really complicated because the work

center that has to further process these parts also has ‘dependent set-up time.’ Unfortunately, this dependence is not due to color but due to another property like grain or width. So what we face are two work centers each having their own ‘preferred sequence.’ Now if you schedule according to the preferred sequence of the first work center the second one will have to spend so much time doing set-ups that it will turn into a huge bottleneck. But if you schedule according to the second work center the first one becomes a bottleneck. You understand?”

“I just understand that you need a smart algorithm to help schedule the bottleneck.” Scott says smoothly, “That’s all I understand, but that’s what I need to understand. So, Lenny what are your recommendations?”

“Let’s buy Intelogic and integrate it prudently into our MRP module. Making sure that only the bottlenecks will be optimized, that buffers will be inserted in the right places and add a good buffer management It’s not too big a deal.”

“Do we really need Intelogic for that?”

“Yes, if we buy them I can dictate what part of their package to use within BGSoft. They are good developers. Once they see my analysis they will be able to deliver the code in a very short time. Look, all the complicated scenarios I described before, it would take us months to program the algorithm. They already did that. We may use only 20% of their existing code, but that alone is worth the price to us. And I can use their people. It is tough to get such capable people.”

“Done,” says Scott. “My next question is, who will help the clients to change the rules?”

“I don’t know,” Lenny answers. “But Scott, what I’ve learned this

week is that Gerry is not such an exception. Many companies are already working according to the new rules. It makes sense. Many more want to do it but they cannot find a suitable system to support them. Besides there are many consultants who are advocates of the Theory of Constraints, maybe we can use them?"

"So the real problem is us," Scott concludes.

"What do you mean?"

"Lenny, we'll have major problems with our two arms handling the market. Gail and her people are so comfortable with selling technology, that it will not be easy to convince them to switch to selling value."

"I've already noticed," Lenny confirms.

"And Maggie is not less of a challenge. She is terrified about going into anything that involves a culture change. And here, since we are talk-

ing about changing such fundamental rules, we are dealing with implementing a culture change. You see what I mean? The biggest obstacles are not the market and not the product. It's us. How are we going to deal with it?"

"Thank God that's your problem." Lenny glances at his watch. "It is time to get some sleep. I am dead tired."

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**"Necessary But Not Sufficient: From MRP to E-Business"**  
will be the topic of Eli Goldratt's Keynote Speech at TOC World 2000.  
For more information visit the AGI website at [www.goldratt.com](http://www.goldratt.com).