Goldratt's Six Questions for Assessing the Value of a New Technology

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Introduction: the importance of assessing the value of new technologies

The objective of the six questions is to lead organizations to reveal the potential value of developing a new technology. It is certainly critical for the organizations, many times startups, developing breakthrough technological advances to comprehend the actual value to the users. Better understanding of the value will help justify the investment, but also focus the development on the truly needed features and the marketing. Dr. Goldratt created the six questions as a leading tool for such organizations.

Actually the value assessment of new technologies is becoming more and more critical to all organizations! The flood of new technologies makes it necessary to come up with a quick objective analysis of the potential value to the organization. Too many organizations are exposed to slogans about Big Data, Blockchain, Artificial Intelligence (AI), Internet-of-Things (IoT), RFID, and so on. Every such technology gives the impression of a new wagon taking you to a new world. Only a cold objective analysis reveals the true potential practical value the organization can gain from the new technology as well as understand better the supporting conditions, such as the need to change some key policies.

In describing the six questions we'll use two imaginary new technologies as leading examples:

1. A non-rechargeable battery that lasts 200 times longer than a regular battery.
2. A word processor with two unique capabilities:
    a. Offering superior grammar check and more effective verbalization adjusted to the targeted audience.
    b. Perfect translation to several languages, which includes automatic adjustment to the target audience.

Question no. 1: What is the Power of the Technology?

The first question is the only one from the perspective of the technology itself. We definitely need a brief description of what the technology can do. We also need to understand the boundaries of the technology, making it clear also **what it cannot do!**

Applied to the battery, we need to know that it can replace the current common batteries, including size and voltage. Also we need to know whether there are exceptions that the current technology cannot, at this stage, replace. We need also to be aware that the cost of producing such a battery is about 25 times more expensive than a regular battery.

We probably need more information regarding the word processor's new capabilities. While the current common grammar and translation technological capabilities look on every sentence, the new technology, using artificial intelligence (AI), is capable of reading the whole document and deduces the nature of the writing, such as academic, journalistic, or popular. It also identifies whether it targets

young people, and whether the style could embrace slang or sophisticated language. The grammar and the effectiveness of every sentence are also checked. The use of AI means the quality of the document is going to be enhanced when more and more documents are being checked and re-written by the software in the future, as well as corrections the human author introduces after the software version.

The translation capability exhibits the same capability across other languages. Thus, a good document in one language is effectively converted to another.

Question no. 2: What current limitation or barrier does the new technology (or product) eliminate or vastly reduce?

The second question defines the meaning of 'value' for the users of such a new technology. While some people love new technologies as something that stirs the mind, like 'it is amazing what mankind is now able to achieve', this in itself doesn't yield practical value. In order to be practically worthy the new technology has to reduce a limitation, maybe even to eliminate it.

The user is the one that suffers from the existing limitation, thus eliminating it is the core of the value.

In order to assess the value it is absolutely necessary to identify the existing limitation, or barrier, that the user is facing.

While it is not clearly mentioned in the question itself, it could well be that a new technology eliminates more than one limitation, and the value could be different for different market segments.

In the example of the battery the immediate limitation is that devices stop, from time to time, without early warning, when we need them the most. The actual value depends on how critical it is to us at the time.

When we consider the word processor **the specific market segment** is of major importance. For most people, who mainly write emails, WhatsApp, and possibly routine posts on Facebook there is no real limitation that the new technology eliminates.

The new word processor reduces, even eliminates, two different limitations that are significant for specific market segments.

Limitation no 1: **The ability to quickly produce documents that conform to good standards of written text**, especially regarding using perfect grammar and good sentence structure. Such well-written documents are frequently used to impress the readers and/or deliver a clear message and the inability to quickly produce such documents that conform to the standards is damaging.

The relevant segments are:

- Organizations that frequently require standard documentations (technical documents etc.)
- Newspapers and magazines.
- Various publishers of professional text books.
- Professionals, like marketing people, where part of their job is writing documents.

Limitation no. 2: **Being unable to read and understand documents written in a foreign language**.

Optional market segments:

- Organizations with international activity.
- Academics, news agencies and other professionals with international activity.
- Book publishers including eBooks.

Question no. 3: **What usage rules, patterns and behaviors exist today that consider the limitation?**

While overcoming the limitation is the core value for the user, the current state is also critical to determine the difference in value between having to cope with the existing limitation and the removal of the limitation.

People do their best to bypass the limitations reality imposes on us. Detailing the current habits in dealing with these limitations is critical to gaining the value when the limitation is no longer active.

The current ways to deal with the batteries losing their power are:

- Using rechargeable batteries. However, this way still imposes stopping the work of the device until the recharge is complete.
- Carrying replacement batteries, even when the batteries are rechargeable. Some damage persists in the need for the batteries to be replaced.

So, the key damage is due to the limitation associated with **the time where the device cannot be used**.

Applying the 3rd question to the work processor also leads to several options to deal with the limitations.

There are three behaviors that currently handle the first limitation:

a. Ignore the quality of the writing – assuming it is good enough.
b. Spend a lot of time in writing the document, read and correct.
c. Using professional editors to polish the original documents.

The second limitation is currently handled by current translation software and using it with the warning that the translation cannot be relied on, or letting a professional translator to do the job. In many cases documents in foreign language, for which their value is not clear upfront, are totally discarded.

Question no 4: **What rules, patterns and behaviors need to be changed to get the benefits of the new technology?**

This question leads to recognize all the required changes the user has to do in order to draw the full value of the new technology. The insight is that we shouldn't assume the user is fully aware of the potential value and what changes are necessary to achieve the full value. While it makes sense that

users will eventually understand the requirements to draw the full value, it might take considerable time, which is bad for the developers of the new technology.

Part of the added-value of truly long-life batteries is giving up buying, storing and carrying regular batteries, which is currently the common practice. The other part is preventing the devices from stopping too often, or even at all.

If the new technology would also fit electrical cars, then overcoming the need to frequently recharge the batteries is of immense value. Likewise, such new batteries for smartphones eliminate the need for re-charging – again gaining considerable value. These two major potential segments might hint at another approach to the net value, which will be analyzed later.

For the batteries the behaviors prior to the new technology are easy to give up. In other cases it might be more difficult.

The new work processor, with its unique capabilities to improve the writing and being capable of translating with the same impact , does require changes in how people write documents and articles.

First, people without the skills and knowledge of writing good text, have now a valid option to communicate their ideas very effectively. Is it that easy to overcome the fear of writing?

People who are good writers still struggle to come up with good documents that express effectively their thoughts. Much time can be saved providing new writing opportunities. More, organizations with international activity are able to easily maintain the same level of articles and documents across all the countries they have business with.

However, working with a new word processor requires getting used to it.

Question no 5 (later version): **What is the application of the new technology that will enable the above change without causing resistance?**

This is mainly a call to actively look for negative consequences from implementing the required changes.

The question also urges the need to look for obstacles, which are practical difficulties in the implementation itself, like users resisting the need to be trained, or even read a detailed manual, just to be capable of using the new technology.

Once good answers to the former questions are received then it is a time to assess not just the added-value, but also **what it takes for the user to eventually draw the full value**, and also **what the user might see as loss of value**. The answer could be several additions and changes to the technology to make it more “friendly” while eliminating the negatives.

This is an important step that too many technology developers and enthusiasts too often miss. Hilarious as the new technology may be, dealing with the changes invoked by the new technology causes trouble as well. Realizing the negatives and balancing the added-value against the lost-value is not enough. Negatives can be resolved! It is the duty of management to make sure that the breakthrough doesn’t

blind them from seeing what the user might object to, and come up with improved overall usage of the new technology.

When we check the idea of batteries that last 200 times the current ones we might realize that for the user the cost of 25 times the price for regular batteries is a serious drawback. While there are cases where the added-value is worth the significant extra cost, in many cases this is definitely not the case.

Analyzing the impact of this cost could raise the idea of **relieving the user from the task of replacing batteries at all**. This could involve selling the new batteries to the electric devices manufacturers to be installed within the device. This fits especially devices that such a battery can be used through the whole device lifetime, like simple cameras, very simple smartphones (for 6 months of active life) and electric shavers. Other devices would still need to be replaced, possibly at a laboratory.

The analysis for the new word processor would raise the following reservations:

a. Having to learn a new word processor is hard for many who are used to Microsoft Word.
b. Some potential users might feel they are being dictated by the software to follow a certain style they don't like.
c. If such a tool would become popular it might harm the desire to learn foreign languages.

Analyzing the first reservation raises the question: As the value lies in the two unique capabilities, that are effective when the draft of the document is completed, then **what is the added value of the normal features of a word processor?** A feature that can be called independently, or even within, Microsoft Word, PowerPoint, or within internet browsers, can achieve most of the value without generating strong reservations.

The second reservation simply means giving up relatively small number of users who are too sensitive. After all nothing could prevent the user from subsequently changing the perfect text to reflect their style.

The cause and effect behind the third one should be scrutinized. On the one hand there would be less need to speak more languages as translation aids would be available, but on the other hand learning more languages would be significantly easier.

The conclusion is: the product application should be a program to be called from Word and other programs to translate/edit a document. Much more analysis is required to focus on specific market segments possible reservations.

Question no 6: **How to build, capitalize and sustain the business?**

While the previous question could easily lead to changes in the strategy for the new technology, this question leads us to integrate it within the overall strategy of the company.

The organization that develops the particular new technology, but maybe also other new technologies, has to see the full picture how the specific new technology is integrated with the marketing aspects as well as with all the other offerings of the organization.

Strategy in the TOC Way includes the specific requirements for 'Build', 'Capitalize' and 'Sustain'. 'Build' is focused on acquiring the required capabilities to generate the added-value to the customers. 'Capitalize' focuses on making it clear to the customers how to draw the full value, and 'Sustain' is how the organization ensures it has enough capacity to meet the expected significant growth of the demand.

Applying the sixth question to the two examples is difficult unless we know what else each company is doing, and many other aspects that are beyond value assessment of the new technology. The answers to the previous questions, especially the fifth question, yield direct impact on the global strategy of the companies.

The management of the company developing the long-life battery has to decide whether to focus on approaching producers of relatively short-life devices, which will include the battery as an integral part of the device, or sell the batteries directly to consumers. It might be possible to do both, but then sustaining the commitments to both markets has to be carefully planned with capacity buffers to ensure high delivery performance.

The developing company of the software that is able to improve the writing and translate to other languages has a key strategic issue: having an agreement with Microsoft to allow Word to access the special features from Word. It could well be that having a complete word processor at hand is used to pressure Microsoft to reach a win-win, where the company wouldn't come out with its own full word processor, in exchange for being able to make money based on the use of the special features. There is no doubt that the strategic issues of building the business case, capitalizing on it, and being able to sustain the success are absolutely critical to plan carefully.