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SOLVING NON-DIGITAL PROBLEMS FOR DIGITAL TRANSFORMATION

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Abstract

Our presentation considers practical application of TRIZ for solving problems arising during digital transformation of business processes in different industries. We discuss several cases from our real projects where different analytical and problem solving tools were successfully used.

Keywords: digital transformation, application of TRIZ, product and process design

Аннотация

В нашей работе мы рассмотрели практическое использование методов ТРИЗ для решения задач, возникающих при цифровой трансформации в различных отраслях. Мы обсуждаем примеры таких задач из реальных проектов, где успешно были использованы различные методы анализа и решения задач.

Ключевые слова: цифровая трансформация, применение ТРИЗ, разработка продуктов и процессов

Our presentation considers practical application of TRIZ tools in relatively new type of innovation such as digital transformation. Digital technologies are dramatically changing business and consumer experience. Using information collected from the customers, business or technological processes gives an outstanding opportunity for delivery of completely new values resulted from processing of accumulated data. Success of digital transformation depends on how well the digital technology gets integrated into the products and processes.

There are industries like e-commerce where collecting and processing of data relatively easily integrate themselves into the business process. There is also a lot of other industries where both products and processes engage physical equipment that imposes a number of different restrictions on integration with the digital technology. The environment or ecosystem of the business process may also impose very strict limitations on using the digital solution. In these cases, adjustment of only the digital technology to the physical world is not sufficient to achieve efficient digital transformation and one has to make some changes in the physical world too. The changes may include adjustments in equipment design, technological and organizational processes, and interaction with customers.

In our presentation we considered several examples of such problems that have been solved to enable digital transformation. The first problem is the most technical and we proposed a solution to this problem using the functional resources inside the system. To address the second problem, we had to look for solution outside the initial system. Finally, in the third example we showed how all the initial technical problems got irrelevant when we changed the business model.

In the first example, a company came up with a service based on using an electronic water flow meter and a remotely controlled shut-off valve at the entrance to a residential piping system. The idea was to collect water consumption data and in case, if the current water consumption deviates from the established pattern, the system should warn the house owner. If the water consumption is unexpected for the owner, then he or she can send a signal to shut the central valve and avoid flooding. The system's developers would like also to detect small leakages like a dripping faucet. However, the electronic flow meter they used did not have enough sensitivity to detect small leakages. Although there are lots of precise water flow meters at the market it was not clear how to combine this sensor with the main flow meter. Such precise flow meters are expensive and very sensitive to water quality. In other words the company wanted to add another feature to their equipment and service, but could not design this solution.

When we analyzed the system we confirmed that it is very difficult to detect changes in the flow resulted from a small leakage if the piping system is connected to the central water supply. However, if we insulate the piping system from the central supply, then water loss from a closed reservoir can be easily detected with a water level meter or pressure meter. We build a prototype and found out that one needs just few seconds to detect pressure or level change resulted from a leakage of 1 liter/hour. As far as our system already had a valve, we could use it for closing the filled piping system. In order to avoid interference of the measuring process with using the water system by the customer we can use collected statistical data on water consumption to identify the moment when it's least possible that the consumer starts the water. In such a way we obtained a very simple and cheap solution, that gave the company a strong competitive advantage.

In the second example we worked with a company that sells coffee machines to offices and supply them with packed individual drinks of about 40 different types and flavors. To collect precise data on their drinks consumption the company decided to connect all the machines to the Internet. The problem was that the already installed machines were not able to identify which particular drink has been consumed. The company tried several identification technologies to incorporate into the machines. Unfortunately, these technologies did not work well and cost of retrofitting was very high.

To solve this problem we analyzed the lifecycle of a packed drink. It turned out that when the consumers insert a pack into the machine they have already made their choice. The consumer makes decision about the drink when they pick it up from a box where the drinks are stored next to the machine. What if instead of identifying which drink has been inserted into the machine, we simply ask the consumer which drink he or she would like to get from the storage box. In this case, the consumers "identify" the drink by themselves and input this information into a connected digital storage box. Such an idea of connected storage box has a number of other advantages. The drink producing company get direct access to the customer, i.e. they can literally talk to each customer through the box interface. It is possible to show more information about the drink as we are not limited with the pack dimensions or dimensions of a small display of the coffee machine. The box can identify the customer to provide customer preferences, including drink selection and brewing parameters. For example, we can individually monitor consumed caffeine or we can propose a better choice of drink based on the consumer's conditions, which we collect from a digital bracelet. This connected box can also enable flexible charging system for the office owner. In this example, we used the resources available in the ecosystem or super-system and got a quite efficient solution. We sufficiently reduced retrofitting cost because we don't have to design an identification module to each legacy model and install it. The digital storage box fits all the models.

Originally the third example is also about coffee, but the problem seems to be much more common. Here is another company that produces machines for brewing coffee and individually packed drinks. Their machines are very good and people like them. However, high price of supplied authentic individual drinks does not justify the difference in taste. The consumers are trying to use cheaper coffee packs with a good brewing machine. The company, in turn, wants to protect their machines and not to let the consumers use 3rd parties' packs. It utilizes various technologies to make the machine work only with authentic packs. Eventually the consumers hack another new technology every time. The discordance here is that the customers are ready to pay for the machine brewing quality, but the company sees their business in selling drink packs. A possible way to coordinate the offer and the demand by changing the structure of the product: let us make the product consisting of two parts – the drink and the machine time for brewing one drink. The total cost of the drink/time combination is the same as before. It means that nothing changes for loyal consumers. The other customers now have choice: they can buy the combine drink/time or just brewing time for a fraction of the combination price and use it with any drink – authentic or not. In this case instead of looking for technology to protect machines from non-authentic packs we can apply already existing standard digital technology, e.g. blockchain, to regulate the distribution and use of brewing time slots. This example illustrates how one tough problem is being replaced with a set of standard engineering tasks as soon as we change the business approach.

In order to solve the problems that arise during digital transformation we need analytical and problem solving instruments. As far as we may deal with different systems in different industries this instruments should be universally applicable to both engineering and non-engineering systems and should allow one to get solution very fast because the timeframes for problem solving are very tight. In our practice, we use a combination of Root-Cause Analysis, different types of system modeling and TRIZ problem solving tools based on contradiction resolution. Such a combination proved to be very efficient for different types of challenges we faced in real projects related to digital transformation. These tools are also compatible with agile approach to IT solution development. In other words, we can use them during multiple quick iterations on the way to the final design. At each iteration we systematically reframe the problem and refine the solution addressing multiple "secondary" or adaptation issues known as innovation killers.

In conclusion, we would like to note that digital transformation as one of the major trend of industry development brings many complicated but interesting challenges, which are a perfect ground to explore the potential of TRIZ approach.

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