Teaching TRIZ within Siemens

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Abstract

Within Siemens 163 people had an introduction to TRIZ with at least a half-day seminar. There are 41 people that had a Basic training for five days. The Basic Training is the equivalent to the MATRIZ Level 1 Certificate. Just eight people taken the Advanced Course (equals MATRIZ Lv 2) up until now.

All those participants gave a feedback on the TRIZ tools they learned about on the course in a very comprehensive survey. They also judged the examples that were used within the course to illustrate the different teaching topics.

This paper shows the outcome of feedback given by 191 engineers on different TRIZ tools. It will elaborate on the examples used and how the understanding of the examples could be linked to the topics taught. It will also show how the tools build upon each other and how many days were spent teaching these topics. Therefore this paper will give TRIZ-teachers hints, on how to build up their lectures and which topics they should teach first.

Keywords

Siemens, Innovation Tool Academy, Teaching TRIZ

INTRODUCTION

In the TrizFuture conference in 2007 I elaborated on the 'Invention on Demand' workshops and how they lead up to the foundation of the Innovation Tool Academy [1].

This paper builds upon facts that were described in detail then [1]. It shows how the Innovation Tool Academy evolved from the foundation and what restructuring it went through based upon feedback from the participants of the courses.

For those not familiar with the facts presented then [1] a short summary of the 'Invention on Demand' workshops and the first layout of the Innovation Tool Academy, will be described in the first two paragraphs of this paper.

INVENTION ON DEMAND

To prove that methods for the conceptual design of products could be used with the product range of Siemens Industry Automation and Drives Technology Divisions a workshop concept was launched consisting of three types of workshops. These workshops were customized to the expected needs of the divisions. The 'Invention on Demand' workshops could be subdivided into Solutions on Demand, Innovation on Demand and Patents on Demand workshops. Each of those workshops had a different set of methods recommended for this kind of workshop and a different goal attached to it.

After one year of Invention on Demand workshops, it was proven, that the proposed methods worked and that the employees of Siemens attach importance to the methods. To further bring methodical product development into the area of conceptual design, one step forward within the company, it was proposed to teach more people the methods which were used in the workshops.

Therefore the methods and their usage was investigated and it was found, that many methods are out of the TRIZ toolbox or were based on TRIZ. It was recommended to try to teach the employees of Siemens a modern TRIZ toolbox. Based on this decision, the Innovation Tool Academy was founded.

INNOVATION TOOL ACADEMY

The Innovation Tool Academy should teach the employees all the necessary tools to help them to work on innovative tasks better. It should help the participants to facilitate Invention on Demand workshops by themselves.

To do all that, the basic structure of the Innovation Tool Academy was developed. The foundation of the Innovation Tool Academy should be the comprehensive TRIZ toolbox. Based on these methods, other methods should follow one by one to fill in the knowledge gaps. Orientation for the selection of the methods for the completion of the Innovation Tool Academy could be found in the three types of Invention on Demand workshops and the experience from those workshops.

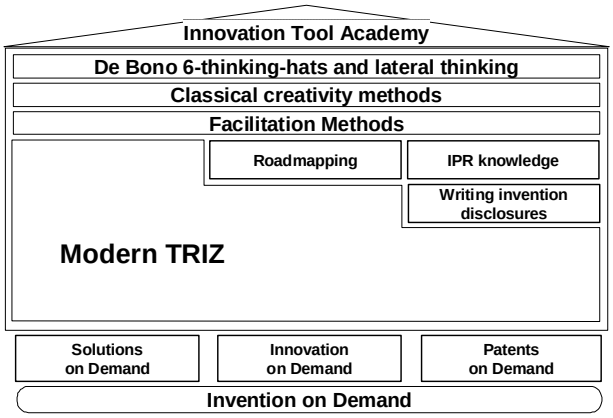

Figure 1: Basic Structure of the Innovation Tool Academy

For the modern TRIZ-lectures we choose a four course layout. One introduction course running for half a day, a basic and advanced course running for five days each and a professional course, that should run three times for five days. After each of the courses starting from the basic course, a test should prove that the knowledge is absorbed well.

Up till now, 163 people passed through the introduction course, 41 went on through basic and from those 8 passed through the advanced course. The feedback that was collected from those participants of the courses made it necessary to restructure the initial layout of the Innovation Tool Academy.

In the next section of the paper, the feedback and conclusions will be explained in more detail.

FEEDBACK AND LESSONS LEARNED

There were two introductory courses initially. One ran for half a day and was meant for managers and another one ran for one and a half days and was meant for engineers. After the initial round of introduction and basic courses it became clear, that the one and a half day format was not needed. This format just explained the function analysis and the inventive principles in a little more detail and showed a few more tools. It was too little to really teach the topic and it was too much time for just information on the topics. Therefore the decision was made to use the introductory course as a purely informational course that should give the participants an overview over the methods so that they can then decide for themselves, if they want to attend the basic course or send their engineers to attend the basic course (in the case of the managers).

From all of these introductory courses 144 feedbacks were received. These feedbacks came from 163 participants of the workshops. Methods that were only shown in the introductory course for engineers are not considered in the feedback.

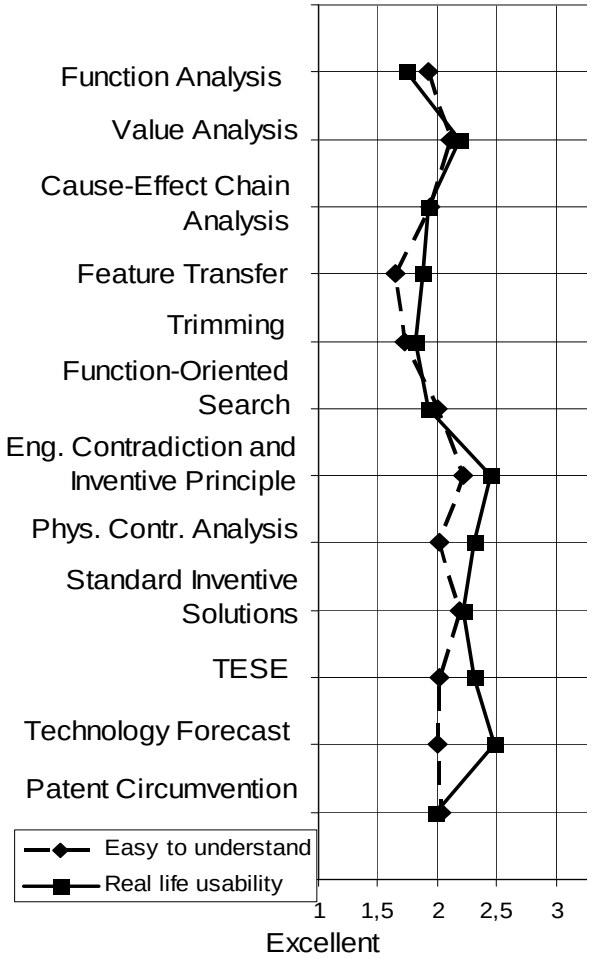

Figure 2: Feedback of the introduction courses

Within the feedback questionnaire two questions were always asked for each method. The first question was "How easy were the tools to understand?" and the second question was "Do you think the tools could be used in real life problems?". The participants were asked to grade the answers with a "1" as the best mark and "6" as the worst mark. This range was chosen because it is a well known ranking system used in German schools.

As it can be seen from figure 2 the average mark given by the participants lays around "2". Function Analysis, Trimming, Cause-Effect Chain Analysis and Feature Transfer were getting pretty good marks. What came as a surprise is, that the engineering contradiction as well as the physical contradiction with their resolution in the 40 inventive principles and the separation principles didn't get the best marks and didn't stir up the enthusiasm of the participants as it could be expected from previous literature [2].

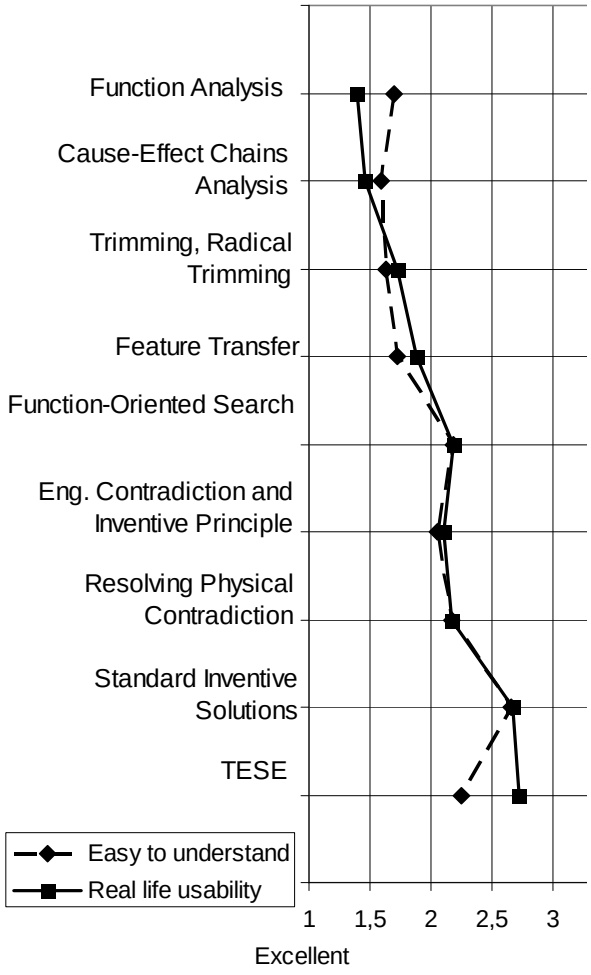

Figure 3: Feedback of the basic courses

From the basic course were received 39 feedbacks out of 41 participants (see figure 3). As in the introductory course, the Function Analysis also got good marks. This method was seen as a basis for other methods to build upon. The introductory topics in the basic course were the Standard Inventive Solutions and the Trend of Engineering System Evolution. Those topics were only introduced to the participants with some examples. They are main topics in the advanced course. They were rated even worse than in the introductory course. Also they were rated not as well in the advanced course.

Up to this survey, only one advanced course had taken place with 8 participants from which 8 feedbacks were gathered. Within the advanced course the participants expected more sophisticated methods than in the basic course. The Pragmatic S-Curve Analysis and the ITA Benchmarking didn't fit into this picture. The introduction to ARIZ was also too short for the participants.

In figure 4 the average marks for the different methods taught in the advanced course can be seen. The only really good marks were given for the Standard Inventive Solutions part of the course.

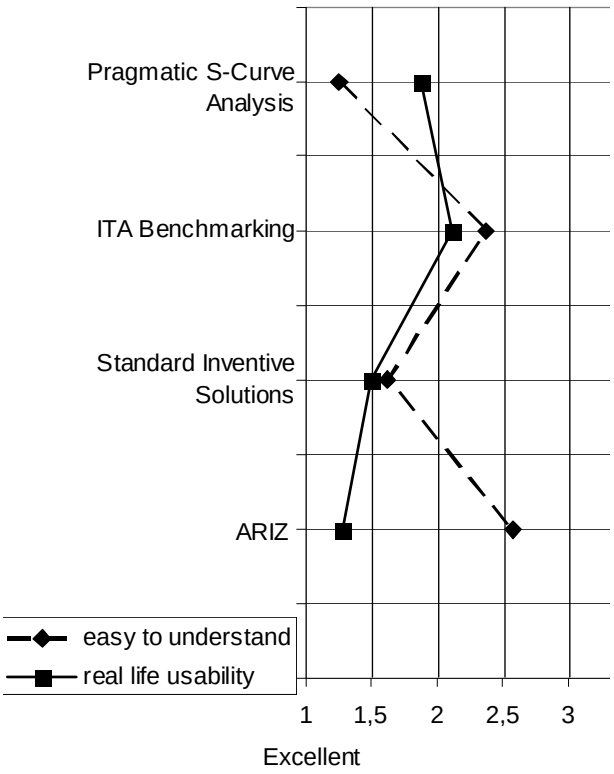

Figure 4: Feedback of the advacned course

Within the feedback questionaire a mark was given for every example we used in the lecture. There were always at least two examples for every TRIZ tool within the course. One example was a generic example and one example was a Siemens-relevant example. The examples were a mix from simple and complex examples out of the field of mechanics, electronics and electro-mechanics. The question “Were the examples understandable?” was asked.

From this question and the feedback we got from it, it couldn’t be determined if simple or complex examples are better. There was also no relevance detectable according to the field those examples came from. Mechanic, electronic or electro-mechanic examples were rated equally.

What gave more hints to the use of examples was the free form comment field. People mentioned, that they wanted to see more examples from the software development field and from Siemens-internal workshops.

Generally speaking it can also be said, that good examples are more important in the introductory and basic courses. The more advanced the participants are, the less important are the examples.

After the advanced course, it was clear, that this course had to be restructured. The professional course also wasn’t accepted in its initial layout. Therefore those two courses were reconsidered and a new layout for the courses was developed.

To do this, we first looked through the different topics and determined which topic contains a knowledge that is a prerequisite for another topic. If the participants don’t get this knowledge first, then the following topic wouldn’t make sense to them. Then we had to consider all the topics for the different MATRIZ-Levels. As the Innovation Tool Academy attached their certificates to the MATRIZ-certificates we didn’t want to loose that. This also led to the requirements for the accreditation of a MATRIZ-Certificate, which is in the case of the level 3 certificate not only based on the topics taught. At last we looked to the needed time to teach the different topics.

Out of those influencing factors, a new layout and structure of the Innovation Tool Academy was constructed. The current curriculum of the academy has the old basic course, a reworked advanced course and several smaller advanced and expert topics instead of one big block of a professional course.

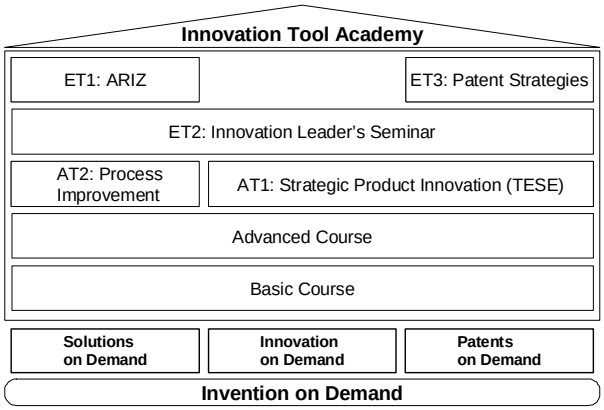

Figure 5: Current curiculum of the Innovation Tool Academy

This means that for the achievement of the “expert creative analyst” certificate, the participant has to take part in five days worth of advanced and expert topics. For the internal certificate it was the best solution and consistent with the other two levels. For the MATRIZ Level 3 certification, it was not sufficient. For this certification, the participant has to go through a certification process, in which he passes the basic and advanced courses as well as the advanced topic 1, expert topic 1 and expert topic 2. On top of that, he also has to document and present a TRIZ-Project, do a presentation on the methods itself and do some small further development on the methods.

The new layout of the Innovation Tool Academy now also gave us the possibility to customize the taught topics for different roles within our company. We can now recommend for a product engineer to go through the basic, the advanced and then take the ARIZ-course on top of that. For an innovation manager it even makes sense to deal first with the course on “Strategic Product Innovation” before he moves on to the advanced course (figure 6).

CONCLUSION

The participants of the courses evaluated the methods within the TRIZ toolbox as good to excellent applicable to their daily work. This was clearly shown by the feedback we received from the people who participated in the courses.

We also saw that management attention is good but not sufficient. We have to find ways to make them want the methods within their group.

The MATRIZ certificate was a very good thing within Siemens as it is an internationally recognized certificate that helps us to judge the TRIZ knowledge of employees.

The layout of the courses has to follow the culture of the company. If culture and courses do not fit, less people will attend the courses.

Our goal is to get the right ideas in less time. With a good TRIZ-knowledge this goal is reachable.

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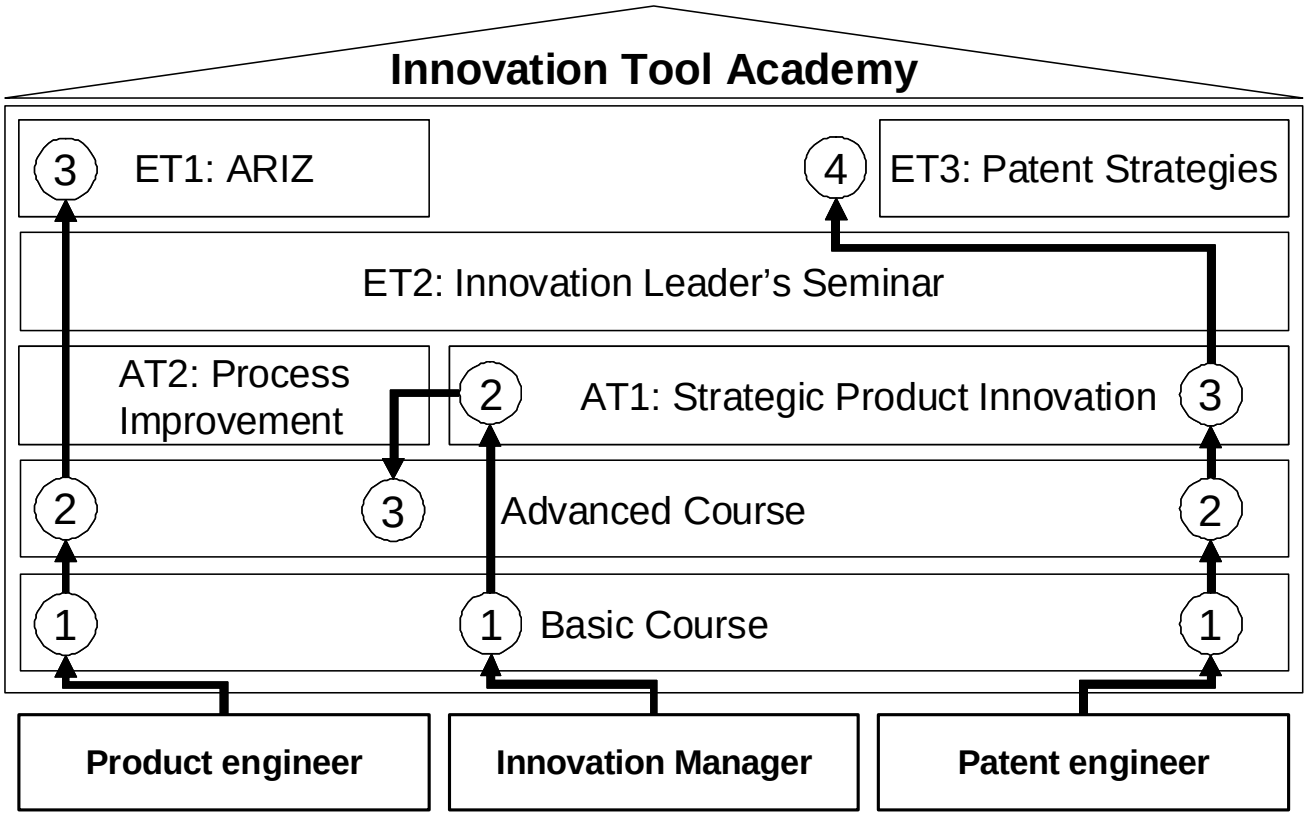

Figure 6: Different paths for different roles