Analysed and Proposed Plan for TRIZ Learning, Training and Application in Tunku Abdul Rahman University College Using S-Curve Analysis

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Abstract. TRIZ has been introduced to Tunku Abdul Rahman University College since 2011 and positive result has been achieved. A research has been carried out to analyze the current stage of TRIZ learning, training and application in TAR UC using TRIZ’s S-Curve analysis and subsequently propose plan for future TRIZ implementation in the university college. The result shows that TRIZ is currently in the first stage of its implementation in TAR UC. Several actions based on the recommendation of how to elevate TRIZ to the next stage in the future are proposed. S-curve analysis is indeed a powerful tool to analyze the trend of the technical system and provide recommendation for the future development of the technical system.

Keywords: TRIZ, S-Curve, Education Innovation, Education Management, Evolution Trends.

1. Introduction

Tunku Abdul Rahman University College (TAR UC) or formerly known as Tunku Abdul Rahman College (TAR College), is a premier institution of higher learning in Malaysia set up in 1969. The University College currently offers more than 100 programmes at pre-university, Diploma and Degree levels. These programmes cover several fields, ranging from professional programmes in accountancy, engineering and built environment, business and management, finance and ICT, to disciplines in applied science, mass communication, creative arts, hospitality management and humanities as well as Foundation and A Level.

The vision of TAR UC is to be a distinguished institution of higher learning acknowledged nationally and globally for its excellence in providing opportunities for intellectual, personal and professional development and growth of its students by fostering their inquisitive, creative and innovative minds to succeed in life [1].

To achieve the Vision, a lot of emphasis has been made to make sure that the students receive the latest knowledge so that they can adapt to the highly demanding work environment and to achieve high performance. TAR UC acknowledges that it is important to improve students’ inventive thinking and creative abilities besides imparting knowledge and skills.

Since 2011, TAR UC has collaborated with Malaysia TRIZ Association (MyTRIZ) to introduce Theory of Innovative Problem Solving (TRIZ) for development of students’ creativity, innovative and problem solving skills. Positive result has been achieved after two years of implementation of TRIZ. The positive result prompted a group of TRIZ practitioners and instructors to analyze the current state of TRIZ learning, training and application in TAR UC using TRIZ’s S-Curve analysis and subsequently propose a plan for future TRIZ implementation in the university college.

TRIZ is an acronym for the Russian phrase "Teoriya Resheniya Izobretatelskikh Zadatch" or “The Theory of Inventive Problem Solving”. TRIZ was discovered by Genrich Altshuller in 1946 when he started reviewing patents looking for clues about how inventive people solve problems [2]. He studied 200,000 patents which were then narrowed down to 40,000 innovative patents and discovered that the problems
repeated across industries and sciences which was later found that the solutions used to solve these problems also repeated correspondingly [2]. TRIZ was initially created for engineering [3]. Recently, TRIZ has extended beyond engineering field especially in management [4], [5], [6] and education [7], [8].

TRIZ has the advantage over other methods such as brainstorming, mind mapping, lateral thinking and morphological analysis as they are only able to identify a problem and its root cause but are relatively weak in generating the solutions as compare to TRIZ [3]. TRIZ strength lies in idea generation [9]. As a result, TRIZ is able to reduce time spent on generating ideas to find solutions.

2. Problem Statement

Numerous workshops and trainings have been conducted to train TRIZ practitioners and TRIZ instructors. The result has been encouraging whereby TAR UC won the 2012 TRIZ Malaysia competition and more than 10 in-house TRIZ instructors have been trained to teach level one TRIZ and more than 1000 students have benefited from TRIZ. The first question is: what is the current stage of the TAR UC’s TRIZ learning, training and application? The second question is: what should be done to elevate TRIZ implementation to the next stage?

3. Methodology

3.1. Trends of evolution

Altshuller observed that the development of technical systems follow certain trends of evolution. The trends of evolution are repeated across the industries regardless of industry [10], [11]. The trends of evolution are useful for generating ideas for good solutions and predicting the future development of the systems [12], [13]. There are eight evolution trends as listed below [13]:

- Increase in ideality
- Follows the S-curve
- Need less human involvement
- Have non-uniform development of parts
- Simplicity-complexity-simplicity
- Increasing dynamism, flexibility and controllability
- Increasing segmentation and use of fields
- Matching and mismatching of parts.

These trends are not arranged in any particular order. This study uses S-curve to analyze the current stage of TRIZ learning, training and application in TAR UC before recommending steps of improvement.

3.2. S-curve analysis

The S-curve as shown in Figure 1 is similar to the life cycle of a technical system (system) and is described as going through four stages from its initial creation (birth), growth, maturity to its eventual decline or replaced by newer technical systems [14].

![Fig. 1: S-curve.](image-url)
The S-curve analysis allows users to identify the current stage of a technical system before setting a direction for strategizing the development for the system. The performance parameter in the $y$-axis is defined as the performance of TRIZ learning, training, and application in TAR UC. By using guidelines recommended by GEN3, the current stage of TRIZ learning, training, and application in TAR UC can be determined [15].

3.3. System, subsystem and super-system

TRIZ requires the understanding of the boundary of the problem before any analysis can be carried out. The boundary is referred to as the interaction between system, subsystem, and super-system (Figure 2). A system consists of interrelated components designed to improve the efficiency of human activities (society). In our case, the system is TAR UC which is the focus of this paper. A Subsystem is the components of the system. A Super-system consists of components that influence the system but were not designed as part of the system [9], [16]. The interaction between various systems is summarised in Fig. 2.

![Fig. 2: Interaction of System, Super-system and Subsystem.](image)

4. Result and Discussion

4.1. Current stage

S-curve analysis shows that TRIZ learning, training, and application in TAR UC is currently in the 1st stage. The indicators of 1st stage as suggested by GEN3 are summarized in the Table 1.

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<th>Indicator of 1st stage [15] (Performance)</th>
<th>Description</th>
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<td>i. The system lacks resources (people and cash) for development projects which causes slow growth.</td>
<td>• Not many experienced instructors. • TAR UC depends on MyTRIZ for sponsorship. • Many teachers do not understand TRIZ and could hardly integrate it with the professional courses.</td>
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<td>ii. The system has many unresolved technical problems, is unreliable and inefficient.</td>
<td>• TRIZ requires deep understanding and practical experience before producing effective results. • A lot of time must be invested in order to properly understand and apply the methodology for many people especially those with no engineering or science knowledge [2]. • No standardized best-practice guide for the methodology [2]. • TRIZ has yet to be studied extensively in education. The theoretical framework of TRIZ in education is lacking.</td>
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<td>iii. Parts and design need further refinement.</td>
<td>Current TRIZ module is lacking in the following area: • No step-by-step systematic application in the application of TRIZ tools in various problem solving situations. • Not enough exercises for students to practice the TRIZ knowledge. • Not enough case studies to show students how TRIZ tools are used.</td>
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<td>iv. Environmental or non-technical requirements may stop the product (TRIZ) going to market.</td>
<td>• Instructors and students do not have enough industry exposure to the application of TRIZ. • TRIZ may not be readily absorbed and embraced by the administrators. • No endorsement for TRIZ teaching materials to be used in core syllabus.</td>
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4.2. Recommendation and action plan

Using recommendation provided by GEN3 for the 1st stage, the action plans to elevate TRIZ learning, teaching and application to the next stage are formulated and summarized in Table 2.

Table 2: Recommendation and Action Plan

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<td>i. Main efforts should be concentrated on identifying and eliminating bottlenecks that prevent the system from entering the market.</td>
<td>The current system have its shortcoming such as • inexperience and insufficient number of TRIZ instructor. • under developed TRIZ module. • shortage of fund.</td>
<td>• Creation of mentor-mentee system to develop the instructors. • Collaborate with MyTRIZ to train more TRIZ level 1 instructors. • Set up R &amp; D centre in the fields of the learning, teaching and application of TRIZ to improve the current TRIZ module. • Maintain ties with MyTRIZ to secure funding.</td>
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<td>ii. Work with existing infrastructure and resources.</td>
<td>TAR UC may capitalize on the availability infrastructure and resources to maintain the optimum flow of the operation.</td>
<td>• Continue TRIZ training in a regular basis. • Encourage more instructors and students to participate in TRIZ competition and conference. • Setting up TAR UC TRIZ committee to oversee the flow of the operation.</td>
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<td>iii. Integrate the technical system with systems that are leading at the moment.</td>
<td>TRIZ philosophy is rooted in engineering. A specialized module can be designed to first cater for Engineering Courses follow by other courses.</td>
<td>• Work with My TRIZ and MQA and accreditation body to design TAR UC TRIZ module starting with Engineering Courses. • Integrate TRIZ into the syllabus of the engineering course offered.</td>
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<td>iv. Develop the system with the intention of using it in one specific field where the ratio of its advantages to its disadvantages is the most acceptable.</td>
<td>TAR UC is a distinguished institution of higher learning with clear vision. It may capitalize on its strength as the center of education to spread the knowledge of creativity, innovative and problem solving skills.</td>
<td>• Set up TRIZ certification centre to provide TRIZ training.</td>
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<td>v. Analyze the physical and super-system limitations of development in order to determine the promise of a technical system</td>
<td>TRIZ is relatively new in Malaysia. Many industries and local learning institutions just started to understand, learn and implement TRIZ. TAR UC needs the right infrastructure, training ground, funds, and platform for commercialization of students’ invention.</td>
<td>• Collaboration with various industries and learning institutions through TRIZ knowledge exchange and research. • Collaboration with industries, learning institutions and MyTRIZ to commercialize students’ product and generate fund.</td>
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5. Conclusion

S-curve analysis shows that TRIZ learning, training and application is currently in stage one. From here, we are able to generate ideas and propose several actions based on the recommendation of how to elevate TRIZ in TAR UC to the next stage in the future. S-curve analysis is indeed a powerful tool to analyze the trend of the technical system and provide recommendation for the development of the technical system.

6. Acknowledgements

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7. References


