

METHOD OF INNOVATION STRATEGIES FORMULATION AND EXAMPLE OF ITS APPLICATION FOR SOFTWARE DEVELOPMENT

Pavel Livotov, Dr-Ing.
p.livotov@tris-europe.com

Abstract

The right formulation of innovation tasks is often much more difficult challenge than inventive problem solving, idea generation or idea management. The best innovation and business success opportunities possess benefits that are important to customers but are not satisfied by existing technical solutions, products or services. Selecting benefits with the highest market and innovation potential from a long list of customer benefits is vital, since chasing after less promising ones consumes resources. The developed method for innovation strategy formulation, systematic problem solving with TRIZ methodology and innovation concept development makes it possible to discover the most promising areas for further design work.

The approach is demonstrated by its application to the improvement of idea management within companies. The case study summarizes requirements which organizations should seriously consider for improvement in management of their know-how assets. It presents the evaluated results of quantitative market research and analysis opportunities for disruptive and sustainable innovation for idea management software. It also demonstrates examples of solution ideas created with the help of the Theory of Inventive Problem Solving TRIZ. Finally, it outlines architecture of the a new web-based software TriS-IDEAS that organizes and accelerates the customer-driven innovation process, supporting systematic problem solving using TRIZ methodology, enabling company-wide virtual innovative teamwork via a web-based intranet combined with an integrated idea and knowledge management system.

1. Introduction

In attempt to achieve their business objectives, companies typically execute an innovation process that involves interviewing customers, brainstorming ideas, formulating new product concepts, creating prototypes, testing them in the market and refining concepts with customer feedback. As most companies confirm, the accepted traditional methods for carrying out innovation processes offer no guarantee of success. It is well understood, for example, that direct use of "voice of the customer" for innovation too often leads to customer disappointment or market failures. Innovations that bring exactly what customers request deliver no significant competitive advantage, rather only "me-too" products.

Despite the best efforts to reduce the risk and avoid failures, about 70% of all industry innovation initiatives are abandoned or fail. Of those innovations that do succeed, over 80% offer only incremental improvements compared to the products on the market. That explains the high level of interest and expectation, if and how the computer-aided innovation and invention tools, including TRIZ methodology [1], [2] can satisfy the true needs of industrial companies. One could argue that TRIZ methods and software deliver the only approach that helps companies to overcome a general lack of creativity, to formulate and solve their problems systematically. Our experience does not support this premise. On the contrary, many companies are able to generate hundreds of ideas with a seemingly endless flow of

creativity as the steadily increasing amount of the new patents applications per year confirms.

However, the current situation in planning and executing innovation processes contains considerable drawbacks. It is firstly due to the lack of the tools for strategic task definition of short to long term innovation, secondly to the lack of methods for market success prediction of new product concepts already in the early stages of innovation process, and finally to the unsatisfactory level of computer-aided idea management support regarding idea generation, exchange, sharing, evaluation, retrieval, taxonomic structuring etc. within companies.

Based on more than 8 years of research work, validation and optimization of achieved results through industrial innovation projects, we developed a methodological approach enabling the market-orientated innovation strategy formulation combined with the TRIZ best practices for inventive problem solving and prediction of technological evolutionary potential. This methodology was implemented as a web-based computer-aided innovation software TriS-IDEAS.

The approach includes a formalized method for identification and quantification of customer benefits – customer's true requirements and often-unsaid needs which are stable over time and independent of currently known technical solutions. In the next step, the method helps to discover and calculate the measurable market or innovation potential of customer benefits in each selected customer group or market segment, and then to calculate the market potential of each benefit as a decisive factor of customer's value. The benefits with highest market potential define the future measurable features of new products. Based on this analysis, innovative concepts that lead to a significant measurable growth in customer value and satisfaction can be systematically developed.

The computer-aided approach uses Scenario Planning to help anticipate and calculate the market opportunities of innovation concepts already in the very early stages of the innovation process - already in the phase where the innovation strategy and tasks are formulated. It structures the innovation activities, focusing them on the tasks that are essential for market success, reducing innovation costs and risk of poor investments.

The paper demonstrates how this method was applied for discovering true industrial needs and market opportunities for computer-aided idea management. It includes the latest results of the market research in more than 300 German speaking European industrial companies, performed in March-April 2005, and presents a real case study of market-orientated product development in software engineering.

2. Approach for innovation scenario planning

The approach for scenario planning of innovation strategies and innovation concept development consists of two stages – the Strategic and Execution phases. The Strategic phase is crucial for formulating the decisive factors for innovation success and provides a basis for systematic execution of the customer-orientated innovation process. It helps to capture market requirements and customer benefits, to transform them into measurable performance factors, and to benchmark the competition. From here, strategic product or service innovations with higher market success can be systematically developed, which in turn will guarantee a significant increase in profits and the unique market position.

The Execution phase of the innovation process follows the Strategic phase after a package of customer benefits was selected as innovation strategy. The Execution phase includes detailed definition of tasks and inventive problems to be solved, systematic idea generation using TRIZ inventive tools, idea evaluation, creation and evaluation (scoring) of innovation

concepts. It is completed with the choice of the optimal innovation concept for further design work and implementation.

The computerized algorithm can be demonstrated as follows:

- Strategic Phase
 1. Initial situation analysis: market, customers, competitors
 2. Functional analysis of the product or system
 3. Capturing the desired customer benefits
 4. Computing market potential of the customer benefits
 5. Formulation of the innovation strategy
- Execution Phase
 6. Systematic idea generation and inventive problem solving supported by TRIZ
 7. Idea evaluation
 8. Innovation concept development and evaluation
 9. Choice of the optimal innovation concept

2.1 Strategic phase

The development of new product concepts starts with the initial situation analysis and systematic clearly arranged documentation of all known requirements. In the next step, the primary system function and all essential system components with their useful positive functions and undesired negative properties are defined. From here, the future innovation tasks and customer desired benefits, as enhancing the positive functions and eliminating negative ones, can be pre-formulated. Thanks to computer-aided execution of the approach, all created project steps and data elements are automatically saved both in the project and global databases.

Capturing of the desired customer benefits belongs to the core part of the Strategic phase. For that purpose, one needs to identify all the criteria customers use to judge value, their true requirements and often-unsaid needs which are independent of currently known technical solutions. Such benefit-based innovation planning belongs to the best practices in innovation management over the past years [3], [4], [5].

The benefits can be, for example, identified by interviewing a representative number of customers for each customer set. The customer interviews are based on answering the following questions:

1. What does the customer really mean and need?
2. What advantages or disadvantages do customers have?
3. What criteria do customers use to judge product value?

Etc.

Capturing and final formulation of the customer benefits is based on the system analysis performed at the earlier step under consideration of the following features:

a) Benefits are independent from technical solutions and therefore deliver true customer needs.

Example: "Minimize connection time of two electric cables" is a customer benefit which can be realized by means of plug connector, cabling box or other solutions.

b) Benefits are stable over time and finite in number, once captured they serve as basis for new product concepts.

Example: Following benefits of music fans remained stable over decades for products such as vinyl disc, tape, audio-CD or DVD, MP3 (Figure 1)

1. Increase tone and sound quality.
2. Increase play duration.
3. Increase damage resistance.
4. Extend service life, etc.



Figure 1. Definition of the music fan's benefits

Based on the identified customer benefits, a questionnaire for quantitative market analysis can be created for each customer set. A statistically representative market survey, performed for each selected customer set separately, delivers two statements for every benefit: its importance degree for customer, and its satisfaction degree to which a benefit is fulfilled through existing products. Importance and satisfaction help to calculate the market potential of a benefit as a decisive factor of customer value. Benefits with high importance and low satisfaction have higher value of market potential.

This calculation method is based on the new mathematical model [6] which considers the influence of the absolute importance level of the customer requirements, the influence of the satisfaction level with solutions and products known to the customers as well as the calculated gap between the importance and satisfaction. Market potential is calculated as a maximum added value in percent which benefit can contribute to increase the total product value, which is usually measured in percent.

Market potential can be also explained as success or innovation potential of a benefit. However, any direct conversion of the market potential into future earnings or profits is not possible. Along with the ideal or highest contribution of each benefit into the potential product value growth, the calculation method also helps to estimate the current product value as a measurable factor for customer satisfaction with a whole product in general.

The aim of the software development project, presented here as a case study, was in first step to analyze the current situation with the level of user's satisfaction, with existing idea management software within industrial companies and to measure the level of importance of deliverable idea management benefits. For this purpose, the following main requirements to any idea management system were discovered by interviewing innovation managers and engineers:

1. Raise the total number of ideas in the company.
2. Raise the number of patented ideas in the company.
3. Submit own ideas fast and easy.
4. Improve motivation (e.g. bonus) for submitting more own ideas.
5. Comfortable and fast knowledge and experience exchange about submitted ideas, e.g. via open discussions, etc.
6. Reduce risk of incorrect evaluation of new ideas (e.g. a good idea is not recommended for implementation and vice versa).
7. Reduce time expenditure for detailed idea evaluation, classification and management.
8. Trace ideas fast and easy after submitting, e.g. such as evaluation results, investments, implementation results, paid bonus, etc.
9. Improve idea and knowledge exchange in the company between persons and departments.

10. Reduce time to find an existing idea in the company, e.g. in the idea pool.
11. Fast analysis and clearly arranged presentation of existing ideas in the company, e.g. through reporting, charts, etc.
12. Flexible definition of user access to ideas, e.g. idea is accessible only for the author, patent attorney, team or department, whole company, etc.
13. Improve adaptability of the idea management process, e.g. steps to be done after submitting an idea are easy to change or optimize, and others.

In the next step, it was quantified which customer benefits have the highest innovation potential for developing of the new and improving of existing software solutions with the high likelihood of market success. The market research was conducted in Germany, Austria and Switzerland with a sample of more than 300 representatives of industrial companies with the help of the specially designed web-based questionnaire. The results were evaluated to estimate the importance level and the level of satisfaction for customer's benefits with statistical validity as shown in Figure 2. As idea management can be conducted both without software support (67% of received questionnaires) and with the software support (33% of questionnaires) these two cases are evaluated and presented separately.

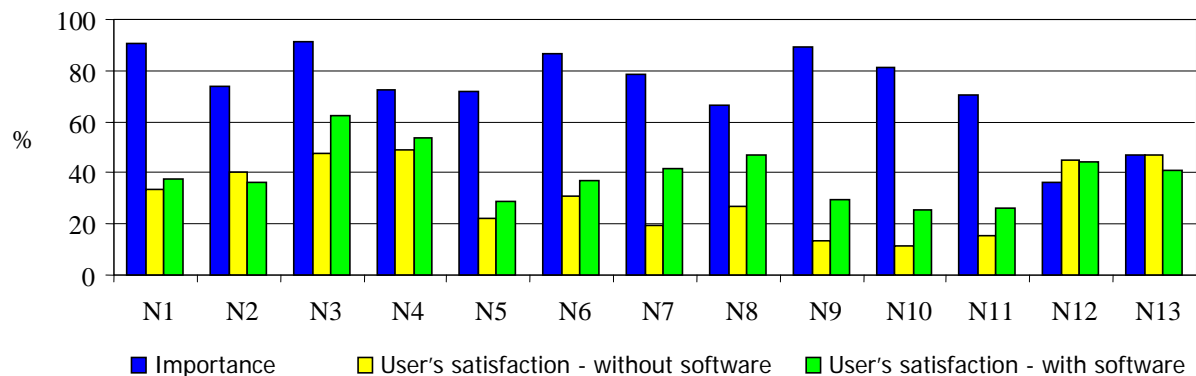


Figure 2. Comparing the importance and satisfaction of the idea management benefits

The results of the investigation demonstrate that the majority of desired idea management benefits still remain underserved in the industrial companies. The majority of existing idea management computer-aided tools does not deliver a significant added value for the companies. About 70% of the software users consider that the performance of existing idea management software is unsatisfactory.

The performed analysis also enables to identify new most profitable directions for product development by clustering customer benefits into four main groups (Figure 3):

- Critical to customers benefits: Importance - high; Satisfaction - low;
- Keep high level of performance: Importance - high; Satisfaction - high;
- Over-engineering and cost cutting potential: Importance - low; Satisfaction - high;
- Possible future potential: Importance - low; Satisfaction - low.

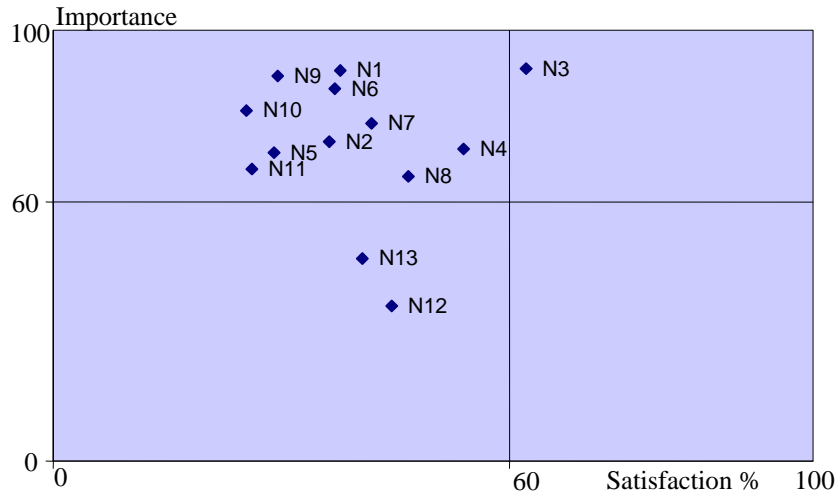


Figure 3. Quadrant analysis of the idea management software user's benefits

The final part of the Strategic phase deals with analysis of the benefits for each selected customer set, i.e. with and without idea management software application. The market potential in percent of the most significant benefits, computed for idea management software users with help of TriS calculation method [6], is shown in the Figure 4.

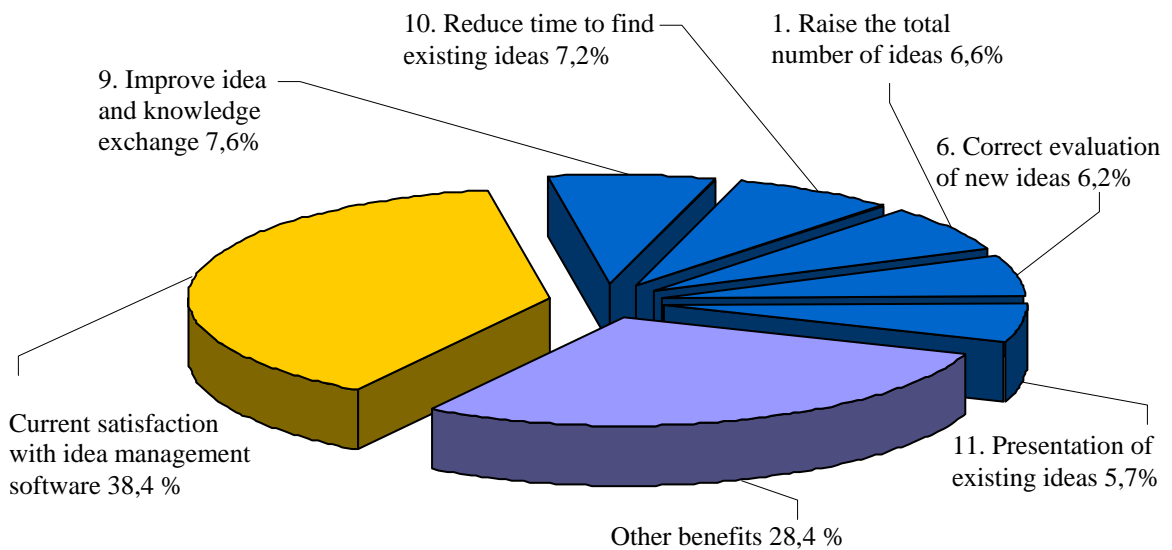


Figure 4. The five most significant benefits of idea management software users with their market potential in %

The customer benefits, sorted in accordance to their market potential, help to structure innovation activities, focusing them on the most essential tasks. Five benefits with highest value of market potential, as listed in the Fig. 4, define the future features of new products. In other words, this package of chosen benefits with the highest market potential shapes the innovation strategy. Analysis of differences to competitive products for each benefit enables benchmarking. The final formulation of the innovation strategy and final choice of the

innovation tasks can be done by comparing the total value of existing product with the target value of future product.

The experience through numerous innovation projects allows us to define the following targets for calculated customer value growth in a new product or service as a guideline for the evaluation of a chosen innovation strategy. For value growth less than 3%, innovation risk in the market is high. For value growth between 4 and 7% compared with best in class, sustainable innovation success is likely. If customer value growth is 8% or more, significant innovation success ensues and often leads to a unique market position.

Expected innovation results on market	Added value, %
Disruptive or breakthrough innovation	> 15 %
Significant innovation success	8...15 %
Notable success for sustainable innovation	4...7 %
High innovation risk	< 3%

Table 1. Guidelines for evaluating innovation strategies

The achievable added value depends on the general maturity level of products, which can be characterized by the total product value as metric for customer satisfaction with the total product. The product value of ca.70% or higher is typical for mature product on the market. As shown in Fig. 4 the average product value of analyzed idea management software with 38,4% is still far away from the maturity border of 70%. The selected five benefits can deliver the added value of 33,3% totally and raise the total product value to 71,7%.

2.2 Execution phase

Customer benefits with the high market potential selected in the Strategic phase create a pool of innovation tasks for systematic idea generation with the help of TRIZ inventive principles. For each task one or more solution ideas can be generated. Measurable customer benefits provide objective basis for idea evaluation directly in relation to the added value each idea delivers to the customers. The value of an idea is 100% if a customer benefit is satisfied to 100%. Additional evaluation criteria such as implementation and development expenditures, costs of the future product cost and risk of possible failures or malfunctions can also be taken into consideration.

To develop a new product concept, the most valuable idea must be selected for each customer benefit. The synthesis of a concept is completed if ideas were chosen for each benefit. Concept value is calculated by the software automatically in accordance to the TriS algorithm, which supports different approaches of concept development. For example, the concept "Maximum Value" includes ideas with maximum idea value regardless of their cost, risk or implementation effort. This approach can be used to estimate maximum added value delivered by previous idea generation. The cost-optimized concept includes ideas with lower cost and average to high value. The cost/effort/risk-optimized concept can be created with following approach:

- Select idea with lowest cost for each customer benefit.
- By equal cost factor select idea with lower effort.
- By equal cost and effort factors select idea with lower risk.
- By equal cost, effort and risk select idea with higher value.

Several product concepts must be further compared in order to select the optimal one for each customer set. Opposing calculated customer satisfaction level of new concept with existing competitive products supports decision making. By any approach the mutual compatibility of ideas remains the key selecting and limiting criterion.

3 Calculation algorithms

For more information about the method of data capturing, statistical evaluation and market potential calculation as well as about the software TriS-IDEAS please contact the author under the address given below.

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Author:

Dr.-Ing. Pavel Livotov, E-Mail: p.livotov@tris-europe.com

TriS Europe GmbH / TriSolver Consulting

Eichendorffstr. 9, D-30175 Hanover, Germany

Fax: +49 511 811 200 40

Tel: +49 511 811 200 45

Internet: www.tris-europe.com