Elements of Success for Government, Industry and University Relations in Siberia

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Abstract

Innovative activities in the Tomsk region have increased multiple folds during the last seven years. This paper builds upon the analysis of the "The Innovative Cluster" of TUSUR, which is often referred to as one of the best innovative clusters in Siberia. The ground work to success in developing government, industry and university linkages within the cluster were set forth several years ago and resulted in a highly efficient internal activities between cluster elements. While optimal value for the coherence factor reflecting top efficiency equals 2.5, calculated coherence factors for the TUSUR Innovative Cluster are as follows: financial resources - 1.5; material resources - 1.9; human resources - 2.5 and information resources - 2.6. This yielded the conclusion that Innovative cluster laid out as resulting in higher efficiency of "Triple Helix", is more probable to generate success in internal cluster activities.

Keywords: coherence evaluation, efficiency of "Triple Helix" interaction, efficiency of innovative activities

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1. Introduction

The Rector and his team from Tomsk State University of Control Systems and Radioelectronics (TUSUR) started innovative activities for the university in the year 2000. They promoted innovative developments in education, science and management and built strong ties with business community and regional government.

Mutual beneficial business relations have been since then. These benefits are:
For the regional government – Further development of innovative activities in Tomsk region and increased attractiveness of the region for investors.
For businesses – easier access to the latest research results, closer relations with scientific elite, employ best university graduates.
For the university - additional university financing from private company and regional government for further development increased university reputation that attract leading professors and most talented students.

As a result of several years of cooperation “The Innovative Cluster” of TUSUR was formed and became the leader in Siberia.

Basic principles of collaboration between government, industry and university within the cluster for all participants, are:

1. ***Partnership.*** Partners are TUSUR alumni, whom have organized technology companies that fit TUSUR profile and have agreed with TUSUR to take part in the mutual activities. This creates conditions for equal rights and mutual respect for the interests of all parties involved.

2. ***“Dual citizenship”.*** This partnership stimulates a company / team to set up research institutes (RI), design bureaus (DB), or research laboratories (RL) within TUSUR. TUSUR guarantees those university subdivisions complete financial freedom. Directors of private firms normally become principals of these RIs, DBs or RLs. If these RIs, DBs or RLs become successful, their directors are then granted a seat on the University Academic Council. Created units within the University structure are given by the university Rector the rights to sign their contracts on behalf of TUSUR and to maintain their own accounting, reporting annually to the University Financial Administration.

3. ***Privilege internal payment.*** The central fund of TUSUR receives a portion of the profits that is earned from the business contracts this way maximum resources remain available for partners and additional development of units.

4. ***Guarantees.*** In the event that a company exits the partnership. TUSUR guarantees to investors/company to provide the usage of all materials generated by the project (i.e., equipment, repairs, buildings, etc.) but no longer provides salaries, travel expenses and other expenses that become direct expenses of the investors/company.

Industries collaborate with the university as such:

1. The industries provide the infrastructure for research and development. They make the necessary repairs to the TUSUR premises and provide furniture, computers and scientific equipment. This is their direct investment to TUSUR.

2. Usually private companies provide their own research and development team but they also may contract parts of their work to TUSUR. Allowing them the broad experience and knowledge of the whole scientific community.

3. Companies supply the university laboratories with modern equipment which essentially advance the students of TUSUR to be better qualified professionals. The university trains specialists according to the requirements of the companies and at the expense of the companies. It given additional financing for TUSUR and qualified specialists for the companies.

Contractually the university and the companies are not financially liable to each other which could be seen as a paradox. However, the synergetic effect created from the interaction of the university and the companies so great that results grow exponentially.

Regional authorities of the Tomsk Regional Administration (TRA) have created favorable conditions and provide financial support as follows:

1. TRA has programs that provide partial financial support for innovative projects via competitions. TRA is the initiator and one of the investors for various elements of innovation infrastructure such as Commercialization Units and Business Incubators. Regional authorities reduce local taxes for innovative projects that are implemented by the industries.

2. Regional authorities insure support of federal authorities for innovative projects and the local participants (i.e., universities, research institutes and businesses).

3. City of Tomsk and regional authorities preserve an image of Tomsk as "The Creative City – The City of Education and Science".

The elements for a "Triple Helix Model" of "The Innovative Cluster" of TUSUR are as represented in Figure 1. The green field is Industry, blue is the university and yellow is the governmental and non-governmental organizations. Interaction of this "Triple Helix" has already been fruitful.

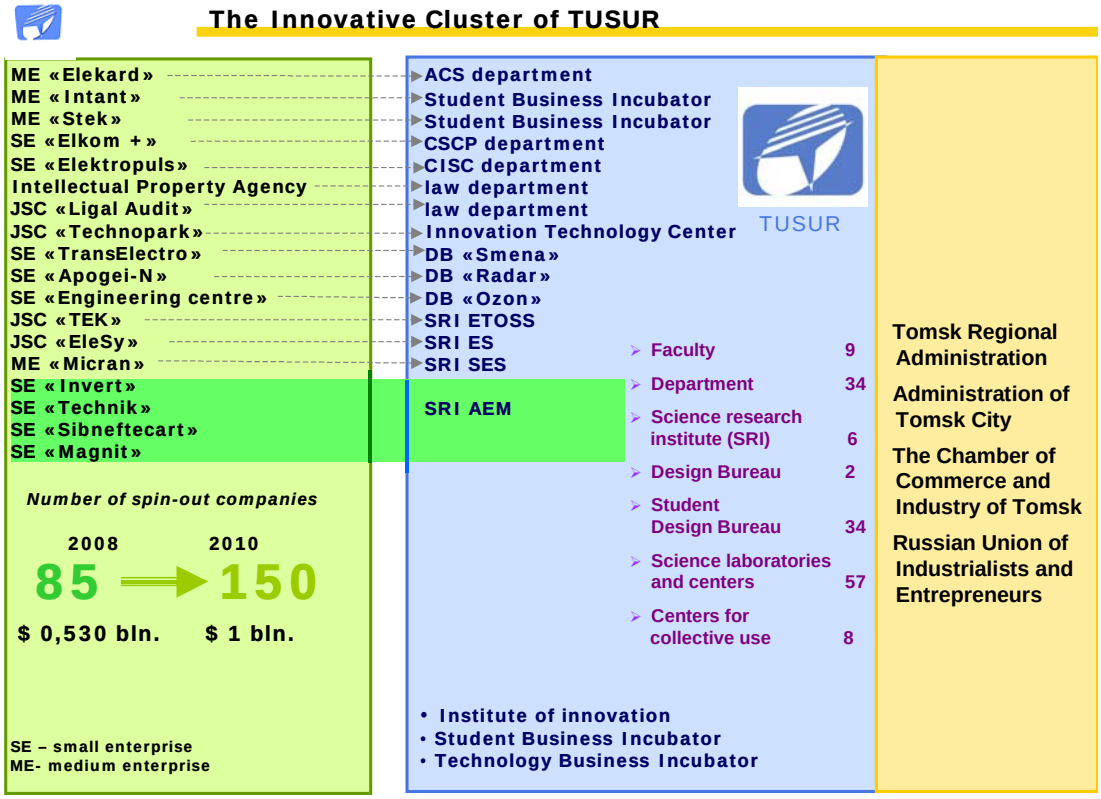

Figure 1. "Triple Helix Model" with a "cross-section" view of "The Innovative Cluster" at TUSUR.

Here is an example where TUSUR uses the "Triple Helix Model" to foster a cluster. First, the innovative projects were not realized by a linear path but by consecutive contacts from various sources. Such as at the startup stage of an innovative project the university provides resources (space, equipment, knowledge, students, consultants and etc.) to the project. The Tomsk Regional and City Administration support the innovative projects with training, grants and consultations. Also, the stage before the "Incubation" (when work starts at a business incubator) there is university support and support from business (finance and consulting).

Further on the startup stage of the company there is continued support from businesses and government (regional and federal). The wide reaching support from TUSUR, business and governmental sources carry on even further. Such the drawback for Russia is that such processes take place only on a microeconomic scale and per micro clusters. The aim for Russia/TUSUR is creation of "Triple Helix" on a macro scale for big clusters. It is necessary to show the efficiency of such model on a micro scale.

Thus, the aim of our investigation is bringing to light the efficiency of "The Innovative Cluster" and determination the strong points of the cluster and its surrounding with its impacts socially and economically.

2. Structural model created based on the investigation of "The Innovative Cluster" of TUSUR

For achieving this ambitious aim, we used methods of system analysis and resource approach. The basic attention is given to the model of composition, to the structure of the system and also to the structural model. Investigation of a cluster starts with determination of its elements and sub-systems. The algorithm of investigation is presented below.

2.1. Construction of the model of composition

The system composition model is described from its sub-systems and elements that it consists. To evaluate "The Innovative Cluster" the following composition of elements was proposed:

1) Education - faculties, departments, institutes, centers.
2) Science - science-research institutes, design bureau.
3) Infrastructure - Student Business Incubator, Technopark, Commercialization Unit, Patent information office and others.
4) Medium Enterprise.
5) Small Enterprise.

2.2. Construction of the structural model

It is generally known that the structural model is a complexity of necessary and sufficient relationships for the aim of an achievement. The outcome of intercommunication among the elements can be completely determined by the production of the structural model. The intercommunication is considered like a resource flow or like access to resources. It is the authors' opinion that information resource is the most important element of an innovative cluster and consequently the importance of the information resource is one of characteristics of a system as innovative activity.

3. Algorithm and mechanism of coherence evaluation

The coherence of a system is considered like the characteristic describing the sustainability and the importance of interactions among its elements. In general, the higher the inter-actions in a system, the more considerable the synergy. The resource approach can presupposes by calculating the coefficient of coherence. In most cases it is enough to determine the next needed resource:

- Finance
- Material
- Human Resources
- Information

This presupposition takes into account each resource separately.

The degree of the cluster coherence is determined by many factors but there are three main factors:

A) resource pool;
B) changes in business environment (primarily – market conditions);
C) limitations of cluster resources.

The resource pool results in the strengthening of internal communication. It happens as the result of companies reorientation to use more available and less expensive resource within the system. In general, most of companies and organizations orient to specific market segments which surround it (customers and suppliers). Internal company changes are a result of reaction to constant external company changes. This process of adaptation to market requirements inhibits the complete integration of a company into a cluster. In other words companies can not receive all necessary resource within the cluster and rely on outside resources.

Thus, the value of the cluster coherence will be at a balance which is stipulated for internal resources and interaction with external surroundings. Lower limit of coherence is 0, and upper limit is determined by number of system elements (in our case 5). In the first case the interaction among elements is absent. In the second case there is the whole integration of elements. The point of view of system conception: optimum value of coherence is medium value, in our case 2.5. Otherwise mutual addition of elements by resources inheres in high level, where synergy effects are significant, system is stable but dependency of elements of system is not critical and enables an independent determination of the aims, priorities and realization of any actions.

For the evaluation of the innovative cluster coherence with the use of the resource approach we used the following algorithm:
Step 1. Forming of matrixes of influence/dependencies factors (one element of cluster influences on another element) on each type of resources with use of the contracted model. Values of factors are formed, so that in the absence of influences or dependencies it becomes zero, but under the absolute influence or dependency it is a unit.
Step 2. In the formula (1) the system coherence factor for each type of resource is calculated. Amount of calculated the integral factors corresponds to the amount of resource types, chosen for the evaluation.

$$S_r = \sum_{i,j=1}^{n} \beta_{ji} \cdot \alpha_i \cdot P_i \qquad (1),$$

where α_i - a factor of innovation activity for i element;
β_{ji} - an influence factor for j element on the element i;
P_i - a potential for i element;
n - the amount of system elements. For “The Innovative Cluster” of TUSUR, according to developed structural model, n = 5.
r – a type of resources on which based the evaluation. In this instance resource r is financial, information, material or human.
Step 3. Analysis of evaluation results "coherence" and "synergy effect".

4. Results and evaluations

The results of approbations of mechanism of the innovative cluster evaluation for the example of “The Innovative Cluster” of TUSUR received the following coherence factors:

1) financial resources: 1.5
2) material resources: 1.9
3) human resources: 2.5
4) information resources: 2.6

Coherence factors on material, information and human resources are possible to interpret as an increasing of resources possibilities for system elements (i.e. a volume of resources, which can be directed to the development, is increased). Reasoning from calculated values of factors, recourse possibilities are increased more than two times. Coherence of “The Innovative Cluster” of TUSUR in information and human resources corresponds to the optimal value. Obtained results characterize high coherence of the system of “The Innovative Cluster” of TUSUR in all types of resources. This gives the following advantages for the system as a whole: significant synergy; long-term system stability; increasing of efficiency and rate of R&D execution and so forth.

5. Conclusion

When an innovative cluster is laid out as a “Triple Helix” the results of the internal activities are probable to generate success. Due to this success and synergy of our “Triple Helix” model the following results were reached by the end of 2008:

- 85 enterprises became successfully organized units and function within TUSUR;
- 120 projects have been implemented by TUSUR graduates for Tomsk enterprises;
- last two years the revenues of the companies in the “Innovative Cluster” showed increases of 50% per year;
- 176 new enterprises have been created by the TUSUR graduates;
- according to Federal authorities Tomsk Region has became a leader of innovative activities in Russia.

Since the formation of “The Innovative Cluster” TUSUR has increased its financing for R&D by 19 times during last 6 years. In 2008 the enterprises created by TUSUR graduates produced about 80% of all high-tech products produced in Tomsk Region.

The long-term outlook for TUSUR will be transformed to an innovative high-tech university in field of radioelectronics and control systems, to occupy the leading positions in Siberian Region and to integrate itself into the global scientific and educational community. The University will continue to surround itself with scientific intensive enterprises (no less than 150), headed and remanded by it’s graduates who support close scientific and educational ties with the university.

TUSUR exerts influence on members of “The Innovative Cluster” and often referred as one of leaders in innovative culture of Siberia. This is a transference of focus from the engineer to the owners of the companies whom employee the engineers. This is “the wave” of high-tech entrepreneurs with distinctive peculiarities and significant advantages that are formed, by the leadership of “The Innovative Cluster” at TUSUR.