



## DETERMINING AND ASSESSING THE SYNERGY EFFICIENCY IN INDUSTRIAL CLUSTER

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### ABSTRACT

*The article deals with the scientific observation of the emergence of the synergy effect. Forms and conditions of emergence of synergy effects of industrial clusters have been determined. The synergistic effect was observed by abstracting the interdependence of the factors. A system of indicators was formed to evaluate the synergistic effect of the industrial cluster. A methodological approach to calculating the synergy effect of industrial clusters is proposed.*

### Introduction

High importance is attached to the use of the cluster approach as the priority directions of Uzbekistan's industry development policy. Cluster policy is a modern version of traditional industrial policy, he enterprises, regions focused on the creation and distribution of innovative products and It is the policy and technology to increase the competitiveness of the whole country. On the basis of industrial clustering, a deep integration of science and education and production occurs.

Industrial clusters formed in the regions help to find solutions for regional economic development, reduce differences in the level of regional development and ensure balanced development.

Clusters create innovative products and achieve economic efficiency by combining their material and financial resources in the face of intense competition and will have access to new markets. Accordingly, the main objective of the implementation of the cluster policy is to ensure the effect of synergy in the industry. However, sufficient scientific and methodological bases have not yet been developed for determining the synergy effect of clusters.

### Literature analysis

G. A. Krasnov, V. V. Vinogradov, A. A. Krasnovlar "The synergistic effect can be both negative and positive. In general, it has been determined that a positive synergistic effect occurs due to the subadditivity of costs as a result of combining "n" economic systems into one system. [1]

In the scientific literature, there are various manifestations of synergy, they are as follows:[2]



trade synergy is an effect obtained based on the reduction of sales costs as a result of the use of a certain sales network by enterprises producing various products, the formation of a centralized system of sales, and the establishment of common warehouses;[3]

operational synergy is an additional effect obtained from the results of targeted and cooperative use of fixed and working capital, labor force in production enterprises;[4]

investment synergy is an additional benefit resulting from the joint use of production capacities, the formation of common resource reserves, the joint use of management and scientific development goals;[5]

management synergy is an additional effect obtained from the purposeful organization of management processes for the creation of new products, penetration into new industries;

functional synergy represents the effect of synergy arising on the basis of the mutual integration of enterprises in the production chain, that is, based on the integration of enterprises for the production of a single product for the purpose of reducing production costs, costs are reduced and the effect of synergy is observed.

financial synergy is an additional effect obtained from the results of using financial resources, obtaining financial assistance by increasing financial opportunities through mutual cooperation, tax benefits and targeted loans;

information synergy is an additional effect obtained from the results of mutual cooperation of certain market information of enterprises;

The synergistic effect in the cluster is formed as a result of consistent implementation of three principles, which are as follows: [6] innovative principle, distributive principle, multiplicative principle.

Innovativeness is the first principle, which is explained by the creation of momentum based on the magnitude and dynamics of innovation and the formation of synergistic effects. [7] According to the principle of innovation, the effect of synergy reflects the sum of the effects obtained based on the wide spread and dispersion of innovations. [8]

The distributive principle implies additional synergies obtained for certain enterprises based on the distribution of costs in innovation processes or production processes. Distributive principle focuses on the benefit obtained based on the distribution of costs among cluster participants. In particular, the joint action of cluster participants to educate customers about certain innovative products is based on the distributive principle.

From the Latin "multiplier" plural, multiplication means In the economy of clusters, income manifests itself in the form of a multiplier in a progressive form. It is known that the essence of the concept of "multiplier" in economic theory is based on J. Keynes's "increase in income based on the increase in the total volume of investment, several times (K) more than the increase in the total volume of investment". [9] The interpretation of the multiplicative principle is based on this rule.

In general, there are reasonable studies on the fact that it is not always possible to determine the synergistic effect of clusters in scientific theoretical views. However, the main participants of the cluster, that is, the interaction of the enterprises in the set forming the cluster due to the complex effect in non-cluster enterprises, it can be considered as a synergy effect that exceeds the sum of the effects of individual activities.



Industrial enterprises need financial resources, skilled labor and high-tech laboratories to develop product, technology and marketing innovations, and small enterprises do not have the capacity to combine them all. On the other hand, the integration of enterprises in a cluster for the production of the final product provides the mentioned opportunities, and the effect of synergy is observed through the diffusion of innovations to the enterprises participating in the cluster.

The closer the relationship between different sectors and types of production in the economy of the region or country, as a rule, the more the multiplier effect is manifested as the sum of incomes that increase as a result of the joint interaction of the entities. [10] In turn, the multiplier effect creates an acceleration effect, because the returns from the multiplier increases used for investment are higher than the increase in investment. As a result of the spread of one or another effect, the development process of the region and the country takes place.

Unlike the multiplier and accelerator effects, the synergy effect is based on the sum of positive effects that appear in the "heart" of the regional agglomeration, that is, the sum of positive effects arising from a new way of forming relations between cluster members.

In research, the multiplier effect of mutual relations is used as a basis for developing a hypothesis for studying the impact of industrial clusters on economic and social development. That is, narrow location (geographically) of industrial sectors in the economy of one country, closeness and strength of mutual relations provide a high multiplier[6] effect, and mutual proximity always ensures an increase in income and expansion of cooperation relations of subjects.[11]

### **Research methodology**

Conducting research begins with the collection of facts, they are studied and systematized, summarized, certain economic laws are studied to create logically structured systems of scientific knowledge that allow explaining the known and predicting new ones. The method of scientific abstraction is used as a methodological basis in the research. With the help of abstraction, the properties of the origin of synergy are determined based on the generalized results of event-based reasoning. Synergy effect is observed by abstracting the interdependence of events. Based on the ideas formed with the help of abstraction, the likelihood of synergy is replaced by a simplified model, which uses mathematical functions to create its visual representation. It helps to express the forms of formation of synergistic effect of these functions. Based on the functions obtained by abstraction, a logical diagram of the process of forming the synergy effect of industrial clusters is created. Factors identified on the basis of monitoring the process of synergy effect formation create an opportunity to develop a system of indicators for evaluating the synergistic effect of the industrial cluster. Examples based on mental thoughts are considered to represent the practical results of the indicator system for evaluating the synergistic effect of the industrial cluster .

### **Analysis and results**

There is a theory of total and marginal (marginal) utility in economics. According to the marginal theory, utility is called additional marginal profit, so the fulfillment of the following conditions is the basis for obtaining the cluster's synergy effect:



$$IMF \rightarrow IUF \quad (1)$$

In this,

IMF – marginal utility of innovation;

IUF is the total utility of innovation.

The total utility of innovation (IUF) has the following linear form:

$$IUF = a + f(s,t,d,e) \quad (2)$$

In this,

a – without innovations utility ;

f (s,t,d,e) additional utility obtained on the basis of innovations;

In turn, the additional benefit obtained on the basis of innovation is reflected in the following:

s – social benefit;

t - technical-technological benefit;

d - financial and economic profit ;

e - ecological benefit;

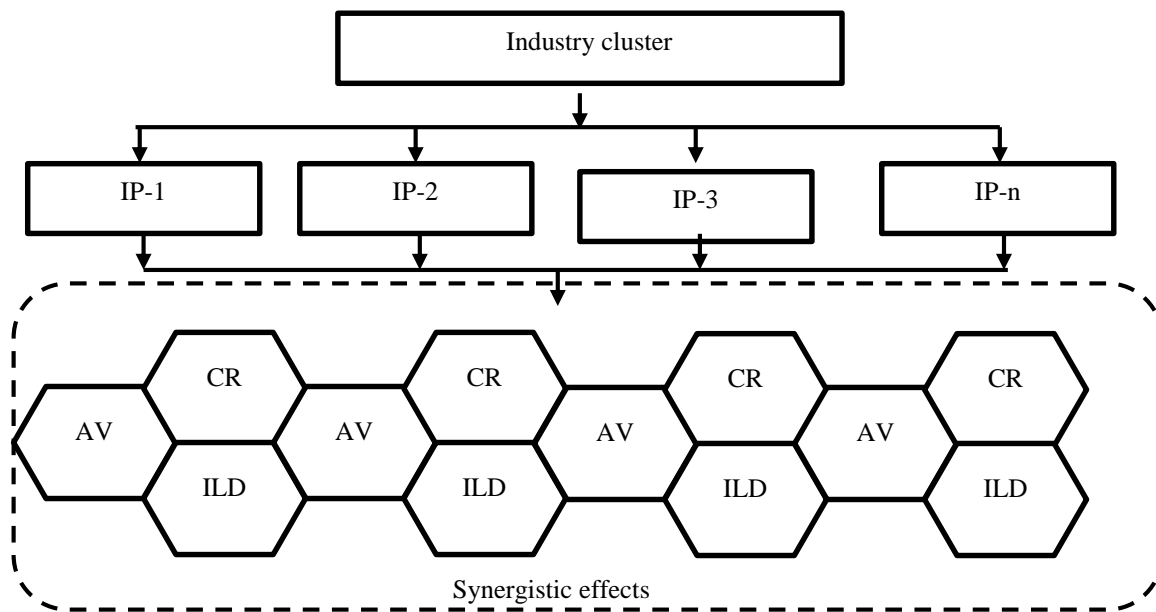
Innovations created in any enterprise provide one-time benefits. Based on this law, the category of synergy emerges. If the enterprise that created the innovation implements it, a benefit with a synergistic effect is formed.

The proposed functional relationship produces the following total utility : the utility function obtained as a result of the realization of innovations after the marginal utility is as follows:

$$IUF = IMF + f(s,t,d,e) \quad (3)$$

Creating an innovation, its marginal utility approaches the total utility, without additional unexpected costs, the costs of each user of the innovation will be reduced by a certain amount, and additional profit will arise based on the optimization method. In addition, implementation of innovation increases the demand for these innovative products, as a result, working capital increases, income increases.

Organization of any production process, production of new products and other activities is not always possible in a single enterprise. Material and financial opportunities for the implementation of innovations by the enterprise are limited. Therefore, at the same time that the adoption of a new type of product depends on real material costs, there is a need to use this technology in fuller capacity by the partner enterprise. Therefore, the creation of a new type of product by two partner enterprises creates a certain amount of added value and is evaluated as a multiplier effect of the cluster. The value created is the saving of costs that should be made by both companies separately for the production of this product, and it is always higher compared to the results obtained separately. At the same time, the multiplier effect always produces the accelerator effect. The synergy effect of clusters is formed based on the mutual spiral mechanism of multiplier and accelerator effects (Fig. 1).



IP – innovative project;  
 AD – added value;  
 CR - cost reduction;  
 ILD - increase the level of development

**Figure 1. The process of formation of synergy effects of industrial clusters<sup>1</sup>**

An economic point of view, the synergy effect of a cluster is an additional effect obtained as a result of the interaction of two or more enterprises and their innovative service providers. In other words, the result of the joint actions of the enterprises operating in the cluster is higher than the sum of the economic results of each enterprise separately.

Based on the results of scientific abstraction, the effect of synergy represents the indirect effect obtained from the results of the effective integration of those operating in the cluster, that is, it is manifested as the result of the effective integration of general management, scientific research and innovation, marketing and operational activities.

The overall benefit of the synergistic approach is formed by the marginal benefits, which, through the actions of the multiplier and accelerator, create many different effects, accumulate and together create the synergistic effect of the industrial cluster.

The synergistic effect obtained from the activity of industrial clusters has a quantitative and qualitative nature, so they should be evaluated. There are many areas of assessment in practice. The first approach to quantitatively assess the synergy effect of clusters is an assessment based on cost methods. The concept of cost evaluation is based on the criterion of the value of net assets of the enterprise, which is defined as the difference between the sum of accumulated assets and the amount of its liabilities. The increase in the value of the net assets of the clusters, that is, the company's business reputation, connections, brand awareness, management level, etc., is determined by excess profits. In this case, the difference between the actual net profit and the profit value that can be obtained at the average level of profitability of the industry is considered as a measure of the synergy effect. This excess profit

<sup>1</sup> Author development



acts as an additional cost of the cluster and allows to increase the real value of the common assets.

Clusters are primarily a specific system. Therefore, another approach to assessing the synergy effect of clusters is a systematic approach.

The systematic approach is a methodological expression of the principles indicated in the general theory of systems, a general scientific methodology for the qualitative study and modeling of various interrelated objects and processes, and it is Yu.A. Lapygin [11] reflected in his studies. A cluster as an economic system has certain properties, its constituent elements, interactions and processes. Due to the non-linear change of the state of the system, the synchronous interaction of several related processes and objects occurs, and its final result is a synergistic effect.

The combination of a systemic and synergistic approach forms a resonant approach. The resonant approach is a type of systematic effect known in the scientific literature as the "butterfly effect". According to this approach, it is based on the assumption that changes in a certain economic space will lead to certain consequences elsewhere through cooperative relations .

Suvorova L. A. In research, it is based on the manifestation of synergistic effect in clusters based on the principle of electromagnetic waves. It happens as follows: the development and implementation of an innovation creates "vibrations" in the activities of all participants in the creation and implementation of this innovation. The result is a synergistic effect in the economy comparable to electromagnetic radiation in physics. [6] Suvorova L. A. suggests using an approach based on the hypothesis that the level of demand for an innovative product is directly proportional to the innovative component in this product . In doing so, the author proposes the following system of indicators:

1. An innovative product (technology) model, which is a set of characteristics, signs (new and existing) that make up an innovative product (technology), represents the following function:

$$I = f(a, b, c, \dots n) + f(i) \quad (4)$$

here,

$f(a, b, c, \dots n)$ - characteristics of properties already present in the innovative product created in the cluster;

$f(i)$ new features of the innovative product created in the cluster ;

2. In the product It is proposed to calculate the innovative component ( I ) according to the following formula :

$$I = \frac{f(i)}{f(a, b, c, \dots n)} \quad (5)$$

3. Also , the rate of diffusion of the innovative product count necessary ( $V_i$ ):

$$V_i = \frac{f(a, b, c, \dots n) + f(i)}{f(a, b, c, \dots n)} \quad (6)$$

Testing this approach based on conditional examples gives the following results. For example, there is a product with 5 features. Innovation resulting in a product with 10 features (5 existing and 5 new). As a result, the innovation component in the new product is equal to 0.5, and if the distribution speed of this innovative product is 2, that is, 12 turns per year, then the innovative product makes 24 turns per year. If the original product has only 2



features, then the innovation component in the new product will be equal to 0.8. The speed of distribution of an innovative product brings out the spillover effect (effect) 5 or 60 times a year.

In the formula of the potential capacity of synergistic effect, the rate of diffusion of an innovative product, i.e.  $V_i$ , is calculated, and the results allow to observe the additional synergistic effect of clusters :

$$E = m * V_i * h \quad (7)$$

$m$  is the main part of the cluster the number of accumulated units;

$V_i$  - speed of distribution of industrial product;

$h$  is the number of levels of aggregated units included in the cluster.

In general, five levels can be distinguished:

1. Modern infrastructure;
2. Production infrastructure;
3. Sales infrastructure;
4. Technological infrastructure;
5. Institutional infrastructure.

Synergistic effect is a result formed as a result of the use of organizational, technological, and financial knowledge, resulting from the interaction of the parts that make up the system . Structurally, the synergistic effect can manifest itself in a complex form (that is, the sum of all types of effects that make up the synergistic effect) or individually.

Manifestation of the synergistic effect largely depends not on the number and quality of the constituent elements, but on the way they are connected, the mechanisms of communication within the system. The more diverse these connections are, the more interaction methods there are in the cluster structures, the higher the organizational capacity of the system as a whole and the higher the speed of distribution of the product created in the cluster.

Within the framework of the multiplicative approach, three methods of calculating the synergy effect are distinguished: the intersectoral balance method, the method of creating a matrix of social accounts, and the method of creating a matrix of total costs.

At present, the form of assessment of the synergy effect based on the financial performance indicators of the individual members of the integrated group in the multiplicative approach is based on the costs and economic results . is used.

Separate, direct general indicators of the activity of separate blocks of the integrated structure (financial, production, scientific research, trade ), as well as direct indicators of the efficiency of the integration as a whole (industrial cluster, market price assessment , value of assets, total based on indicators such as turnover, gross profit, etc.) .

To evaluate the synergy effect of the industrial cluster, all indicators can be combined into five groups (Table 1).

Table 1

of innovation cluster synergy effect evaluation indicators

Group	k indicators of the group	Indicator name
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Indicators for evaluating the diffusion effect	Diffusion of certain types of innovations to other areas define sh	<ol style="list-style-type: none"> <li>1. Number of commercialized innovations, exchanges</li> <li>2. users and receivers of innovations , units.</li> <li>3. joint innovation projects created with partner innovation centers, exchanges .</li> <li>4. The number of innovative technologies used in new industries .</li> </ol>
Indicators for evaluating the resonance effect	It is characterized by the activation and stimulation of innovations carried out in a specific industry or production sector	<ol style="list-style-type: none"> <li>1. Increasing the share of small and medium-sized innovative enterprises in the regional economy , %</li> <li>2. The number of innovation-products produced in connection with the emergence of innovations in the relevant sectors, exchanges .</li> <li>3. innovation-processes that have arisen in connection with the production of modern goods, exchanges .</li> <li>4. The number of copyrights of legal entities and individuals on scientific and technical development and production of innovations</li> </ol>
Indicators for evaluation according to the increasing scope of use	describe the "chain reaction" effect of the spread of innovation in another industry or production area on the basis of a subsequent accelerator .	<ol style="list-style-type: none"> <li>5. The number of scientific research and design organizations created for the development of innovations in the last 5 years, units:</li> <li>6. - innovative products</li> <li>7. - innovative processes</li> <li>8. 2. Share of innovative goods and services in the total volume of production, %</li> <li>9. 3. Number, units of IT technologies.</li> <li>10. 4. Number of supported technologies</li> <li>11. disruptive innovation, units</li> </ol>
Effect of acceleration effect	Evaluation based on positive results obtained	<ol style="list-style-type: none"> <li>1. Growth rate of production of innovative products, in % compared to last year</li> <li>2. Number, units of advanced production technologies to be exported</li> <li>3. The dynamics of updating the innovative portfolio, at least once every 5 years.</li> <li>4. Growth in the number of innovation adopters, in percent.</li> </ol>
Synergistic impact assessment metrics	Describe the non-linear overall effect resulting from cluster activity	<ol style="list-style-type: none"> <li>1. To increase the volume of production of innovative products, works, services, in soums</li> <li>2. Growth of the production volume per worker due to the introduction of innovative technologies,</li> </ol>



		<p>in soums</p> <p>3. Expenses for research and development in the corporate sector of the economy, in soums</p> <p>4. Increasing the volume of attracting foreign investments to the production of innovative products, in soums</p> <p>5. Consolidated income of enterprises operating cross-functionally in the field of innovation from the sale of innovative products without resources, in soums</p> <p>6. Growth of profit from innovative activities, in soums</p> <p>7. Number of jobs created as a result of innovative activity, unit</p> <p>8. Growth of the tax component in the income part of the budget from the production of innovative products, in soums</p> <p>9. The number of innovative projects and innovative business initiatives reviewed by the authorities, units, in units</p>
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Source: Compiled by the author.

As we can see, absolute and relative financial and economic indicators are used in the assessment of the synergy effect of cluster activities.

the synergy effect of the cluster according to the given formula (1), and the method of its calculation can be expressed in Table 1. [6]<sup>2</sup>

$$C S = M * A * K; \quad (8)$$

in this

C - synergy effect of the cluster;

M – multiplier of synergy effect;

A – synergy effect accelerator;

K is the degree of clustering.

The following formula is used to calculate the synergy effect multiplier:

$$M = MX_s / I_x \quad (9)$$

in this

$MX_s$  - income of the enterprise;

$I_x$  – costs of innovative activities;

The synergy effect accelerator is found by the following formula:

$$A = I_x / I_s \quad (10)$$

in this

$I_s$  – the volume of the involved investment;

The degree of clustering of the industry is found by the following formula:

<sup>2</sup> Suvorova L. A. Synergetic effect clustering otrasli: analysis, analysis, prognosis: monograph. - Kirov: VyatGU, 2015. - 54-55 p.



$$K = MX_s / MX_{s-1} \quad (11)$$

In this,

$MX_s$  - income of the enterprise;

$MX_{s-1}$  - income of the previous period;

Based on the methodology of calculation of the proposed synergy effect, the results of the interaction of the enterprises and the providers of various innovative services to the production enterprises operating in this field will give a synergy effect.

A characteristic feature of the synergy effect calculation model is the absence of a linear relationship. This is explained by the complex structure of the organizational structure of the cluster, the many partner organizations that make up the cluster, as well as theoretically unpredictable innovations that are at the center of the implementation of the activities of such organizations.

As a special case, it suggests using the synergy multiplier when predicting the synergy effects of a cluster.

$$m_{\text{sin}} = 1/MPP \quad (12)$$

in this

$m_{\text{sin}}$  - synergy multiplier ;

The above theoretical views indicate that in order to form clusters, first of all, it is necessary to bring out synergy effect, to create an environment for the implementation of cluster initiatives, its structural composition and fundamental methodological foundations.

### **Conclusions and recommendations**

A systematic analysis of the signs of modern clusters and the principles of mutual cooperation in the cluster method shows that the formation of mutual relations between economic entities - cluster participants is the most important tool. The effective integration of cluster participants brings out a unique advantage, such as the simplification of the use of technologies, the distribution of risks in various forms of joint economic activity, the organization of joint scientific research works, and the joint use of knowledge and basic funds.

As a mechanism of mutual cooperation of the initiators of cluster projects, it is necessary to establish them on the basis of the hierarchical principle. In its implementation, it is advisable to use subcontract schemes widely used in the economy. By clustering on the basis of subcontracting schemes, a system of mutual support and mutual learning is created, which ultimately helps to develop new types of products and infrastructure.

The activity of scientific and educational centers within clusters is considered as the main condition and component of the effectiveness of cluster structures. In forming the organizational structures of the cluster projects implemented in the republic, these aspects were not paid enough attention. Based on this, first of all, we believe that it is desirable to solve the activities of the structures that prepare personnel for themselves, implement their scientific and innovative development within the existing possibilities.

### **References:**

1. Krasnov G. A., Vinogradov V. V., Krasnov A. A. Conditions for the introduction of synergetic effects in the integration of the economic system // Ekonomicheskije nauki vestnik nizhegorodskogo universiteta im. N. I. Lobachevsky. - 2009. - No. 4. - p. 219-222.



2. Potemkin A. P. Ne novaya industrializatsiya, a vyravnivanie razvitiya finansovogo i realnogo sektorov // Mir peremen. – 2014. – No. 1. - S.67-68.
3. Ansoff I. Strategic management / I. Ansoff. - M.: Ekonomika, 1989.
4. Taburchak P. P., Tomilina E. I. Corporate synergism and strategic management //Vestnik UGTU-UPI. Series economy and management.—2005.—No. 6. – 2005. – T. 6. - S. 16-25.
5. Chizhov A.V. Innovative synergism. Investitsii v budushchee // Nauchnye trudy Volnogo ekonomicheskogo obshchestva Rossii. 2012. No. URL: <https://cyberleninka.ru/article/n/innovatsionnyy-sinergizm-investitsii-v-budushee> (data obrashcheniya: 23.02.2023).
6. Suvorova L. A. Synergetic effect clustering otrasli: analysis, estimation, forecast. - 2015.
7. Bosch G. D. Innovativnost biznes-clusterov v strategii razvitiya regionov // Ekonomika regiona. - 2010. - No. 3. - pp. 123-129.
8. Akhmadovich KZ Synergy effect textile clusters of Uzbekistan //Asian Journal of Technology & Management Research [ISSN: 2249-0892]. - 2019. - T. 9. – no. 1.
9. Keynes Dj. M. Obshchaya teoriya zanyatosti, protsenta i deneg // Anthology of economic classics. - M.: Ekonov, 1993.
10. Lafta Dj. K. Theory organization: Uchebnoe posobie. - M. : TK Welby, Izd-vo Prospekt, 2003. – 416 p
11. Lapygin Yu.A. Organizational theory: Uchebnoe posobie. - M. : YUNITI-DANA, 2007. – 311 p.