

# “Theoretical and methodic grounds to identify potential sales markets of innovative production for Ukrainian machine building enterprises”

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## Theoretical and methodic grounds to identify potential sales markets of innovative production for Ukrainian machine building enterprises

### Abstract

Necessity to reveal interconnections between countries in the context of sales activity capacity development in the innovative goods realization sphere becomes important in research to activate innovative activity at the industrial enterprises. It means to identify countries, which are close in economic development parameters and innovative activity expansion rates. And it will allow to find potential sales markets and partnership location centers.

Practical implementation of the mentioned task is possible owing to cognitive maps of the sales policy in machine building innovatively active enterprises, that give prerequisite urgency of the given research. Reasonability to choose cognitive maps method to formalize the observed problem is preconditioned by the fact that sales policy is observed as dynamic system, including great number of system generating elements, which are interconnected between each other and interdependent on each other. Besides tools development becomes urgent, that allows to foresee the investigated system behavior in future, depending on market situation.

The article deals with principally new scientific and methodic approach to define potential sales markets and partnership centers establishment for machine building enterprise in Ukraine. Cognitive maps method use allows finding cause-and-effect connections between chosen countries. It is a reason to see each of them as partner for further collaboration or potential sales market of the innovative production.

Practical formalization of the suggested scientific and methodic approach on examples of Ukrainian machine building enterprises results in fact that collaboration with industrial enterprises from Uzbekistan, Estonia and Kazakhstan stimulates development of the modern approaches to conduct sales policy and to increase efforts for the given state markets development, for native enterprises. The industrial enterprises of Ukraine, Georgia, Russia are main consumers of machine building innovative and active enterprises goods.

**Keywords:** enterprise, machine building industry, cognitive map, sales policy, sales potential, innovations, countries-partners, centers of partnership establishment.

**JEL Classification:** D24, F15, L11, L64, M31, O31.

### Introduction

Nowadays problems concerning enterprises activity efficiency provided in all industrial branches depend on existence and effective implementation of the innovative constituent in business. On the one hand, innovative and active enterprises are more competitive at the market, and on the other hand – they have high potential to extend its production sales sphere. The leading industrial branches in Ukraine are metallurgy, machine building and chemical industry.

It's clear that level of the innovative development is key factor to involve investments. In its turn, it is significant criterion of the general economic growth. Current negative state of the Ukrainian economy substantially had great impact on machine building industry enterprises, which lost big part of sales market (Russian market) and had to enter international sales markets and to find new partners under conditions of orders amounts shortening, relatively high energy intensity in production, and as a result of free financial resources shortening to optimize production and innovative investigations introduction.

### Analysis of the recent research and publications.

Problems of sales policy optimization at industrial enterprises and innovation implementation process are observed by many scientists, among which both leading foreign specialists: G. Stuart [1], G.J. Bolt [2], A.A. Thompson and A.J. Strickland [3], J. Lancaster and D. Jobber [4], and native scientists: V.F. Gamaliy [5], L.V. Balabanova [6], S.M. Illyashenko [7], A.V. Voichak [8] S. Kozmenko [9, 10], T. Vasylieva [11, 12, 13] and others. In works of mentioned researchers conceptual bases of sales net development, sales policy formation premises, its place in the system to control enterprise, peculiarities of the innovative production innovative policy are studied.

Most scientific works describe separate aspects in sales policy, connected with optimal sales channels choice, economy's subjects sales possibilities identification and correspondences of the produced goods to consumer's current needs. Technology and methodology of the innovative production potential sales markets determination are undefined totally. Regulation of the effective prognostication questions concerning probable places to realize produced goods requires forming adequate mechanism not only at the separate enterprise level, but also at the separate branches level in the country's economy.

Thus, questions to develop potential of the sales net within innovative and active activity intensification at the industrial enterprises require profound studies. At this time, considering loss of native industrial enterprises at some sales markets, there are no effective approaches to set relations between enterprises of various countries to implement innovative production, in the economic science.

**Problem statement.** The object of the article is to ground scientific and methodic bases to identify potential sales markets on example of machine building enterprises in Ukraine.

**Main material.** Nowadays it is impossible to provide effective development of the industrial enterprise without innovations. Taking in to account the native equipment obsolescence, its energy capacity, great powers of the Ukrainian industrial enterprises and qualified personnel, the innovatively active activity is able to provide competitive advantages at the international markets of the industrial production. Special attention is paid here to the sales channels of produced goods and existing partnership relations. Its efficient functioning is provided by the sales system at the enterprise. Necessity of clearly set and efficient production sales system is confirmed by the fact that enterprise activity depends on consumers' needs and their satisfaction in time.

While concentrating on industrial enterprise sales policy, one has to mention its sales potential, determined as "complex of informational, material, marketing, managerial and communicative resources and abilities for sale. They provide readiness and ability of the enterprise to bring good to the market, its realization with constant improvement of the sales technologies, product row innovations, considering marketing environment factors" [9, 10]. It allows to confirm that it is reasonably to study interconnections between countries in the context of sales activity potential development at the industrial enterprises in the innovative goods realization sphere.

Under modern conditions in order to prognosticate dynamic systems development experts from various spheres are involved, one of whose tasks is to accumulate and to process great informational data. With purpose to provide their work quality mathematic method to create cognitive maps is used in scientific literature. It is

sign-oriented graph. It is especially effective under conditions of uncertainty at the market, social and economic and political transformations in the country.

Cognitive map is a list of main laws and super vision of object's known for expert regularities in form of the sign-oriented graph, where tops of the graph are factors (features of the investigated object), and lines, connecting these factors, are cause-and-effect links between them [16].

Reasonability to choose cognitive maps method to formalize studied problem is preconditioned by the fact that sales policy is observed as dynamic system, including great number of system-created elements, interconnected between each other and interdependent on each other. Besides tools development becomes also urgent and it allows to foresee the investigated system behavior in future depending on market situation.

Thus, cognitive maps are concentrated on the concrete logic and mathematic peculiarity of the cause-and-effect links between factors, which determine research object's peculiarities. In this case, one suggests to pay attention to machine building enterprises and to their sales potential, considering losses of the great productive powers and as a result great part of the sales market. Scientific and methodic approach to build cognitive maps of the machine building innovatively active enterprise sales policy is presented in Figure 1.

As incoming data one proposes to observe amounts and ratio of the production selling during 2010-2014 for such countries as Ukraine, Uzbekistan, Kazakhstan, Georgia, Estonia and Russian Federation (Table 1).

Choice of the mentioned countries is preconditioned by several reasons, particularly: similarity of the historical development, which had great impact on formation and setting of the economic subjects' functioning market bases. Under convergence conditions of the innovative activity parameters it plays great role, because it allows to set partnership relations with economic subjects, who conduct their activity under similar economic conditions; closeness of preconditions and key features in economic development dynamics. It provides to define sales markets in the given countries as potential ones for Ukraine etc.

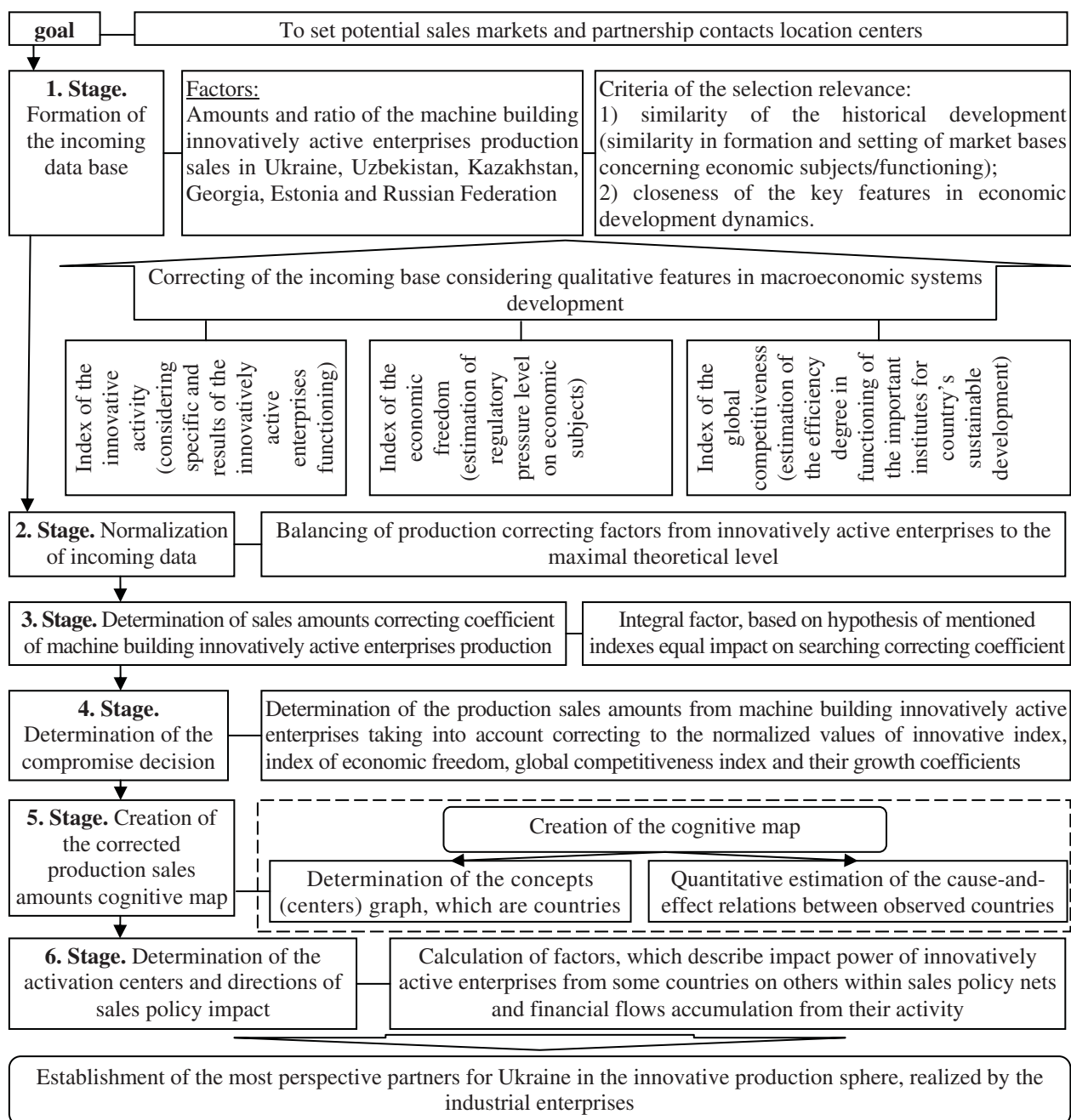


Fig. 1. Algorithm to build cognitive map of the machine building innovatively active enterprises sales policy

Table 1. Dynamics of amounts and ratio for machine building innovatively active enterprises production sales 2010-2014

Countries	Year									
	2010		2011		2012		2013		2014	
	Sales amount thousand hrn	ratio, %	Sales amount thousand hrn	ratio, %	Sales amount thousand hrn	ratio, %	Sales amount thousand hrn	ratio, %	Sales amount thousand hrn	ratio, %
Ukraine	2391272.59	61	2937555.5	55	5262249.36	51	7676663.558	45	8237395.698	42
Uzbekistan	235207.14	6	427280.8	8	928632.24	9	1876517.759	11	2549670.097	13
Kazakhstan	431213.09	11	640921.2	12	1444539.04	14	2558887.853	15	3334183.973	17
Georgia	117603.57	3	160230.3	3	412725.44	4	1023555.141	6	1372899.283	7
Estonia	78402.38	2	160230.3	3	309544.08	3	341185.047	2	588385.407	3
Russia	666420.23	17	1014791.9	19	1960445.84	19	3582442.994	21	3530312.442	18
Totally	3920119	100	5341010	100	10318136	100	17059252.35	100	19612846.9	100

It is irrationally to use only absolute factors to realize goods in value terms, to build cognitive maps. It is so, because in spite of economic features similarity, presented instates selection, they differ in size and scales of markets, that's why it is necessary to check outgoing factor, considering qualitative features of the economic systems' development. The following indexes are suggested to be used as the parameters: innovative activity index, which allows to consider specific of the innovatively active enterprises functioning, their efficiency and state progress in innovative processes intensification sphere; economic freedom index, which allows to estimate regulatory pressure level on the economic subjects, and thus is important parameter while estimating perspectives in innovatively active enterprises sales policy and system abilities both to investigation and realization of the innovative goods, and to its purchasing; global competitiveness index, which allows to estimate functioning efficiency degree of the important institutes for sustainable development in country, depending on its economic development stage.

Firstly, one proposes to build integral factor, based on multiplicative model use, considering hypothesis of the indexes' equal impact (innovative index, economic freedom index, global competitiveness index) on searching checking coefficient.

Thus, formula to calculate checking coefficient of production sales amounts from machine building enterprises is:

$$IK_t = II_t^{norm} \cdot IES_t^{norm} \cdot IGK_t^{norm} \cdot II_t^{kr} \cdot IES_t^{kr} \cdot IGK_t^{kr}, \quad (1)$$

where  $IK_t$  – coefficient of production sales checking from machine building innovatively active enterprises for  $t$ -year of the observed time diapason in research;

$IGK_t^{norm}$  – normalized value of the global competitiveness index at the machine building innovatively active enterprises for  $t$ -year of the observed time diapason ( $t = 1$  for 2010,  $t = 2$  for 2011,  $t = 3$  for 2012,  $t = 4$  for 2013,  $t = 5$  for 2014);

$IES_t^{norm}$  – normalized index value of the economic freedom at machine building innovatively active enterprises for  $t$ -year of the observed time diapason ( $t = 1$  for 2010,  $t = 2$  for 2011,  $t = 3$  for 2012,  $t = 4$  for 2013,  $t = 5$  for 2014);

$II_t^{norm}$  – normalized innovative index value of the machine building innovatively active enterprises for  $t$ -year of the observed time diapason in research ( $t = 1$  for 2010,  $t = 2$  for 2011,  $t = 3$  for 2012,  $t = 4$  for 2013,  $t = 5$  for 2014);

$II_t^{kr}$  (accordingly,  $IES_t^{kr}$ ,  $IGK_t^{kr}$ ) – coefficient of the innovative index growing (accordingly, economic freedom index, global competitiveness index) for  $t$ -year of the observed time diapason.

As a result of the theoretical stages practical implementation in the proposed scientific and methodical approach to identify potential markets for machine building enterprises in Ukraine, a significant difference is established in the values of the productions of major sales for Ukraine, Uzbekistan and Russia and the correcting factor for Estonia, Kazakhstan and Russia. Therefore, it is reasonably to determine compromising decision, based on cognitive maps.

Dynamics of the factors in all countries, corrected into the innovative index value, economic freedom index, global competitiveness index, are presented in Figure 2.

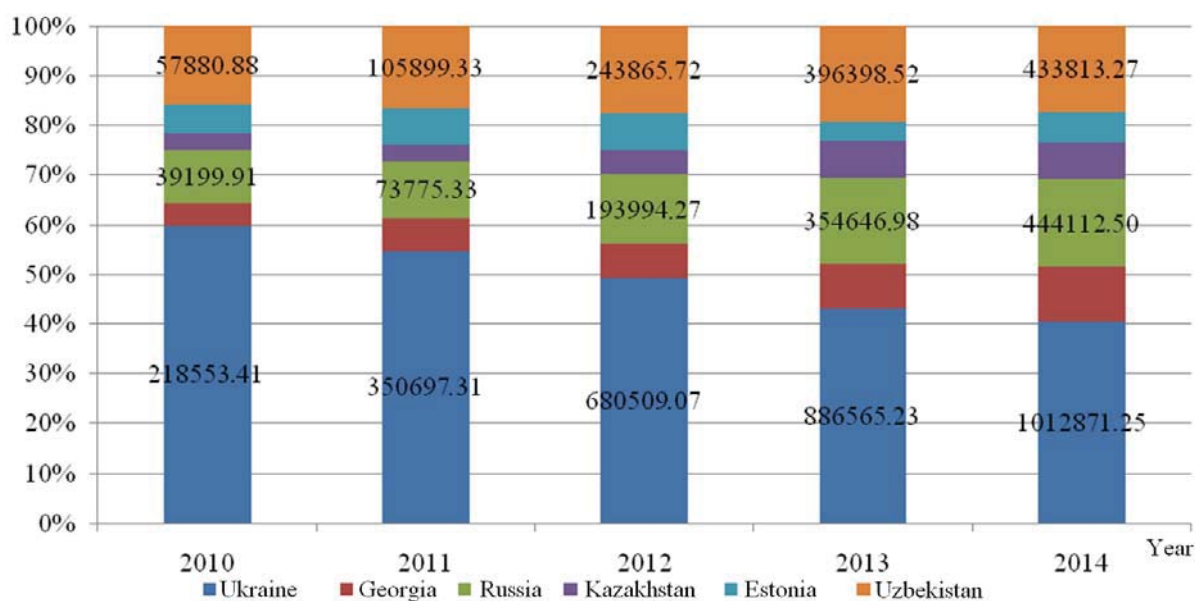


Fig. 2. Dynamics of the production sales amounts, correcting into innovative index value, economic freedom index value, global competitiveness index during 2010-2014

The cognitive map creation generally foresees the following stages:

1) determination of concepts (centers) in graph, which are countries, particularly Ukraine, Georgia, Russia, Kazakhstan, Estonia and Uzbekistan. Concepts of the cognitive maps are marked with rounds (ovals) with proper countries' names;

2) quantitative estimation of cause-and-effect relations between observed countries, which is suggested to be conducted on the bases of correlated matrix (Table 2). Relations between centers of graph are marked with sections, over which quantitative estimation is estimation of the proper relation.

Table 2. Correlated matrix of correcting indexes into production sales amounts indexes value during 2010-2014

	Ukraine	Georgia	Russia	Kazakhstan	Estonia	Uzbekistan
Ukraine	1.0000					
Georgia	0.9576	1.0000				
Russia	0.9821	0.9913	1.0000			
Kazakhstan	0.9684	0.9876	0.9969	1.0000		
Estonia	0.9061	0.8923	0.8797	0.8412	1.0000	
Uzbekistan	0.9933	0.9668	0.9915	0.9869	0.8624	1.0000

Thus, on the bases of data mentioned above, we will create cognitive map of the innovatively active machine building enterprises sales policy (Figure 3).

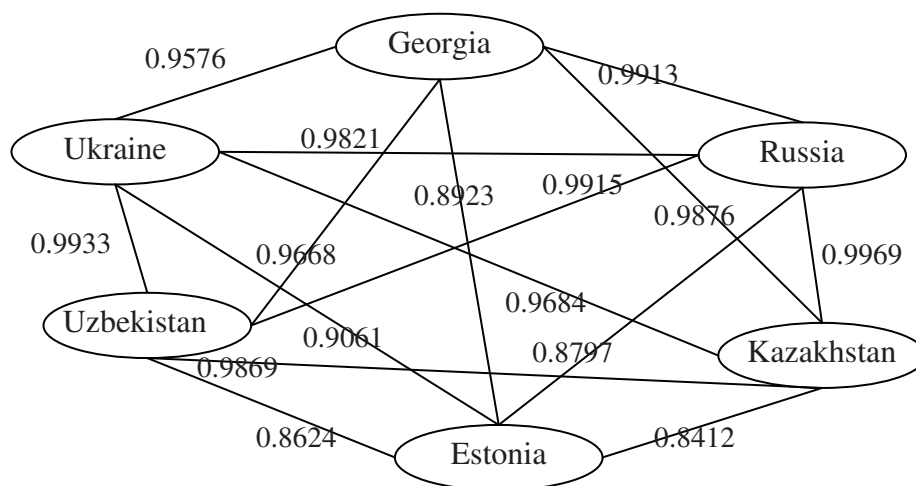


Fig. 3. Graph (cognitive map) of the innovatively active machine building enterprises sales policy during 2010-2014

On the bases of Figure 3 one can notice that the closest Ukrainian relation is for such countries as Uzbekistan, Russia and Kazakhstan, and the smallest is for relations with Estonia.

With purpose to determine activation centers and impact directions of the innovatively active machine building enterprises sales policy, it is reasonably to calculate consonances factors of the interconnection influence and centralization, which provide consequent calculations.

The distinctive peculiarity of the cognitive maps creation is ability to consider not only cause-and-effect relations between countries', marked with graph arcs, but also countries relations, not connected between each other, but interconnected through other concepts. Besides, cognitive maps allow to define leading centers to activate

innovatively active machine building enterprises' sales policy. It is necessary to use formula of sales policy cognitive matrix transformation to describe quantitatively both obvious and hidden relations with countries while realizing the sales policy by innovatively active machine building enterprises. Its calculation results are presented in Table 3:

$$\text{If } z_{ij} > 0, r_{2i-1,2j-1} = z_{ij}, r_{2i,2j} = z_{ij}.$$

$$\text{If } z_{ij} < 0, r_{2i-1,2j} = -z_{ij}, r_{2i,2j-1} = -z_{ij}, \quad (2)$$

where  $z_{ij}$  – quantitative estimation of the cause-and-effect relations between  $i$ -th and  $j$ -th concepts (countries);

$r_{2i-1,2j-1}$ ,  $r_{2i,2j}$ ,  $r_{2i-1,2j}$ ,  $r_{2i,2j-1}$  – correlation coefficients.

Table 3. Transformed cognitive matrix of the innovatively active machine building enterprises sales policy

	Ukraine		Georgia		Russia		Kazakhstan		Estonia		Uzbekistan	
Ukraine	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Georgia	0.958	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.958	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Russia	0.982	0.000	0.991	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.982	0.000	0.991	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
Kazakhstan	0.968	0.000	0.988	0.000	0.997	0.000	1.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.968	0.000	0.988	0.000	0.997	0.000	1.000	0.000	0.000	0.000	0.000
Estonia	0.906	0.000	0.892	0.000	0.880	0.000	0.841	0.000	1.000	0.000	0.000	0.000
	0.000	0.906	0.000	0.892	0.000	0.880	0.000	0.841	0.000	1.000	0.000	0.000
Uzbekistan	0.993	0.000	0.967	0.000	0.991	0.000	0.987	0.000	0.862	0.000	1.000	0.000
	0.000	0.993	0.000	0.967	0.000	0.991	0.000	0.987	0.000	0.862	0.000	1.000

Final stage of scientific and methodic approach is to determine activation centers and sales policy impact of the innovatively active machine building enterprises sales policy, results of which are presented in Table 4.

Table 4. Centers of the activation and innovatively active machine building enterprises sales policy impact directions

Country	Consonance of $i$ - center (county) impact	Consonance of the $j$ - center (country) impact	Factor of centralization
	$\bar{C}_i = \frac{1}{n} \sum_{j=1}^n c_{ij}$	$\bar{C}_j = \frac{1}{n} \sum_{i=1}^n c_{ij}$	$E_i = \bar{C}_i - \bar{C}_j$
Ukraine	0.1667	0.9679	-0.8013
Georgia	0.3263	0.9615	-0.6352
Russia	0.4956	0.9625	-0.4669
Kazakhstan	0.6588	0.9559	-0.2971
Estonia	0.7532	0.9665	-0.2132
Uzbekistan	0.9668	0.6644	0.3024

Notes:  $C_{ij}$  – factors of interconnection consonances between graph centers (countries)

Graphical center of the activation and innovatively active machine building enterprises sales policy impact directions is presented in Figure 4.

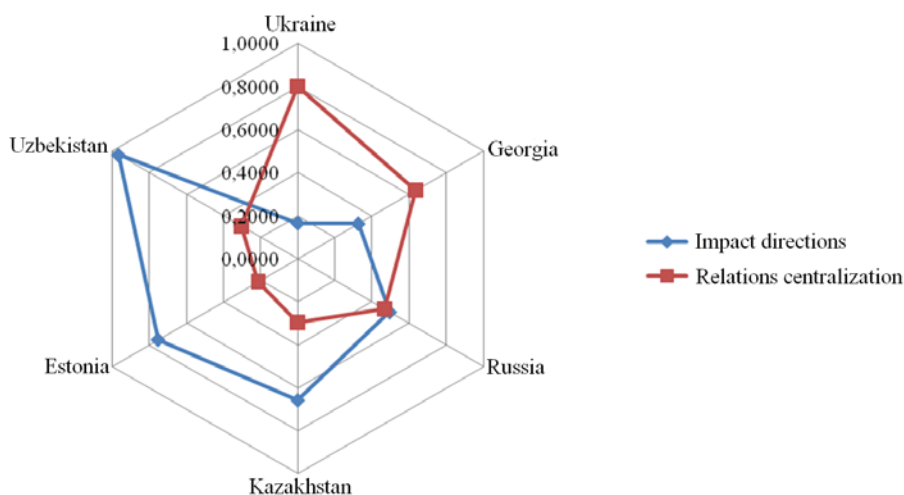


Fig 4. Graphical presentation of activation centers and innovatively active machine building enterprises sales policy impact directions during 2010-2014

## Conclusions

The suggested scientific and methodic approach to identify potential markets of the innovation production sales policy will allow to estimate exactly sales policy parameters of the innovatively active enterprises and

system abilities either to investigate, realize innovative products, and to their purchase, and also to determine reasonable areas to build and develop sales net. On the example of the industrial machine building enterprises in Ukraine, one establishes that sales policy impact directions of the innovatively active machine building

enterprises are companies from such countries as Uzbekistan, Estonia and Kazakhstan. Therefore centers of relations activation are Ukraine, Georgia and Russian Federation. Practical value of the

proposed scientific and methodic approach consists in ability to reveal the most perspective partners for Ukraine in the sphere of innovative production implementation by various industrial enterprises.

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