formation is closely connected with the organization of interaction between the individual elements of the external structure. Such interaction is via customer databases, readers' conferences that suit, publishing meeting consumer consulting services companies.

The methods considered for evaluation and analysis of intellectual capital does not imply universality, but focused on the adaptation of assessment indicators for the individual approach in each case. This integrated approach financial and non-financial asset valuation, which enables long-term planning and development of the organization as a whole.

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THE INDUSTRIAL PRODUCTION VOLUME MODELING IN THE WEST KAZAKHSTAN REGION WITH THE PRODUCTION FUNCTIONS USING

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Essentially, all the models are wrong, but some of them are useful.

George Box

In the industry of the Republic of Kazakhstan to share-but-West Kazakhstan region is accounted for about 9 percent of the total volume of industrial production. Let us consider some types of models of production functions, the dynamics of shares of mining and manufacturing industries, the structure of the gross regional product, the coefficient of variation in output growth of the economy in relation to the industrial production of the Wes-Kazakhstan region. And the construction schedule of production functions is considered, where the actual and estimated values of the industrial production volume clearly have been shown.

The industrial production share (e.g. for 2005−2011) is made up about 50 per cent for in the gross regional product (GRP) structure of the Western-Kazakhstan Region. The share of the other major sectors (e.g. the agriculture, building, services' production) is accounted for the rest part of GRP (Fig. 1).

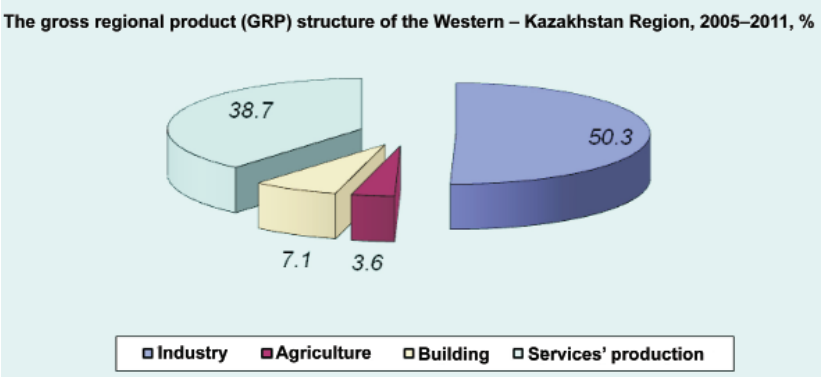

Fig. 1. The gross regional product (GRP) structure of the Western-Kazakhstan Region, (2005–2011)

About 9 per cent of the total industrial production volume is accounted on the share of the Western-Kazakhstan Region in the industry of Republic of Kazakhstan.

So, the industrial production volume in the Western-Kazakhstan Region for 1994−2011 years has been developed unevenly, which can be seen in the Fig. 2.

Thus, the sustainable industry development has been planned around since 2002.

As a part of the industrial production, the main share is accounted on the mining industry (e.g. about 90 per cent) and the manufacturing one. The manufacturing industry is approximately taken 8,5 per cent of the total industrial production volume.

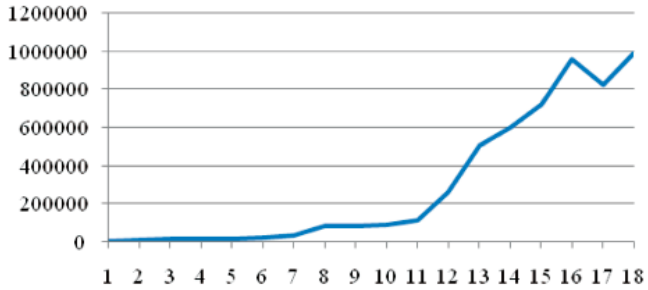

Fig. 2. The Industrial Production Volume in the Western-Kazakhstan Region (1994 – 2011), mln. tenge

The shares dynamics of the mining and the manufacturing industries in the structure of the industrial production (e.g. in per cent) have been given in the following Table 1.

Table 1

	Mining Industry	Manufacturing Industry
2006	90,3	7,9
2007	90,0	8,1
2008	89,6	8,7
2009	88,2	9,0
2010	89,0	8,4

The Region is rich in the fuel and energy resources types (e.g. the crude oil and the petroleum gas, the natural gas), and, in short term, the mining and the manufacturing industries will be remained the main branches of the Region's industrial production.

The variation coefficient of the volume industrial production for 2005–2011 years has been amounted 6,3 per cent. During the period of 2000–2011 years, the volume variation of the industrial production has been made up 38,9 per cent, while for the period of 1994–2011 years, the variation coefficient is amounted 50 per cent.

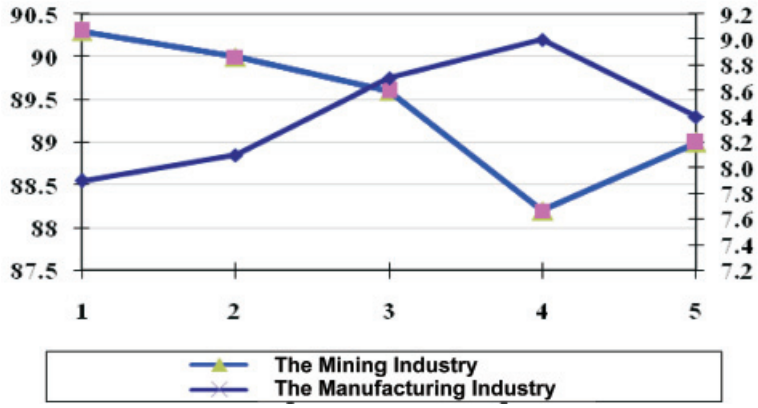

Fig. 3. The Structure of the Mining and Manufacturing Industries in the Industrial Production (e.g. 2006 – 2010 years), %

For the period of 1994–2011 years, the average annual growth rate of the volume industrial production has been made up 0,58 per cent.

The economic growth issues are the fundamental question of any economic system. The economic growth is defined and measured in two interrelated ways: it is the real GRP increase over some period of time, or it can be possible to be regarded, as the increase in some time period of the real GRP per capita.

There are two basic types of the economic growth: the extensive and the intensive ones.

The extensive economic growth is meant, that the production volume quantitative increase of the goods and the services is practically taken its place at the qualitative constancy of the production factors.

The intensive economic growth is connected to the fact that the goods and the services production increase is provided by the efficiency improving of the production factors. This production type is

led to be overcome the productive resources limitations, it is involved the technological process improvement, and its further introduction into the production process.

So, the extensive factors of the further economic growth are the following: the volume increase in the raw materials, materials, and fuel consumption; the employed workers increase; the investments volume increase with the technologies existing level.

The intensive factors of the further economic growth are the following: the use improving of the fixed and the circulating capitals; the workers skills development; the GDP acceleration (e.g. first of all, the new techniques and the technologies introduction, through the fixed assets renewal); the production organization further improvement.

In reality, the two opposite type of the economic growth can be interacted, and to be coexisted.

The economic theory has long been sufficiently to be investigated the economic growth challenges.

So, the production functions are being widely used for the mathematical description of the manufacturing process in the economic theory.

So, the production function – this is the mathematical – economically correlation, that is specified the link between the economic characteristics of the issue and the used economic resources (e.g. factors), or their shared volumes in the analytical form. The various economic units are described through the production function: the enterprises, the industries, national economy, as a whole. Thus, the production functions are used the most commonly of the type $Y = AK^{\alpha}L^{\beta}$, here Y – issue, K – the production assets, L – the labor, A, α, β – the coefficients, having determined by the statistical data processing.

The most common type of the production function – is the **Cobb–Douglas** function, having named after its creators. The American economist **Paul Douglas** has still noticed in 1927, that the national income distribution between the labor and the capital is practically being changed little over time, i.g. the production growth and the workers, and the capital owners are equally enjoyed by the benefits of the thriving economy. Before Douglas the task has been faced to be determined the causes of such constancy shares of the production factors. He had turned to the mathematician **Charles Cobb** that he found the function with the properties of the permanent shares of the production factors, having provided that the production factors are always received their marginal products. Such function has been derived the following expression:

$$Y = AK^{\alpha}L^{\beta},$$

where A – is the proportionality factor; α, β – is the coefficient of elasticity of the goods output by the capital and the labor costs.

The given function is based on the assumption of the complete interchangeability of the labor and the capital, on the constant return of each unit of any factor.

The following application variants of the **Cobb – Douglas** function are quite possible:

a) $\alpha + \beta = 1$ – the constant efficiency of the production factors;

b) $\alpha + \beta > 1$ – the increasing efficiency of the production factors;

c) $\alpha + \beta < 1$ – the falling efficiency of the production factors.

The further modification of the **Cobb – Douglas** production function is connected with it, having taken into account the impact of the technological and scientifically progress. The production function after Ya. Tinbergen – is one of the possible forms of these functions. He has removed the restriction on the exponents of the production functions, which are equal to one. So, in this case, the production function is acquired the following form:

$$Y = AK^{\alpha}L^{\beta},$$

where α and β – the coefficients of elasticity of the production volume by the capital and the labor, respectively.

When $(\alpha + \beta) = 1$, this function is became the **Cobb – Douglas** production function with its advantages and disadvantages.

The coefficient of elasticity is shown the product's relative change, having expressed in the percentage, with the relative increase in the factor of one per cent. If the output elasticity by the capital α is more the output elasticity by the labor, then the economy has the labor – saving (e.g. intensive) growth. If the inequality is performed $\beta > \alpha$, then we have the asset – saving (e.g. extensive) growth of the econo-world. In this case, the labor force increase by one per cent is practically led to a greater increase in the production volume, than the same increase in the capital.

Another modification of the **Cobb–Douglas** production function is associated with the name of Robert Solow, who has proposed to be considered the technological – scientifically progress upon the economic growth, as the independent variable. So, in this case, the production function is acquired the following form:

$$Y = AK^{\alpha}L^{1-\alpha}e^{\lambda},$$

where λ – is the growth rate of the production total gross output, at the expense of the technological – scientifically progress.

So, the coefficient value λ is indicated the impact degree of the technological – scientifically progress upon the economic growth.

So, let us consider some models types of the production functions, with respect to the industrial production of the Western-Kazakhstan Region.

As the models, let us consider the following five types of the **Cobb – Douglas**, Ya. Tinbergen, R. Solow production functions; the function, when the information resource is considered, as the GDP par; and the information resource, as the separate factor of the production):

- $Y = AK^{\alpha}L^{1-\alpha}$;
- $Y = AK^{\alpha}L^{\beta}$;

- $Y = AK^{\alpha}L^{1-\beta}e^{\gamma t}$;
- $Y = AK^{\alpha}L^{1-\beta}e^{\gamma I}$;
- $Y = AK^{\alpha}L^{1-\beta}I^{\gamma}$.

The model parameters have been calculated by the program PF lite v. 2.2 beta release (e.g. after the author N. Rykov), according to the Annex 2 data.

$Y = 0{,}4986 \cdot K^{0{,}3482} \cdot L^{0{,}6518}$;

$Y = 0{,}7021 \cdot K^{0{,}1866} \cdot L^{1{,}5766}$;

$Y = 0{,}0889 \cdot K^{0{,}0035} \cdot L^{0{,}9965} \cdot e^{0{,}1679t}$;

$Y = 0{,}2142 \cdot K^{0{,}4118} \cdot L^{0{,}5882} \cdot e^{0{,}8683I}$;

$Y = 0{,}6987 \cdot K^{0{,}1771} \cdot L^{1{,}6025} \cdot I^{-0{,}0116}$.

The average relative error of the approximation (e.g. it has been given in %).

The models 2 and 5 have been given the smallest relative error, i.e. the production function model after Ya. Tinbergen and PF, when the information resource is considered, as the separate factor.

Let us construct the graphs of the production functions for the actual and estimated values of the industrial production volume in the Western-Kazakhstan Region for the 1994–2011 years. These graphs have already been shown in Figs. 4 and 5.

Table 2

PF Cobb–Douglas	PF Ya. Tinbergen	PF R. Solow	PF Information resource as part of GRP	PF Information resource as part of separate factor
148	30	39	65	30

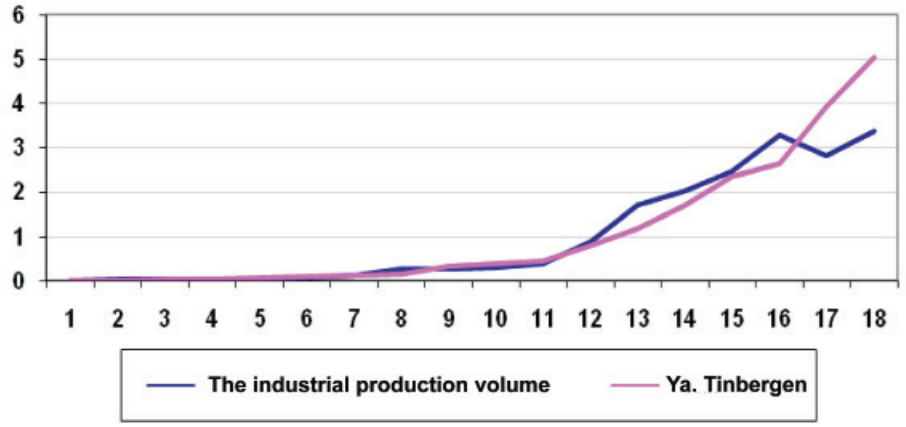

Fig. 4. The actual and estimated values of the industrial production volume in the Western-Kazakhstan Region (e.g.1994–2011)

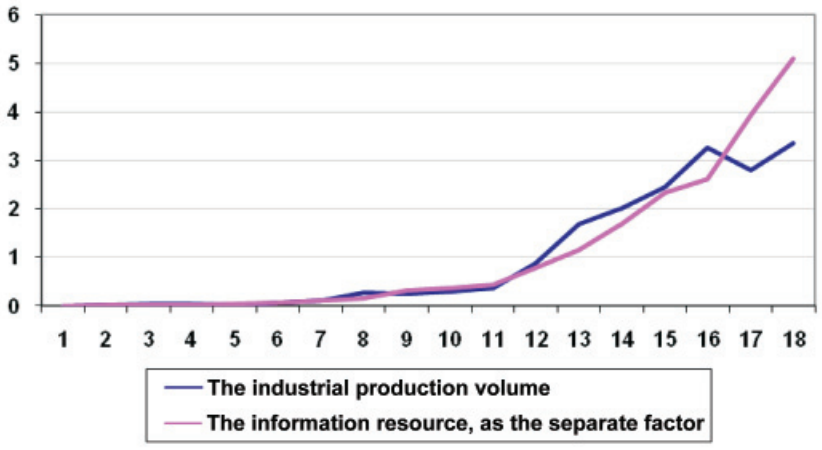

Fig. 5. The actual and estimated values of the industrial production volume in the Western-Kazakhstan Region (e.g.1994–2011)

So, the calculations have been shown, that the industrial production is being developed through the extensive way (e.g. $\beta = 1{,}5766 > \alpha = 0{,}1866$) in the Western-Kazakhstan Region, i.e. the workforce increase by one per cent is practically led to a greater increase of the industrial production volume, than the same increase by the capital.

And the model is shown the same situation, when the investments are considered, as the production separate factor, and, for this, this factor influence upon the industrial production volume is practically absent (e.g. $\gamma = -0{,}0116$). So, the economic growth in the Region by this model is also pointed to the extensive growth of the industrial production – $\beta = 1{,}6025 > 0{,}1771 = \alpha$.

Let us make the forecast of the industrial production volume by these models in the Western-Kazakhstan Region for the 2012 year. The ADAPTA program has been used for the forecasting purposes (e.g. after the author N. Rykov).The final results of the calculations by this program have been given in the subsequent Tables 3, 4.

Table 3

Year	The industrial production volume, mln. tenge	HARMO_ Industrial production volume (after Ya. Tinbergen), mln. tenge	OOF_HARMO The average relative error of the approximation
1994	822,0968781	1003,79	0,22
1995	4266,457874	3970,78	0,07
1996	6620,668484	6874,13	0,04
1997	10342,67774	9820,37	0,05
1998	13328,17103	14133,33	0,06
1999	22874,29478	22196,99	0,03
2000	31785,31921	30418,10	0,04
2001	45057,02267	50346,39	0,12
2002	92295,05876	86941,77	0,06
2003	107896,5572	104686,29	0,03
2004	122617,7952	132310,62	0,08
2005	224999,9413	217621,57	0,03
2006	329113,2908	332884,46	0,01
2007	481838,901	487479,16	0,01
2008	662176,7574	634478,70	0,04
2009	747602,2014	786912,24	0,05
2010	1114155,519	1082326,11	0,03
2011	1430296,295	1438698,39	0,01
2012		1614147,52	The average relative error of the approximation OOF = 5,44 %

Table 4

Year	The industrial production volume, mln. tenge	HARMO_Industrial production volume (e.g. Information resource, as the separate factor), mln. tenge	OOF_HARMO The average relative error of the approximation
1	2	3	4
1994	817,68	994,53	0,22
1995	4288,44	4001,12	0,07
1996	6698,07	6947,66	0,04
1997	10433,23	9924,89	0,05
1998	13388,00	14153,26	0,06
1999	22606,58	21963,46	0,03
2000	31358,55	29967,28	0,04
2001	44489,68	49769,30	0,12
2002	91888,54	86590,89	0,06
2003	108410,54	105299,31	0,03
2004	124268,84	133707,91	0,08
2005	225678,74	218473,47	0,03

End of Table 4

1	2	3	4
2006	328952,35	332577,39	0,01
2007	480096,65	485917,67	0,01
2008	659867,86	631752,21	0,04
2009	744243,89	783831,76	0,05
2010	1115284,31	1084086,00	0,03
2011	1442467,04	1449776,66	0,01
2012		1627518,08	The error of the approximation OOF = 5,44 %

Thus, the actual value of the industrial production value in the Western-Kazakhstan Region in 2012 has been amounted 1 480 715,8 tenge. The difference in the planned and the actual values of the GRP industry by the considered models are made up 9 and 9,9 per cent, which it can be considered to be the good approximation to the original and the initial data.

The expected calculated volume of the industrial production in the Western-Kazakhstan Region for the 2013 year is made up 1 579 979,4 mln. tenge, with the average relative error of the made prediction is about ± 9,2 per cent.

Table 5

The Origin Data on the Industry of the Western-Kazakhstan Region

	У	К	L	I
Year	The industrial production volume, mln. tenge	The fixed assets availability at the book value, mln. tenge	The average wages in the industry, tenge	The investments in the fixed assets in the industry, mln. tenge
1994	426,3	23344	2065	801,60
1995	7077,4	33692	5619	2240,00
1996	12271,6	39666	7283	1999,70
1997	11859,5	58039	9239	3199,30
1998	10381,8	59800	10813	6391,90
1999	19218,9	64622	15092	51263,30
2000	31560,3	63775	18623	96313,00
2001	80960,1	59711	23418	157610,00
2002	77842,4	68358	36318	184434,10
2003	88088,1	68171	40113	104712,00
2004	110818,8	74911	43020	53886,00
2005	260613,9	466671	50916	42875,80
2006	501689,9	664221	62154	67786,80
2007	596796,4	682715	78898	147908,00
2008	721135,3	853359	94010	180187,20
2009	961322,7	1016699	99448	193085,00
2010	825144,0	1227242	125264	172237,10
2011	990133,7	1358890	145009	115477,60

Table 6

The Origin Data on the Industry (in the Coefficients – Data Is Divided into the Average Values Indices)

Year	The industrial production volume	The fixed assets availability at the book value	The average wages in the industry	The investments in the fixed assets in the industry
1	2	3	4	5
1994	0,001446	0,0610399	0,042857	0,009118
1995	0,024003	0,0880979	0,116617	0,02548

End of Table 6

1	2	3	4	5
1996	0,041619	0,1037187	0,151152	0,022747
1997	0,040222	0,1517605	0,191746	0,036392
1998	0,03521	0,1563652	0,224413	0,072708
1999	0,065181	0,1689737	0,31322	0,583123
2000	0,107038	0,166759	0,386502	1,095567
2001	0,274579	0,1561325	0,486018	1,792824
2002	0,264005	0,1787426	0,753744	2,09795
2003	0,298753	0,1782537	0,832506	1,191106
2004	0,375845	0,1958774	0,892838	0,612957
2005	0,88388	1,2202523	1,056712	0,487715
2006	1,701496	1,7368065	1,289945	0,771079
2007	2,024052	1,7851647	1,63745	1,682463
2008	2,445751	2,231365	1,951085	2,049641
2009	3,260354	2,6584667	2,063945	2,196355
2010	2,7985	3,208995	2,599731	1,959208
2011	3,358067	3,5532285	3,009519	1,313565

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METHODICAL APPROACH TOWARDS EVALUATING LEVEL OF INNOVATIVE DEVELOPMENT OF A REGION

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The article justifies facilitation of Innovativity index of regional economy as an indicator of a region's innovative development level. We suggest a method of its evaluation, approbated on materials of Central federal district (CFD)

Dynamic and indefinite environment, exposed to swift qualitative alterations, sets new goals of managing innovative development. In order to evaluate innovative development level, the author suggests using Innovativity index of regional economy *(Ria)*.

The following indexes are included into calculating rating of innovative activity of regions:

X1 – the volume of innovative production according to total GRP (%);

X2 – the part of employees, involved into development and researches according to the total number of employees (%);

X3 – internal expenses for researches and development according to GRP (%);

X4 – expenses for technological innovations according to GRP (%).

The data of all-federal and regional statistics, provided in ROSSTAT annual reports, have been used as informational basis.

Functional model of innovative activity rating is presented as:

$$Ria = \sum_{i=1}^{4} K_i \cdot X_i, \qquad (1)$$

where *Ria* is rating of innovative activity of regional economy; $K_1 = K_3 = 0{,}3$; $K_2 = K_4 = 0{,}2$ are coefficients that illustrate weight of economical-statistic indexes.

The procedure of evaluating innovative activity rating has been carried out along two basic directions: alteration of innovative activity rating value in dynamics; rating value in comparison to other regions of CFD. According to the first criterion, CFD form the following groups: intensively increasing (increase in rating more than 20%); steady increasing (increase in rating within limits of 15–20%); steady decreasing (decrease in rating within limits of 15–20%); intensively decreasing (decrease in rating more than 20%). According to innovative activity level, we can outline the following groups of regions: high rating (over 3); rating value higher that