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COMMUNICATIONS AND INFORMATIZATION SERVICE ENTERPRISES' COMPATIBILITY AND INTEGRATION FEASIBILITY ASSESSMENT

Purpose. Development and scientific substantiation of the methodological approach and the expediency of communications and informatization service enterprises' integration and compatibility at association, thus elaborating practical recommendations for that methodological approach application.

Methodology. A combination of integral assessment methods, computational and constructive method, structural-logical and qualitative system analysis and synthesis methods was used in this study.

Findings. As a result of introducing the methodological approach, the calculation is suggested of communications and informatization service enterprises' adaptivity indicators to interoperate with other enterprises within the integrated system frame, which indicate the need for the chosen enterprises integration. These indicators reflect the presence of their reciprocal production, technological and personnel links, i. e. the enterprises' tendency to integrate. The choice of expectedly integrable enterprises cannot be random. Therefore, to justify economic feasibility of the integration it is necessary to calculate the compatibility indicators.

Originality. The proposed scientific and methodological approach gives the possibility of identifying the most favorable preconditions for the establishment of communications and informatization enterprise's integrated activity form in a particular economic region. In contrast to the existing ones, this approach involves the following stages: 1. Assessment of influence rendered by the communications and informatization enterprises' integration form of activity factors taking into account the development peculiarities of that economic region where the integration system is located. 2. Analysis of financial condition of communications and informatization enterprises integrated to the system. 3. Evaluation of efficiency of resource use at the integrated system's communications and informatization enterprises in order to identify savings or excessive spending as to the particular type of resources. 4. Analysis of communications and informatization enterprises' compatibility with other enterprises making part to the integrated system.

Practical value. The study results can be used by scientists and practitioners in the field of communications and information service enterprise management to determine the feasibility and effectiveness of these enterprises' integration, depending on the motives and goals of integration, as well as to determine the compatibility potential of enterprises making part to the integration structures.

Keywords: *integrated structure, communication services, informatization services, potential, efficiency*

Introduction. Under 2020 worldwide crisis the individual businesses and the global economy faced the necessity to choose their further action scheme. The interconnectedness and interdependence of all globalization processes and their participants become obvious. The coronavirus spread slows down the processes related to the scheduled trade integration of Ukraine with other countries, so the integration processes become more relevant and important. The development of new forms of integration in the entrepreneurial activity of Ukrainians becomes a prerequisite for economic stabilization, and the key role in further sustainable development of both the economy and society is attributed to the communications and informatization sphere. Just this sphere creating an innovative and technological component of socio-economic development of the state is one of the national economy top priority and importance areas on the stage of globalization with the transition to digital economy on the way of Ukraine's integration into the global information space.

However, in the communications and informatization sphere the integration process development rate is slow due to several factors, among which worth to mention is the incompleteness of applied methodological tools for enterprise development on the integration basis. Therefore, there arises a scientific and applied problem of methodological support to the practical implementation of communications and informatization field enterprises' development integration forms.

The proposed method to assess the integration expediency is based on the assessment of enterprises' financial condition, assessment of efficient resource use and the enterprise compatibility assessment, including all these parameters, which does mean it uses a comprehensive approach to assessing the need for integration. The entity's financial condition assess-

ment is based on the publicly reported statements and a comprehensive assessment of the enterprises' compatibility does necessarily include their interconnected components analysis.

Literature review. The significant number of publications exposes the integration effectiveness studies concerning enterprises in various sectors of economy. A particular attention has been paid to the study on such integration principles, its advantages and disadvantages [1]. Numerous works expose different methods and algorithms to assess the feasibility and effectiveness of economic subjects' integration. The sought approaches to the integration efficiency assessment have several advantages while their applicability is limited as a rule. Many of these methods [2] do not include a comprehensive study on the possibility of integration, do not justify the choice of enterprises and do not take into account their strategic direction. Among other methods worth to be mentioned are this one of economic potential assessing, by N. Sedykh (2009) and the method of potential effectiveness assessing, by S. Shubin (2007). The method by N. Sedykh (2009) allows establishing the integrated structure interest's equilibrium extent and thus the ranking of enterprises in order to choose strategies for their effective development. S. Shubin (2007) developed a method for assessing the potential effectiveness of vertical integration. The method by S. Shubin (2007) allows evaluating the feasibility of vertically integrated structure forming in the relevant economical sector. Peculiarities of the development of methods for assessing the integration of enterprises in various fields of activity are investigated in the papers by Vereskun, et al. [3], Rekova, et al. [4] and Kwilinski [5]. Nowadays, the researchers Knyazeva and Lititanskas have proposed an approach that allows identifying potential synergies from the integration of Ukrposhta and State Savings Bank of Ukraine. To this end, the authors formed a set of key success factors for each enterprise, an example of calculating the degree of both enterprises complementarity on the key success factors. The obtained results give evidence in favor of these enterprises' association and the possibility of obtaining a synergistic effect from that association [6]. The practical implementation of the presented model of a communications enterprise interaction with all other market players in the study by Striy, et al. [7] can contribute to increasing the efficiency of communications enterprises' economic activities in the context of new technologies introduction. The conceptual provisions of state regulation of integration processes of the Ukrainian telecommunications business activity are defined in research by Yatskevych [8]. Those conceptual provisions for state regulation of the telecommunications industry's activity integration processes are based on modern state regulation tools with consideration to process approach, which, in turn, allows clearly structuring main components of conceptual provisions to ensure integration processes based on all its components equilibrium. The topic of balancing factors in communications and telecommunications enterprises is continued by [9, 10], assessing it as one of the important stages of the enterprise's study aimed to make a decision on the need for integration. In [11, 12], they propose a methodology for calculating the synergistic effect, which is advisable to use immediately after the integration and the start of operating activities of a corporate integration association, since it can be adjusted depending on the type of corporate integration association being created and its formation motives [13, 14].

Referring to the foregoing discussion and due to the desire to achieve a deep understanding of the feasibility assessment as to the communication and informatization service enterprises' integration and interoperability, our research puts forward the following hypothesis: the creation of integrated enterprises can provide employment opportunities based on their own reforms, reduce costs and increase efficiency through synergy and harmonization of approaches in logistics [15, 16], engineering [17], information technology [18], quality management fields [19], etc.

Unsolved aspects of the problem. The scientific achievements of these scientists are undoubtedly important to form theoretical foundations for assessing the communications and informatization enterprises' integration feasibility. However, the issues of complex research on communications and informatization enterprises integration factors and their influence duration intertwined are open. Methodological tools for assessing indicators, as well as analytical characteristics of the compatibility potential impact on the degree of integration ties between enterprises, that is potential participants in an integrated enterprise, need to be improved.

The purpose refers to the development and scientific substantiation of both the methodology and the expediency of communications and informatization service enterprises' integration and alignment in an association, thus elaborating practical recommendations for that methodology application.

Methods. A combination of integral assessment methods, computational and constructive method, structural-logical and qualitative system analysis and synthesis methods was used in this study.

The integral assessment method is used in the methodology development for assessing the efficiency of resource use and compatibility of communications and informatization enterprises. In order to develop a mechanism for enterprises' integration, a calculation and design method was introduced. Methods of structural-logical and qualitative system analysis and synthesis were used in the development of theoretical and methodological foundations and applied forms of enterprise integration. Using these methods, an attempt was made to determine the uniqueness and novelty of the proposed method to evaluate the integration expediency and compatibility of enterprises operating in the field of communications and informatization services.

Methodology results. In order to identify savings or cost overruns in a particular type of resource, it is convenient to evaluate resource efficiency in communications and informatization service enterprises of the integrated system. Analyzing by this method, one can determine exactly what "bottleneck" exists at each of the enterprises and what resources should be used more effectively. In addition, in order to find reserves for efficiency increase by the enterprise's partial integration a comparative assessment of the resource efficiency at target enterprises can be carried out.

To calculate relative ratios, the authors developed a corresponding system as follows:

1. Relative deviation of gross payroll: taking into account the dynamics of revenue from sales of products (goods and services) (ΔP) it is advisable to calculate that value as a difference between labor costs and deductions for social coverage in the reported and the previous period multiplied by the ratio of income from products (goods and services) sale in the reported and previous periods

$$\Delta P = (2505_{(f.2,c.3)} + 2510_{(f.2,c.3)}) - (2505_{(f.2,c.4)} + 2510_{(f.2,c.4)}) \cdot K_p,$$

where K_p is dynamics coefficient of revenue from products (goods and services) sales.

$$K_p = \frac{2000_{(f.2,c.3)}}{2000_{(f.2,c.4)}}.$$

2. Relative deviation of material costs; taking into account the dynamics of revenue from products (goods and services) sales (ΔMC) it is advisable to calculate that value as a difference between the material cost in the reported and previous periods multiplied by the ratio of income from sale of products (goods and services) in both the reported and previous periods

$$3\Delta MC = 2500_{(f.2,c.3)} - 2500_{(f.2,c.4)} \cdot K_p.$$

3. Relative depreciation deductions deviation: with the account of revenue from products (goods and services) sales dy-

namics (ΔA) is advisable to calculate as a difference between total depreciation in the reported and previous periods multiplied by the ratio of income from sale of products (goods and services) in the reported and previous periods

$$\Delta A = 2515_{(f.2,c.3)} - 2515_{(f.2,c.4)} \cdot K_p.$$

4. Relative deviation of other operating costs, taking into account the dynamics of revenue from products (goods and services) sales (ΔOC) is advisable to calculate as a difference between the amount of other operating expenses in the reported and previous periods multiplied by the ratio of income from products (goods and services) sale in the reported and previous periods

$$\Delta OC = 2520_{(f.2,c.3)} - 2520_{(f.2,c.4)} \cdot K_p.$$

5. Relative deviation of fixed assets in view of the dynamics of revenue from products (goods and services) sales (ΔFA) is advisable to calculate as a difference between the value of fixed assets in the reported and the previous period multiplied by the ratio of income from sale of products (goods and services) in the reported and previous periods

$$\Delta FA = 1010_{(f.1,c.4)} - 1010_{(f.1,c.3)} \cdot K_p.$$

6. Relative deviation of current assets considering the dynamics of revenue from products (goods and services) sales (ΔCA) is advisable to calculate as a difference between current assets in the reported and previous periods multiplied by the ratio of income from sale of products (goods and services) in both the reported and previous periods

$$\Delta CA = 1195_{(f.1,c.4)} - 1195_{(f.1,c.3)} \cdot K_p.$$

7. Relative deviation of current liabilities and securities, taking into account the dynamics of revenue from sales of products (goods and services) (ΔCL) is advisable to calculate as a difference between current liabilities and securities in the reported and previous periods multiplied by the ratio of income from sale of products (goods and services) in the reported and previous periods

$$\Delta CL = 1695_{(f.1,c.4)} - 1695_{(f.1,c.3)} \cdot K_p.$$

Then we proceed to the calculation of economic activities total efficiency on the basis of relative deviations for each resource by the formula

$$\sum eff. = \Delta P + \Delta MC + \Delta A + \Delta OC + \Delta FA + \Delta CA + \Delta CL.$$

The cost reserve calculation is carried out by the formula

$$\Delta C = 2050_{(f.2,c.3)} - 2050_{(f.2,c.4)} \cdot K_p.$$

If the calculation result is positive, the resource use effect goes negative. On the contrary, if we get a negative value, the comprehensive economic effect is positive. On the basis of calculations one can assess the availability of reserves to increase efficiency. Also, the result is used to assess feasibility of transition to a new form of production. We apply the proposed methodology for the analysis of communications and information services rendering enterprises for the years 2017−2019 (Tables 1−6).

Table 1

Evaluating the effectiveness of resource use in the communications and informatization service enterprise PJSC "Ukrposhta" for the years 2017−2019

Parameter		Years		
Initial characteristics	Line code	2017	2018	2019
Fixed assets	1010	1 822 675	7 160 567	3 163 663
Current assets	1195	1 861 277	2 218 431	4 282 827
Current liabilities and securities	1695	1 815 604	2 222 679	4 916 156
Net income from sales of products (goods and services)	2000	3 902 454	4 483 659	5 484 044
Cost of products (goods and services)	2050	3 619 626	4 190 939	5 243 970
Material costs	2500	432 290	482 598	507 853
Salary expenses	2505	1 991 110	2 487 682	3 350 848
Allocations for social deductions	2510	739 317	550 924	808 216
Depreciation	2515	123 548	336 932	197 164
Other operating expenses	2520	936 813	873 964	978 653
Calculated	Abbreviation			
1. The relative deviation of total payroll, taking into account the dynamics of revenue from sales of products (goods and services)	ΔP	−64 266.15	−98 472.26	442 490.33
2. The relative deviation of material costs, taking into account the dynamics of revenue from sales of products (goods and services)	ΔMC	19 383.95	−14 074.34	−82 421.30
3. The relative deviation of depreciation deductions, taking into account the dynamics of revenue from sales of products (goods and services)	ΔA	−16 928.72	194 983.60	−214 943.59
4. The relative deviation of other operating costs, taking into account the dynamics of revenue from sales of products (goods and services)	ΔOC	259 707.25	−202 371.57	−90 308.09
5. The relative deviation of fixed assets in view of the dynamics of revenue fromproducts (goods and services) sales	ΔFA	−97 033.08	5 066 435.16	−5 594 555.34
6. The relative deviation from current assets taking into account the dynamics of revenue from products(goods and services) sales	ΔCA	−896 092.06	79 948.04	1 569 424.13
7. The relative deviation of current liabilities and securities taking into account the dynamics of revenue from sales of products (goods and services)	ΔCL	−994 454.91	136 671.27	2 197 557.32
Provision costs	ΔC	−4 772.93	32 230.48	117 957.10
Cumulative efficiency of business enterprises	$\sum eff.$	−1 789 683.72	5 163 119.91	−1 772 756.55

Table 2

Evaluating the effectiveness of resource use in the communications and informatization service enterprise PJSC "Ukrtelecom" for the years 2017−2019

Parameter		Years		
Initial characteristic	Line code	2017	2018	2019
Fixed assets	1010	8 983 451	8 839 758	8 627 127
Current assets	1195	1 632 136	1 859 780	2 249 266
Current liabilities and securities	1695	2 295 526	2 729 547	3 170 960
Net income from sales of products (goods and services)	2000	6 394 757	6 327 113	6 117 115
Cost of products (goods and services)	2050	3 620 700	3 830 125	3 577 332
Material costs	2500	887 327	954 305	846 096
Salary expenses	2505	1 793 323	1 901 924	1 860 217
Allocations for social deductions	2510	592 412	362 969	377 158
Depreciation	2515	472 529	500 125	518 996
Other operating expenses	2520	1 536 406	1 779 634	1 593 344
Calculated	Abbreviation			
1. The relative deviation of total payroll, taking into account the dynamics of revenue from sales of products (goods and services)	ΔP	−470 852.62	−95 605.60	47 654.20
2. The relative deviation of material costs, taking into account the dynamics of revenue from sales of products (goods and services)	ΔMC	32 791.61	76 364.18	−76 535.45
3. The relative deviation of depreciation deductions, taking into account the dynamics of revenue from sales of products (goods and services)	ΔA	−79 998.62	32 594.43	35 470.24
4. The relative deviation of other operating costs, taking into account the dynamics of revenue from sales of products (goods and services)	ΔOC	42 292.48	259 480.17	−127 223.63
5. The relative deviation of fixed assets in view of the dynamics of revenue from products (goods and services) sales	ΔFA	4 447 538.56	−48 665.69	80 762.13
6. The relative deviation from current assets taking into account the dynamics of revenue from products (goods and services) sales	ΔCA	127 328.79	244 908.80	451 212.43
7. The relative deviation of current liabilities and securities taking into account the dynamics of revenue from sales of products (goods and services)	ΔCL	−717 309.93	458 303.17	532 007.15
Provision costs	ΔC	−466 263.37	247 724.91	−125 670.47
Cumulative efficiency of business enterprises	$\sum eff.$	3 381 790.27	927 379.46	943 347.06

Table 3

Evaluating the effectiveness of resource use in the communications and informatization service enterprise CJSC "Kyivstar" for the years 2017−2019

Parameter		Years		
Initial characteristics	Line code	2017	2018	2019
Fixed assets	1010	6 993 237	6 128 482	7 148 400
Current assets	1195	3 784 028	5 315 192	8 928 856
Current liabilities and securities	1695	6 061 287	4 934 139	4 315 927
Net income from sales of products (goods and services)	2000	14 925 358	15 753 027	17 078 988
Cost of products (goods and services)	2050	7 927 329	8 699 457	7 372 418
Material costs	2500	3 347 186	2 275 894	2 139 190
Salary expenses	2505	837 710	841 395	990 737
Allocations for social deductions	2510	208 299	126 932	152 485
Depreciation	2515	1 737 246	3 671 345	2 255 480
Other operating expenses	2520	4 364 238	4 746 638	5 363 954
Calculated	Abbreviation			

1. The relative deviation of total payroll, taking into account the dynamics of revenue from sales of products (goods and services)	ΔP	−120 477.80	451 648.23	−1 100 010.17
2. The relative deviation of material costs, taking into account the dynamics of revenue from sales of products (goods and services)	ΔMC	−913 036.05	622 543.08	−3 133 159.77
3. The relative deviation of depreciation deductions, taking into account the dynamics of revenue from sales of products (goods and services)	ΔA	−291 986.54	2 813 227.98	−6 249 579.97
4. The relative deviation of other operating costs, taking into account the dynamics of revenue from sales of products (goods and services)	ΔOC	320 049.17	2 590 911.70	−5 632 136.22
5. The relative deviation of fixed assets in view of the dynamics of revenue from products (goods and services) sales	ΔFA	−919 519.27	2 674 155.05	−7 048 878.36
6. The relative deviation from current assets taking into account the dynamics of revenue from products (goods and services) sales	ΔCA	−184 835.25	3 446 061.88	−3 384 349.84
7. The relative deviation of current liabilities and securities taking into account the dynamics of revenue from sales of products (goods and services)	ΔCL	802 807.41	1 940 151.09	−7 114 529.16
Provision costs	ΔC	3 667 106.95	4 783 732.97	−12 780 796.55
Cumulative efficiency of business enterprises	$\sum eff.$	−1 306 998.33	14 538 699.03	−33 662 643.48

Table 4

Evaluating the effectiveness of resource use in the communications and informatization service enterprise PJSC "VF Ukraine" for the years 2017−2019

Parameter		Years		
Initial characteristics	Line code	2017	2018	2019
Fixed assets	1010	5 367 511	6 501 670	7 602 685
Current assets	1195	3 506 880	3 519 713	3 244 631
Current liabilities and securities	1695	5 501 962	5 197 995	6 233 277
Net income from sales of products (goods and services)	2000	10 087 908	11 175 861	11 745 324
Cost of products (goods and services)	2050	5 285 331	6 767 731	6 345 629
Material costs	2500	3 547 174	4 537 584	3 847 369
Salary expenses	2505	542 689	619 726	682 692
Allocations for social deductions	2510	165 272	113 044	125 879
Depreciation	2515	1 791 681	2 379 718	2 755 761
Other operating expenses	2520	3 914 072	2 740 672	2 377 369
Calculated	Abbreviation			
1. The relative deviation of total payroll, taking into account the dynamics of revenue from sales of products (goods and services)	ΔP	55 443.85	−51 542.64	38 462.90
2. The relative deviation of material costs, taking into account the dynamics of revenue from sales of products (goods and services)	ΔMC	311 612.38	607 857.09	−921 426.38
3. The relative deviation of depreciation deductions, taking into account the dynamics of revenue from sales of products (goods and services)	ΔA	−130 622.58	394 809.16	254 785.11
4. The relative deviation of other operating costs, taking into account the dynamics of revenue from sales of products (goods and services)	ΔOC	403 886.99	−1 595 521.85	−502 953.21
5. The relative deviation of fixed assets in view of the dynamics of revenue from products (goods and services) sales	ΔFA	1626680.48	555 287.77	769 724.15
6. The relative deviation from current assets taking into account the dynamics of revenue from products (goods and services) sales	ΔCA	−2 605 820.56	−365 374.32	−454 428.03
7. The relative deviation of current liabilities and securities taking into account the dynamics of revenue from sales of products (goods and services)	ΔCL	530 040.61	−897 338.40	770 419.56
Provision costs	ΔC	−118 901.35	3 443 082.35	−6 180 976.85
Cumulative efficiency of business enterprises	$\sum eff.$	191 221.18	−1 351 823.19	−45 415.90

Evaluating the effectiveness of resource use in the communications and informatization service enterprise SE "Ukrainian State Center of Radio Frequencies" for the years 2017−2019

Parameter		Years		
Initial characteristics	Line code	2017	2018	2019
Fixed assets	1010	238 992	303 968	344 860
Current assets	1195	467 768	409 559	337 090
Current liabilities and securities	1695	9693	16 986	22 501
Net income from sales of products (goods and services)	2000	451 956	482 136	514 878
Cost of products (goods and services)	2050	189 606	208 480	266 858
Material costs	2500	15 308	16 269	14 721
Salary expenses	2505	104 929	130 592	161 760
Allocations for social deductions	2510	37 032	28 371	34 399
Depreciation	2515	47 443	52 076	69 172
Other operating expenses	2520	165 843	178 260	170 644
Calculated	Abbreviation			
1. The relative deviation of total payroll, taking into account the dynamics of revenue from sales of products (goods and services)	ΔP	−18 442.50	7522.35	26 400.78
2. The relative deviation of material costs, taking into account the dynamics of revenue from sales of products (goods and services)	ΔMC	694.93	−61.21	−2652.83
3. The relative deviation of depreciation deductions, taking into account the dynamics of revenue from sales of products (goods and services)	ΔA	−7860.49	1464.93	13 559.50
4. The relative deviation of other operating costs, taking into account the dynamics of revenue from sales of products (goods and services)	ΔOC	102 309.09	1342.60	−19 721.69
5. The relative deviation of fixed assets in view of the dynamics of revenue from products (goods and services) sales	ΔFA	−27 117.22	49 016.97	20 249.44
6. The relative deviation from current assets taking into account the dynamics of revenue from products (goods and services) sales	ΔCA	−19 244.40	−89 444.87	−100 282.27
7. The relative deviation of current liabilities and securities taking into account the dynamics of revenue from sales of products (goods and services)	ΔCL	−3544.18	6645.74	4361.48
Provision costs	ΔC	−5544.24	6212.79	44 220.06
Cumulative efficiency of business enterprises	$\sum eff.$	26 795.23	−23 513.49	−58 085.60

Thus, following the assessment of communication and informatization service enterprises' resource efficiency for the period of 2017−2019, one could argue that there is both a negative effect and a positive one. Thus, at PJSC "Ukrposhta" and JSC "Kyivstar" in 2017 and 2019 respectively the cumulative economic impact of resource use is positive because the values are negative. And in 2018, it is the opposite: that year's effect is negative. PJSC "Ukrtelecom" during the analyzed period demonstrates a stable negative effect from the use of resources, since the evaluation always comes out positive. Both PJSC "VF Ukraine" and SE "Ukrainian State Center of Radio Frequencies" had a negative effect in 2017, but during 2018−2019 the cumulative economic effect from the resource use is positive. That is, we can argue that all enterprises except PJSC "Ukrtelecom", have available reserves to increase efficiency, i. e. the possibility to increase the services − per unit of total costs parameter through more rational use of all resources. Thus, enterprises can focus certain reserves, aimed to streamline the use of resources, on improving the efficiency of their key business processes, widening the scope of research activity, to staff motivation, to the improvement of technical and technological basis, to maintain social and environmental responsibility, information management, energy saving.

Results. The next stage refers to the calculation of communications and informatization service enterprises' compatibility with other integrated system companies, this parameter identifying the need to integrate the target companies. These figures reflect the presence of industrial, technological and human relations between them, i. e. the enterprises' propensity to integration. The parameter identifying companies' susceptibility to integration can never bear the random character. Therefore, for the integration feasibility study required is the calculation of compatibility.

To calculate the companies' potential compatibility we suggest using several integration indicators as follows:

Table 6

The combined efficiency of communications and informatization enterprises' economic activities in 2017−2019

Company name	Years		
	2017	2018	2019
PJSC "Ukrposhta"	−1 789 683.72	5 163 119.91	−1 772 756.55
PJSC "Ukrtelecom"	3 381 790.27	927 379.46	943 347.06
CJSC "Kyivstar"	−1 306 998.33	14 538 699.03	−33 662 643.48
PJSC "VF Ukraine"	191 221.18	−1 351 823.19	−45 415.90
SE "Ukrainian State Center of Radio Frequencies"	26 795.23	−23 513.49	−58 085.60

1. Market integration value reflects the share of total direct sales in their entirety

$$K_P = \frac{V_{ds}}{\sum\limits_{i=1}^{n} V_{s_i}},$$

where V_{ds} is the volume of direct sales of products generated at the integrated group; $\sum\limits_{i=1}^{n} V_{s_i}$ is total sales of companies which are the integrated structure potential participants; I is enterprise – potential participant of the integrated structure; n is the number of companies potential participants in the integrated structure.

2. Value of production capacity integration shows the proportion of production facilities involved to ensure the integrated enterprises' internal production processes in the total production capacity

$$K_{IPC} = \frac{PC_{PC}}{\sum\limits_{i=1}^{n} PC_{pc_i}}.$$

Where PC_{PC} is the number of production facilities involved to ensure domestic supplies; $\sum\limits_{i=1}^{n} PC_{pc_i}$ is total production capacity of enterprises potential participants of the integrated structure.

3. Value of the enterprise scientific integration reflects the share of joint scientific research in total research volume

$$K_{R\&D} = \frac{V_{R\&D_\Sigma}}{\sum\limits_{i=1}^{n} V_{R\&D_i}},$$

where $V_{R\&D_\Sigma}$ is the total amount of $R\&D$ performed by each of the participants; $\sum\limits_{i=1}^{n} V_{R\&D_i}$ is the amount of $R\&D$ performed by joint efforts of association potential participants.

4. Value of enterprise informational integration (organizational compliance unit) shows the share of shared/jointly used information, software and other intangible assets (patents, licenses, etc.) used by the integrated system enterprises in these assets total amount

$$K_{22} = \frac{K_{progr.\Sigma}}{\sum\limits_{i=1}^{n} K_{progr.i}},$$

where $K_{progr.\Sigma}$ is the number of shared programs used by each enterprise; $\sum\limits_{i=1}^{n} K_{progr.i}$ is the total number of applications used in the ith enterprise.

5. Target market integration index expresses the degree of joint market presence and services rendered to one target audience

$$K_{2M} = \frac{K_{\tilde{n}m}}{\sum\limits_{i=1}^{n} K_{tc.i}},$$

where K_{cm} is the number of consumers who are at once customers of several companies within one integrated structure; $\sum\limits_{i=1}^{n} K_{tc.i}$ is total target audience (consumers) integrated structure.

6. Value of technology integration (compatibility) reflects the degree of technological solutions, production capacity and logistics networks compatibility

$$K_{TI} = \frac{K_{scl}}{\sum\limits_{i=1}^{n} K_{scl_i}},$$

where K_{scl} is the volume of technological solutions, production facilities and logistics networks, integrated (or eligible for integration) into a single system; $\sum\limits_{i=1}^{n} K_{scl_i}$ – total technological solutions, production capacity and logistics networks.

7. Indicator of flexible management by personnel rotation demonstrating how effectively and quickly staff rotation is carried out

$$K_{FM} = \frac{K_{rp.}}{\sum\limits_{i=1}^{n} K_{pw}} \cdot \frac{T}{T_{pw}},$$

where K_{rp} is the number of employees whose position was shifted, including the internal staff rotation (within the same company or unit), external (between branches and departments of the entity located in the same region) and interregional (position change with the relocation to another region on a branch or structural unit of the entity); $\sum\limits_{i=1}^{n} K_{pw}$ is the total number of employees involved in the companies which are potential participants of the integrated structure; T is period, for which employees are repositioned; T_{pw} is the total time period being analyzed.

8. Index of business activity (or turnover growth rate) reflecting the degree of increase in the number of stock turnround cycles

$$K_{BA} = \frac{V_t \cdot \overline{S}_{t-1}}{V_{t-1} \cdot \overline{S}_t},$$

where V is volume of sales; $\overline{S}$ is average balance of reserves; t is the current period; $t - 1$ is the previous period.

9. Indicator of integrated structure maneuverability shows how the company without significant costs and losses in output may change product lines

$$K_M = \left(1 - \frac{1}{n}\right) \cdot \left[1 - \sum\limits_{i=1}^{n}\sum\limits_{j=1}^{m} \frac{FS_{ij}}{Activ}\right],$$

where n is the number of different functional states of the enterprise within its technological capabilities; m is the number of services provided by the enterprise; FS_{ij} is transition from i^{th} to j^{th} functional status of the enterprise; $Activ$ is reference period of company activity.

10. The level of diversification value reflects the multiplicity of the enterprise's services and markets vectors

$$K_D = 1 - \sum\limits_{j=1}^{m} \varphi_j^2,$$

where $-\varphi_j^2$ is the proportion of jth type of services/products in the total services/products volume.

11. Indicator of consumers' tolerance to the integrated structure expresses the probability of consumers' refusal from the enterprise's product/services

$$K_T = \frac{C}{C_g},$$

where C is the number of surveyed consumers which refuse from a company's services when it joins the integrated structure; C_g is the total number of surveyed consumers of companies potential participants of the integrated structure.

12. The marketing activity efficiency factor expresses the relationship between the financial results and activities of marketing services that affect the enterprise's financial stability and competitiveness

$$K_{EM} = \frac{ME}{R},$$

where *ME* is volume of marketing expenses related to the advancement of design services/products, expected for introducing the integration process completed; *R* is revenues from expected services/products project implementation.

We apply the proposed methodology regarding the calculation of communications and informatization enterprises compatibility with other enterprises integrated into system (Table 7).

For a balanced assessment of interoperability, the compatibility indicators shall be assigned scores to summarize the potential compatibility of comparable enterprises by placing weight coefficients. Then to proceed with potential compatibility evaluation based on the scores, an expert assigns a compatibility score from 0 to 10 points to each indicator corresponding to the degree of its importance within the indicators range. Next, determined is the weight coefficient value as the arithmetic mean of each indicator score assigned by the expert. Then, the integral compatibility indicator is calculated based on the data from Table 8.

The overall indicator of compatibility for each company is defined in points as follows

$$IIC = \sum_{i}^{n} x_i \cdot j_i. \tag{23}$$

Now we calculate the integral compatibility index for the analyzed enterprises (Table 9).

Thus, evaluated is the integral indicator of interoperability, which suggests that the most compatible for integration is CJSC "Kyivstar", since its integral index value exceeding all others' one, amounts to 41.27.

Conclusions. Assessing the existence and role of integration ties between the companies which are potential participants of the integrated structure implies the possibility to calculate the companies' compatibility potential prior to their association into an integrated structure. Such analysis still at the integration planning stage will help in evaluating the risk of companies' non-compliance.

Table 7

Indicators of communications and informatization enterprises' interoperability with other enterprises integrated into system

Parameter	Enterprises			
	PJSC "Ukrposhta"	PJSC "Ukrtelecom"	CJSC "Kyivstar"	PJSC "VF Ukraine"
1. Indicators of market integration	0.07	0.13	0.22	0.17
2. Key integration of production capacity (production conformity unit)	0.05	0.07	0.03	0.04
3. Enterprise scientific integration indicator	0.10	0.32	0.47	0.43
4. Enterprise information integration (organizational compliance unit) indicator	0.78	0.81	0.85	0.85
5. Target markets integration indicator	0.19	0.12	0.19	0.17
6. Technology integration (compatibility) indicator	1.05	1.15	1.17	1.17
7. Flexibility by personnel management rotation indicator	0.00025	0.00069	0.00661	0.00601
8. Business activity (growth rate or turnover rate) indicator	1.07	1.13	1.21	1.23
9. Integrated structure maneuverability indicator	0.72	0.84	0.97	0.96
10. Diversification level indicator	0.28	0.05	0.0063	0.0098
11. Indicator of consumers tolerance to the integrated structure	0.01	0.01	0.01	0.01
12. Efficiency of marketing activities	0.041	0.070	0.084	0.089

Table 8

Initial data for determining the effectiveness of enterprise integration

Compatibility Index	Potential i^{th} participant of the integrated economic structure							Weight coefficients
	1	2	3	4	5	6	7	
1. Indicators of market integration	x_1	x_1	x_1	x_1	x_1	x_1	x_1	j_1
2. Key integration of production capacity (production conformity unit)	x_2	x_2	x_2	x_2	x_2	x_2	x_2	j_2
3. Enterprise's scientific integration indicator	x_3	x_3	x_3	x_3	x_3	x_3	x_3	j_3
4. Enterprise's information integration (organizational compliance unit) indicator	x_4	x_4	x_4	x_4	x_4	x_4	x_4	j_4
5. Target market integration indicator	x_5	x_5	x_5	x_5	x_5	x_5	x_5	j_5
6. Technology integration (compatibility) indicator	x_6	x_6	x_6	x_6	x_6	x_6	x_6	j_6
7. Flexibility by personnel management rotation indicator	x_7	x_7	x_7	x_7	x_7	x_7	x_7	j_7
8. Business activity (growth rate or turnover rate) indicator	x_8	x_8	x_8	x_8	x_8	x_8	x_8	j_8
9. Integrated structure maneuverability indicator	x_9	x_9	x_9	x_9	x_9	x_9	x_9	j_9
10. Diversification level indicator	x_{10}	x_{10}	x_{10}	x_{10}	x_{10}	x_{10}	x_{10}	j_{10}
11. Indicator of consumer tolerance to the integrated structure	x_{11}	x_{11}	x_{11}	x_{11}	x_{11}	x_{11}	x_{11}	j_{11}
12. Efficiency of marketing activities	x_{12}	x_{12}	x_{12}	x_{12}	x_{12}	x_{12}	x_{12}	j_{12}
The overall indicator of compatibility	*IRS*	*IRS*	*IRS*	*IRS*	*IRS*	*IRS*	*IRS*	

Finding the integrated compatibility parameter for communications and informatization enterprises with other branches' companies in the integrated system

Parameter	weight coefficient	Enterprises			
		PJSC "Ukrposhta"	PJSC "Ukrtelecom"	CJSC "Kyivstar"	PJSC "VF Ukraine"
1. Indicators of market integration	9.10	0.64	1.18	2.00	1.55
2. Key integration of production capacity (production conformity unit)	9.76	0.49	0.68	0.29	0.39
3. Enterprise's scientific integration indicator	8.27	0.83	2.65	3.89	3.56
4. Enterprise's information integration (organizational compliance unit) indicator	5.36	4.18	4.34	4.56	4.56
5. Target market integration indicator	7.64	1.45	0.92	1.45	1.30
6. Technology integration (compatibility) indicator	6.89	7.23	7.92	8.06	8.06
7. Flexibility by personnel management rotation indicator	5.24	0.00131	0.00362	0.03464	0.03149
8. Business activity (growth rate or turnover rate) indicator	8.77	9.38	9.91	10.61	10.79
9. Integrated structure maneuverability indicator	9.84	7.08	8.27	9.54	9.45
10. Diversification level indicator	7.97	2.23	0.40	0.05	0.08
11. Indicator of consumer tolerance to the integrated structure	4.23	0.04	0.04	0.04	0.04
12. Efficiency of marketing activities	8.81	0.36	0.62	0.74	0.78
The overall indicator of compatibility		33.92	36.93	41.27	40.58

Clearly obvious are the benefits of the proposed methodology for assessing the integration feasibility:

1) methods based onto (and including as tools) the assessment of enterprises' financial condition, resource efficiency evaluation and the enterprises' compatibility assessment, in other words, the use of a comprehensive approach to assessing the need for integration;

2) the entity financial condition assessment is based on publicly reported statements;

3) when analyzing entities' interlinked objects, a comprehensive assessment of enterprises compatibility is carried out.

The concomitant use of economic activities efficiency complex analysis and the existing compatibility potential evaluation which give grounds to substantiate the enterprise integration represents this methodology novelty. The method for assessing the integration feasibility can be used especially for high technology companies with a limited applicability to other types companies.

Thus, the proposed methodology for assessing the feasibility of integration allows the simultaneous assessment of prospects for businesses integration and interoperability with the ability to assess potential risks and to develop a system of measures to eliminate or minimize the association's negative effects. In addition, the developed technique provides for evaluating both external and internal environments: creation of integrated enterprises allows staff employment the employer entity's reform running, it serves to reduce costs and increase efficiency through synergy and harmonization of approaches in logistics, engineering, information technology, quality management.

Thus, the decision-making on the complementary interoperability of communications and informatization service enterprises as well as on their compatibility potential becomes with the proposed method possible even at reintegration stage that circumstance being of key importance when creating the integration structure.

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Оцінка сумісності й можливості інтеграції підприємств служб зв'язку та інформатизації

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Мета. Розробити й науково обґрунтувати методологічний підхід і доцільність інтеграції й сумісності підприємств послуг зв'язку та інформатизації при об'єднанні, а також розробити практичні рекомендації щодо застосування цього підходу.

Методика. У даному дослідженні використовувалося поєднання методів інтегральної оцінки, розрахунково-конструктивного методу, структурно-логічного та якісного системного аналізу й методів синтезу.

Результати. У результаті впровадження методологічного підходу запропоновано розрахунок показників адаптивності підприємств послуг зв'язку та інформатизації до взаємодії з іншими підприємствами в рамках інтегрованої системи, що вказують на необхідність інтеграції обраних підприємств. Ці показники відображають наявність у них взаємних виробничих, технологічних і кадрових зв'язків, тобто прагнення підприємств до інтеграції. Вибір очікувано інтегрованих підприємств не може бути випадковим. Тому для обґрунтування економічної доцільності інтеграції необхідно розрахувати показники сумісності.

Наукова новизна. Запропонований науково-методологічний підхід дозволяє виявити найбільш сприятливі передумови для створення інтегрованої форми діяльності підприємства зв'язку та інформатизації в конкретному економічному регіоні. На відміну від існуючих, даний підхід включає в себе наступні етапи: 1. Оцінка впливу чинників інтеграційної форми діяльності підприємств сфери зв'язку та інформатизації з урахуванням особливостей розвитку економічного регіону, в якому знаходиться інтеграційна система. 2. Аналіз фінансового стану інтегрованих у систему підприємств сфери зв'язку та інформатизації. 3. Оцінка ефективності використання ресурсів на підприємствах інтегрованої системи зв'язку та інформатизації з метою виявлення економії або перевитрати на той чи інший вид ресурсів. 4. Аналіз сумісності підприємств зв'язку та інформатизації з іншими підприємствами, що входять до єдиної системи.

Практична значимість. Результати дослідження можуть бути використані науковцями та практиками сфери управління підприємствами служб зв'язку та інформатизації для визначення доцільності та ефективності інтеграції цих підприємств у залежності від мотивів і цілей інтеграції, а також для визначення потенціалу сумісності підприємств — учасників інтеграційних структур.

Ключові слова: *інтегрована структура, служби зв'язку, служби інформатизації, потенціал, ефективність*