

ASSESSMENT TECHNIQUES FOR INTEGRATION EFFICIENCY OF ECONOMIC OBJECTS

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Abstract

Nowadays one of the most topical problems is the economic efficiency assessment of enterprises' integration within technological chains, financial structures, logistic systems and so on. Especially it covers Ukraine's economy, that fell under the impact of world financial crisis and hereby requires restructuring and creating such unions of economic objects capable to secure production growth, investment flow into country's economy as well as improving competitiveness of production at world market. The paper reviews integration problems for economic objects aiming to achieve a synergy effect from complementary actions of their assets, which total value exceeds isolated functioning results. It is explained that application of system-dynamic approach to investigation the efficiency integration of economic objects with regards of process design peculiarities of managerial decisions allows maximum accurate analyzing the results of interaction of economic units within unified integrated structure. Study suggested a simulation model developed on the base of conceptual description the function results for integrated formation, which is the key technique tool for efficiency assessment of integration.

Keywords: management technique, assessment, economic efficiency, integration, complex economic object

INTRODUCTION

Functioning of any economic system is connected with complex interaction of its elements that is on the present economic stage is revealed and developed more and more like integration of economic objects. This study intends to investigate the problems of integration processes where an integration of economic objects is studied from different sides that results in missing the unique approach to the sense of integration of economic objects.

A well-known Russian scientist A.M. Gataulin, in the field of economic regulation of macroeconomic interbranch and interregional relations characterizes an integration of economic objects as organizational form of interconnected co-operation of a certain number of enterprises and institutions of different economic activities based on the social division of labour, specialization and cooperation (Gataulin, 2007). Levitskiy (2012) determined the integration of economic objects as some kind of enterprises' cooperation through their association, conformation and cooperation infusion resulting in development and growth of their interlinks. In this case, author paid a specific attention to interbranch interaction and exchange among economic objects as elements of unified economic system.

Sukhanova (2000), a specialist in the field of development of production, financial, currency and trade relations considers an integration of economic objects as a way to harmonize reproduction processes of economic system elements functioning. Ye.F. Gerstein, an economist and specialist in the field of differentiation and integration in industry interprets an integration of economic objects in two aspects (Gerstein, 1993):

- like enlarging, concentration and often diversification of the main chain link of a large production-economic complex;
- like formation of new links between production-economic units.

According to the description given in the economic dictionary, an integration of economic objects is enlargement and deepening of production - technological interlinks between enterprises, joint usage of various resources, union of capital funds and creation of favourable conditions for performing common economic activity (Raizberg, Lozovskiy and Starodubtseva, 1999).

Based on analysis and systematization of different approaches to define the integration of economic objects one can formulate the following summarizing definition that is grounded on the principles of system approach as the most reasonable approach to investigate current systems, which are featured with complex structure and management processes (Herstein, 1993; Palamarchuk, 1999; Raizberg, Lozovskiy and Starodubtseva, 1999; Sukhanova, 2000; Gataulin, 2007; Levitskiy, 2012).

Integration of Economic Objects

This is a union of economic objects (subsystems) aiming to form economic system of a new quality, which operation will allow providing the growth of operation efficiency and competitiveness of united partners including permanent changes of internal and external factors. So, the purpose of integration is achieving of synergy effect from complementary action of assets of economic objects, which summarized value exceeds detached operational results of the economic objects. It stipulates the topicality of formation of economic objects integration in today's post-crisis conditions of functioning and development of world economy, when the unification problem of economic units to solve the most critical production problems is especially sharp. It particularly considers the Ukraine's economy, which significantly falls under impact of world financial crisis in 2008-2009, and consequently requires restructuration and creation of such economic objects union, which are capable to secure production growth, invest flow-in to country's economy and increasing of competitiveness of native producers in world trade markets.

Herewith, a process of creating the integration formations in Ukrainian economy is constantly accompanied with searching the optimal types of financial-economic cooperation of economic units and effective methods for their management. And, efficiency of unification of economic objects significantly depends on the results of financial-economic mechanism of their interaction, which is designed basing on the integration efficiency assessment. In its turn the integration efficiency assessment is connected with analyzing the operation results of certain unified members, the general result of operation of integrated union, dynamics of money interaction flows of elements of integrated structure.

In spite of enormous background in the world on creating and developing of different integrated unions, the assessment challenges for integration efficiency of economic objects in scientific-economic papers are still unsolved due to high variety of structure of integrated formations (Williamson O.I., 1995; Buleyev, Bogachev and Melnikova, 2003; Afonichkin, Zhurova and Yagodin, 2006; Levitskiy, Frunze and Zaitseva, 2010).

RESEARCH METHODOLOGY

Time behavior studying of integrated formation can be provided using system dynamics technique which is for today is the most applicable and efficient approach to economic prognosis and microeconomic analysis of complex system behavior for interacted elements. Theory of system dynamics was developed in the middle 1950s by American cybernetic engineer Jay Forrester and constitutes a unity of principles and methods of behavior analysis of complex dynamic systems with feedback (Forrester, 1958).

Using of system dynamics for assessment of efficiency integration of economic objects will provide organizational and quantitative basis for optimal management of integrated formation.

If considering system dynamics integration of economic objects (F) can be presented as a trine of interconnected elements (Lychkina, 2005):

$$F = \langle E, C, T \rangle, \quad (1)$$

where

E – variety of elements of integrated formation;

C – variety of possible links between elements of integrated formation;

T – variety of analyzed time moments.

System dynamic investigation process implies stage sequence performing (Lychkina, 2005):

- Determination of a task and objectives for implementation of imitation experiment;
- Finding out a conceptual model of investigated system (challenging situation);
- Formalization of imitation model by determining mathematical dependencies between elements of investigated system (components of challenging situation);
- Choosing the way of program performing of imitation model and development of imitation program;
- Performing complex testing of imitation model in chosen modeling environment;
- Setting the conditions of performing the imitation experiment and implementation of designed imitation model;
- Analysis and interpretation of results obtained from performed imitation experiments with following development and acceptance of management decisions.

According to the technological algorithm as it were stated time and again a purpose of imitation investigation is efficiency assessment of integrated economic objects.

RESULTS

An importance of efficiency assessment for interaction between enterprises and organizations for development of practical management technique by large integrated structures, as well as the need in further research methodological development of integration processes stipulated the necessity to develop assessment mechanism for economic objects integration.

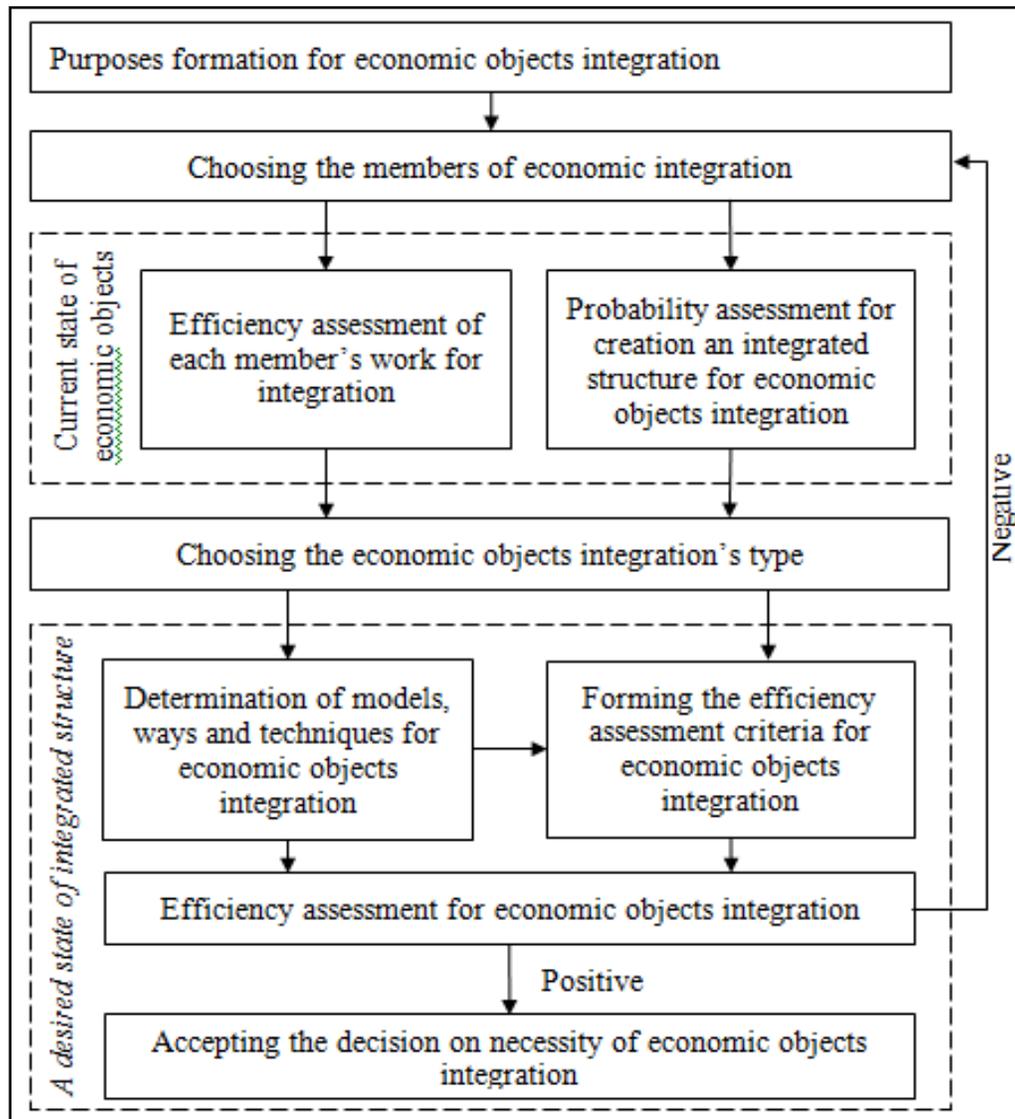
It is evident that efficiency assessment for economic objects depends on the specific factors of different kinds of integration among which one should outline (Ivanter and Klotsvog, 1997):

- Horizontal integration: implies a unification of economic objects producing a one-type products, that results in large scales of new structural formation, increasing number of employees, the growth of activities in the main production specialization of the union's members etc.;

- Vertical integration: implies a unification of economic objects into hierarchical management structure covering the successive stages of production processes due to its functioning to control the production stages and distribution of products (intermediate resource), efficient resource exchange between union's members, shortening of transaction expenses etc.;
- Diversification: implies a unification of economic objects aiming a development of assorted range of produces items and general sales.

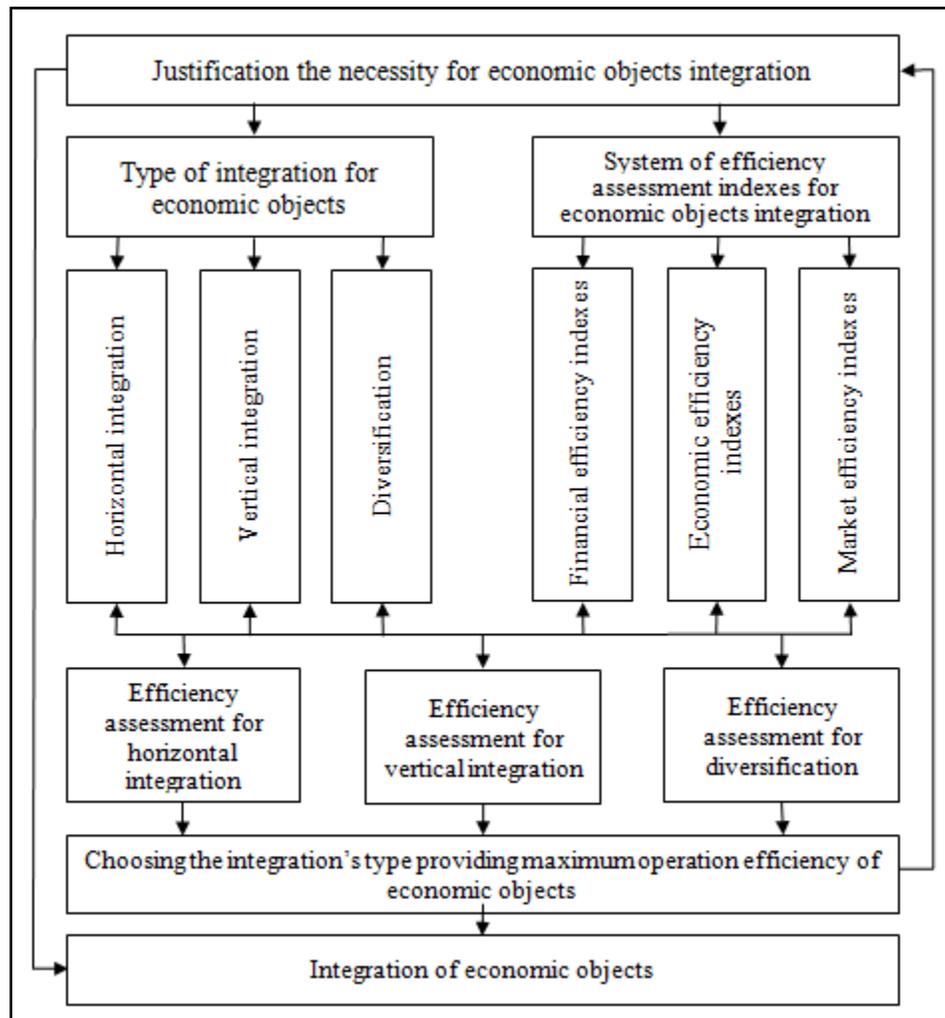
By turn efficiency of this is that kind of integration of economic objects directly depends on their integration strategy within the frames of which the goals integration system of economic units is determined as well as the choice of necessary models, methods and integration mechanisms, control for their realization & efficiency of members' work in the union (Figure 1).

Figure 1. General view of realization process for integration strategy of economic objects



Though, integration strategy of economic objects works as a mean of achieving the goals for additional growth of each member of the union and efficiency increase due to their interaction. As an integration strategy of economic objects implies finding of the most economically reasonable integrated formation, the efficiency assessment of economic units must be carried out through synergy effect, which comes along with integration processes and has been the integral goal of their performing (Figure 2).

Figure 2. Choice rationale for integration's type of economic objects



And, efficiency assessment of integration objects reasonably includes the following aspects:

- financial aspect: implies the calculation of the indexes, which determine the efficiency of finance usage by integrated formation of existing financial resources that lead to yield, payment ability, financial sustainability and unification flexibility of economic objects;
- economic aspect: implies the calculation of the indexes, which characterize usage efficiency for integrated formations having production resources, distribution level of expenses on

structural elements of this integrated formation and the results of executive mechanism on cost reducing for produced items;

- market aspect: implies the calculation of the indexes, which characterize the accordance of growth and development pace of integrated formation to market development pace, where it works and quantitatively presenting the advantages obtained when economic objects have been united.

Analysis of economical and financially oriented literature, devoted to the assessment results of economic activity of enterprises and companies, allowed to allocate the following indexes of financial efficiency of integration, which are common for all kinds of economic objects unions (Zudenko and Denisenko, 2001): profitability of fixed assets; profitability current assets; profitability of production; equity profitability; profitability of borrowed capital; autonomy index; absolute liquidity ratio; critical liquidity ratio; current liquidity ratio.

It is noteworthy that choosing from the variety of liquidity ratio indexes of absolute, critical and current liquidity is justified with their importance for different economic subjects involved into the integration process (Thompson and Strickland, 2001):

- absolute liquidity ratio: for material and production resources suppliers;
- critical liquidity ratio: for banks;
- current liquidity ratio: for investors (stockholders and bondholders).

The following indicators can be referred to as indexes of economic efficiency integration, which are common for all kinds of unions of economic objects (Yakutin, 1998; Kokhno, 2007): capital productivity; material consumption; labour productivity; profitability of production.

As to market integration efficiency indexes they are reasonably to be considered in direct correlation with certain kind of a union of economic units. It is justified by the difference in tasks in economic policy (economic advance), which conception depends on the interaction forms of structural elements of the founded integrated structure.

Though, for horizontal integration of economic objects they suggest to analyze a concordance of market development pace where the integration formation is functioning, and a development of the integrated formation itself using the following coefficient (Buleyev and Bogachev, 2009):

$$A_{GR} = \frac{N_E}{N_M} \quad , (2)$$

where

A_{GR} – index for concordance of integrated formation development pace to pace of market development ;

N_E – number of new kinds of products, produced by integrated formation;

N_M – number of new kinds of production marketed, where integrated formation is functioning.

Assessment of outside competitive advantages, which are obtained while economic objects are integrating, can be performed using the indexes given in the Table 1 (Levitskiy, 2012).

Table 1. Efficiency assessment indexes of outside competitive advantages during integration of economic objects

Integration types (of economic objects)	Efficiency assessment index
Horizontal integration	Sales profitability
	Change ratio of market share to market growth pace
Vertical integration	Quantity ratio of permanent clients to general quantity of clients
	Defects level ratio in production to production volume
Diversification	Sales profitability
	Change ratio of market share to market growth pace

Furthermore, one should consider some common peculiarities of efficiency assessment of integrated formations, which depend on the kind of integration.

So, for horizontal integration one should compare the efficiency of activity of each member of the union with functioning efficiency of a whole integrated structure aiming to check up an implementation of necessary condition for system effect (Buleyev and Bogachev, 2009):

$$S_E > E_1 + E_2 + \dots + E_n, \quad (3)$$

where

S_E – a synergy effect produced by integrated formation;

E_1, E_2, \dots, E_n – an economic effect (effect) of functioning of n economic object, $n = \overline{1, N}$.

For vertical integration of economic objects for efficiency assessment it is reasonable to compare the activity results of each member of the union with industry average values. A synergy effect which is generated by integration formation can be determined according to the following expression (Buleyev and Bogachev, 2009):

$$S_E = \sum_{n=1}^N E_n \rightarrow \max, \quad n = \overline{1, N} \quad (4)$$

At production diversification of economic objects, for efficiency assessment one should consider a change of the main indexes of functioning of integrated formation comparing with change of the same indexes in average in a branch. Taking into account the diversification peculiarities a synergy effect of unification of economic units can be presented in the following (Buleyev and Bogachev, 2009):

$$S_E = \sum_{n=1}^N E_n^0 + \sum_{n=1}^N E_n^P + E_F, \quad (4)$$

where

E_n^0 – an effect being obtained by n economic object at adhering previous structure of produced items;

E_n^P – an effect being obtained at production of a new type of product beyond the n economic object;

E_F – cumulative operation effect of integrated formation obtained after introduction into present product assortment a new diversified kind of product.

When calculating a synergy effect of economic objects integration except of the assessment of their interaction results one should surely include expenses for implementing a unification of economic units which regardless their integration kind can be referred to (Gerstein, 1993):

- expenses for implementing the technological compatibility of production processes during economic objects integration;
- expenses for flow of documentation at integration process of economic objects (transaction expenses, arbitrary occasions etc.);
- expenses for debt service on loans for implementation of integration procedure of economic objects (if they exist);
- other expenses.

Therefore, all the above mentioned expenses to accompany the integration of economic objects constitute so-called integrated price. So, the total calculated effect from integration of economic objects (TE) can be presented as (Buleyev and Bogachev, 2009):

$$TE = S_E - P_F, \quad (5)$$

where

P_F – price of economic objects integration.

From Equation (5) it is seen that if total calculated effect from integration of economic objects is positive, the creation of integrated formation can be financially reasonable and justified.

Then the above studied financial coefficients and determined interlinks between the data will form a technique for efficiency assessment of economic objects integration. Considering unstable working conditions of economic objects, which are specific for present development stage of Ukraine and require continuous measuring the work parameters of economic units the efficiency assessment of their integration is necessary to make in dynamics. It will allow performing the continuous monitoring of union's members activity aiming its timely correction and finding out perspective trends of integrative formation development.

Peculiar properties given above for assessment process of efficiency of integrated formation have determined main elements, variables and functional dependencies which will constitute realization of the following stage of imitation modeling – development of conceptual model. A conceptual model is a system-based, thoughtful, logically-mathematical description of challenging situation in informal language (Levitskiy, 2012). Conceptual description of problematic situation offers description of a general idea of imitation model and accordingly determination its main structure, including all assumptions and hypothesis which they need for making imitation experiment. This allows performing a transition from real system to logically structured scheme of its functioning in the terms of non-mathematical expressions using algorithmization of function its elements.

Like so, development of conceptual model is the most important and labour-consuming stage for a researcher in technological algorithm of imitation modeling, which requires very thorough approach. As result of implementing the development stage for conceptual description of a problematic situation it is presented a functional model – a diagram of causation of elements of simulated system. Creating the cause-effect diagram allows to clear the specific features of dynamic processes, which occur in an investigated system. Direction and polarity of each cause-effect relation between elements of an investigated system are determined by the following rules (Levitskiy, 2012):

- A sign of cause-effect relation between element is determined by their interaction accordingly to the hypothesis set on functioning of the investigated system;
- Relation of A element to B element is positive (negative), if when changing A element the B element is changing in the same (or opposite) direction;
- Closed sequence of cause-effect relations between elements of investigated system makes an feedback circuit for actions and information (so called feedback loop);
- Feedback circuit sign is determined by signs' product, which have been given to the links between elements forming this circuit;

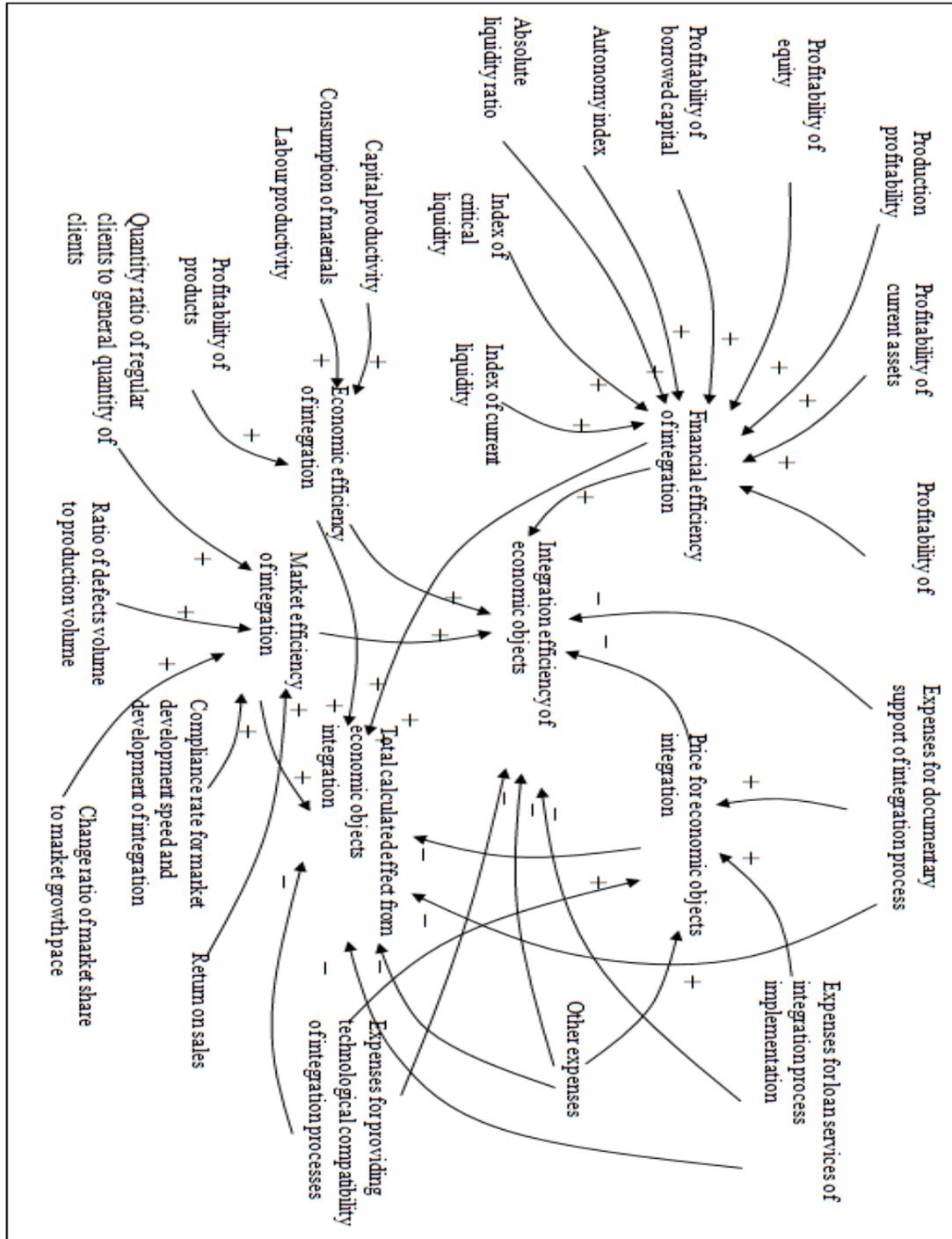
- Inside positive (negative) feedback circuit change of one element stimulates change of the next elements constituting the circuit in the initial (opposite) direction;
- Cause-effect sequence between elements that does not create a closed action and information circuit is an open action and information circuit, which has not a personal sign.

It is noteworthy that detailing level of conceptual model is necessary being accorded to simplicity principles as well as synchronous presenting the structure of investigated system. Accordingly the chosen level of detailing must provide excluding of incorrect aspects of system functioning because of lack information. In other words, an optimal structure of conceptual model must reflect the key trends describing the processes inside modeled system, its condition and specificities of its transition from one state into another. All the this will help escaping troubles in further formalization and program implementing of imitation model as well as provide uniqueness of accepting the results of imitation experiments by a researcher. According to this when studying the process of efficiency assessment for integration of economic objects the most relevant values and indexes were distinguished, that characterize the functioning results of integrated formation and the most important dependencies between them were determined. Considering the above studied formation principles for conceptual model and peculiarities of functioning of integrated structures, the cause-effect diagram of imitation model of efficiency assessment for integration of economic objects will have the form as it is shown in Figure 3.

It can be seen from Figure 3 that the conceptual model of efficiency assessment of integrated economic objects is a sign-type oriented graph, which reflects elements interaction mechanism of complex economic system. Outlined links between structural elements of investigated system are more considerable ones to find out the regulations of processes within the system and achieving the purpose of imitation modeling. In concert with the purpose set for carrying out the imitation modeling each element of conceptual model of efficiency assessment of economic objects integration contains a financial component

The formed conceptual model contains required primary information for developing of detailed formalized description of investigated problematic situation. And transformation of conceptual description of investigated system's model is performed by using the certain programming technique and application of necessary languages and simulation systems.

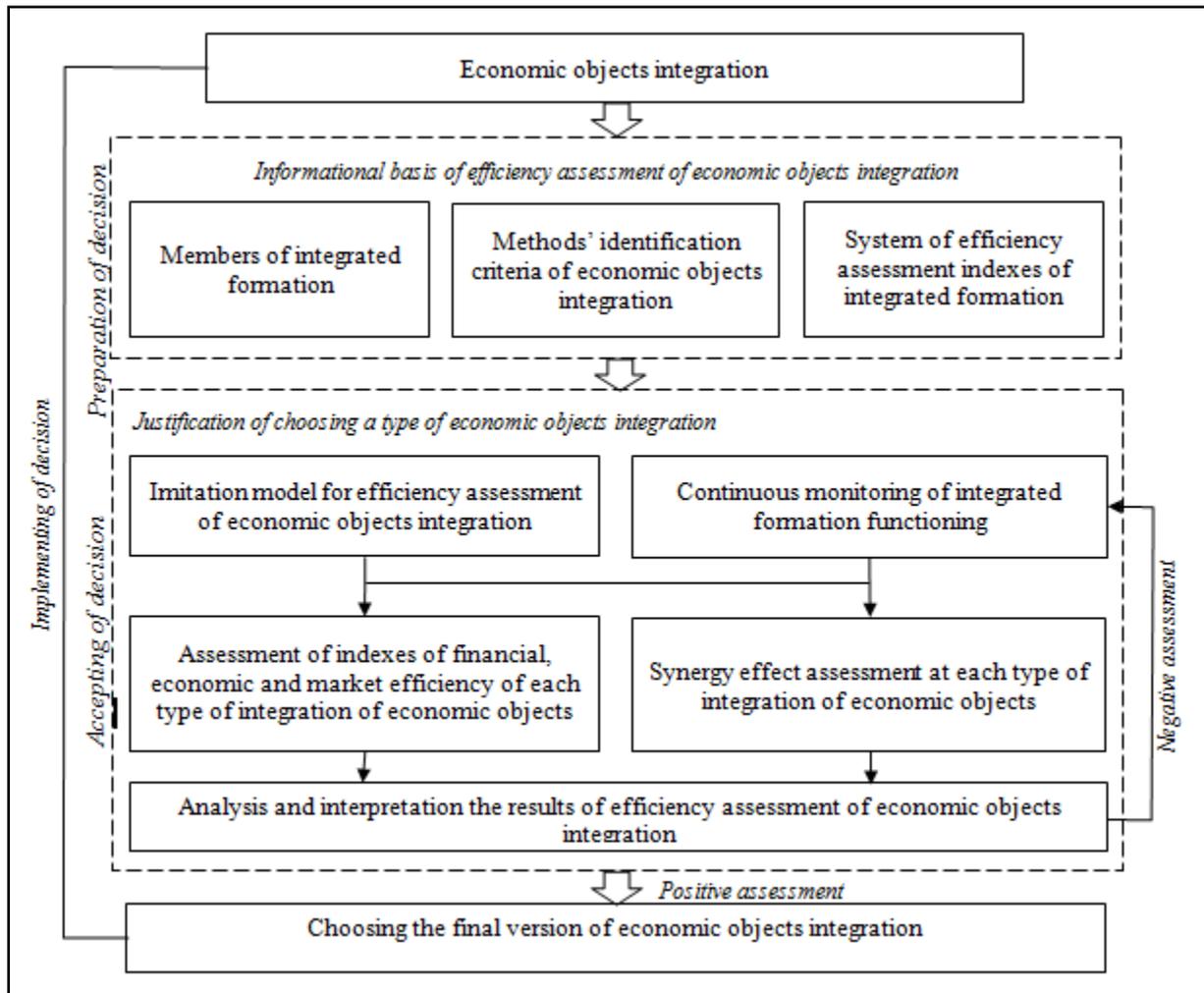
Figure 3. Cause-and-effect diagram for imitation model of efficiency assessment of economic objects integration



Application of conceptual model is necessary on the other stages as well, especially: to check the approximation of developed imitation model, its modification aiming widening the range of behavioral pictures of investigated system described by imitation model etc. Note the developed conceptual model to be used in efficiency assessment of economic objects by specialists of various fields that is postulated by informalized description method for its structure and working

characteristics. So, an imitation model designed on the base of conceptual description of functioning results of integrated formation is a key tool of efficiency assessment technique for economic objects integration (Figure 4).

Figure 4. Mechanism of efficiency assessment of economic objects integration



Now consider the specific features of proposed mechanism of efficiency assessment of economic objects integration. Implementing results of efficiency assessment mechanism for economic objects integration is acceptance of managerial decision on unification of economic units by a method chosen for formation of integrated structure. Obviously, relying upon management technique a development process of managerial decision is considered as coherence of interlinked stages: preparation, acceptance and implementation of managerial decision (Thompson and Strickland, 2006).

Though, in methodology of efficiency assessment of economic objects integration the preparation stage of managerial decision implies economic analysis of the situation, which includes:

- Searching, collecting and processing the information about members of integrated formation;
- Revealing and analysis the identification criteria for integration method of economic objects;
- Formation of index list of efficiency assessment of integrated formation.

In this case, identifying criteria for integration of economic objects can be accepted as contiguity of covered branches, uniformity of output products made by the member's unification and their business-processes (Thompson and Strickland, 2006). So, at preparation stage of managerial decision a formation of information basis is carried out to perform efficiency assessment for economic objects integration. At the managerial decision acceptance stage on a basis of multi optional calculations they perform the development and assessment of alternative decisions. Furthermore, a developed imitation model of efficiency assessment for economic objects integration allows implementing a continuous monitoring of integrated formation activity.

DISCUSSION

Implementation results for imitation model are: indexes of financial, economic and market efficiency of each type of economic objects integration; assessment of synergy effect at each type of economic objects integration. Analysis and interpretation the results of efficiency assessment of economic objects integration allow ranging the methods to create an integrated structure towards decreasing their reasonability.

Finally, at the stage of implementing of managerial decision they perform the final version of economic objects integration and pushing the decision towards its performance.

Considering the above in description of developed technique for efficiency assessment of economic objects integration one can outline two main components:

- A static component: contains structural analysis of simulated process aiming to distinguish necessary and sufficient elements for studying of problematic situation;
- A dynamic component: contains an imitation model of efficiency assessment of economic objects integration, which allows tracing a changeability dynamics for simulated process characteristics in order to substantiate and accept a decision on performing integration in concert with the chosen integrated method.

So, accepting system-dynamic approach to investigating of integration efficiency of economic objects considering the specific developing process features for managerial decisions allow as accurate as possible to analyze the interrelation results for economic units within unified integrated structure.

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