Approach and Software for Risk Assessment of Stakeholders of Hybrid Projects of Transport Enterprise

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Abstract
An approach to the implementation of the processes of determining the value of stakeholders of hybrid projects of transport enterprises is proposed. It is based on the developed structural model for determining the value of stakeholders in hybrid projects of transport companies. It has been established that there are two types of hybrid projects of transport companies, between which there are systemic relationships. Disclosure of the relationship between hybrid transport projects and the project environment provides a quantitative assessment of stakeholder value risks. The values of stakeholders belong to individual hybrid projects of transport enterprises. Substantiated values of hybrid projects of transport companies have causal links (volumes, deadlines, timeliness, etc.). Based on the proposed approach, software was developed and the risks of stakeholders of hybrid projects of transport companies were quantified. The results of forecasting quantitative indicators of risk values of stakeholders of motor transport enterprises hybrid projects are the basis for justifying risk measures and improving management efficiency during the implementation of hybrid projects of transport companies.

Keywords 1
Hybrid projects, management, risk, value, stakeholders, transport companies.

1. Introduction

The motor transport industry is a synergetic industry, which is very important for the development of all other sectors of the economy of any state. It is an indicator of both the level of development of the state and the creation of values for a number of stakeholders [1-3]. With the accession of our country to the world trade organization, the problem of creating efficient trucking companies has become even more acute, as the range of transport services has expanded and the scale of road transport has increased significantly [4-6]. Nevertheless, international transport should comply with the requirements of EU legislation.

The strengthening of the requirements of the EU and our country to the quality of transport services requires motor transport enterprises (TE), which provide various transport services, to perform their activities using a project approach. At the same time, the provision of separate transport services should be considered as hybrid projects that are systematically integrated with TE projects. Systematic implementation of such integrated projects makes it possible to create TE with the necessary resources (vehicles of certain types and configurations, service premises, equipment and contractors, etc.), which will significantly improve the provision of quality transport services and increase the value for stakeholders of relevant hybrid projects [7-9].

At the same time, the implementation of integrated TE projects and their management requires the solution of a number of scientific and applied problems. One of such tasks is to substantiate the approach and software for quantitative risk assessment of stakeholders of hybrid projects of TE.

2. Analysis of literature data and problem statement

Today, project management researchers have developed many methods, models, approaches and software for project management in various subject areas [10-12]. Some of them offer tools for risk and value management of projects and programs. Analysis of scientific papers with approaches and tools for value management in projects shows the importance for the theory and management practice of decision making [13-15]. However, they have shortcomings and cannot be fully used to justify the structure and risk value of stakeholders in hybrid TE projects. In particular, the feasibility of assessing the risk of stakeholders of hybrid TE projects is not substantiated and, accordingly, not taken into account. This affects the quality of the product obtained (transport services provided) and the effectiveness of hybrid TE projects [16-18].

The current project management methodologies deserve attention [19-21]. In particular, the P2M methodology contains approaches and processes of project management and development programs of organizations. It assumes that the implementation of projects provides value to their stakeholders [22-24]. This methodology provides general principles of project cost management that do not take into account the specifics of hybrid TE projects. Therefore, it cannot be fully used to manage the value of hybrid TE projects. TE projects and hybrid projects implemented by TE differ significantly from other projects both in structure and features of value formation for stakeholders. In addition, they differ in their specific design environment, which is a source of risk [25-27].

Based on the above, we can say that to manage the risk and value of stakeholders in hybrid TE projects should take into account the value structure that requires the development of an appropriate model. There are systemic relationships between the value of stakeholders in hybrid TE projects that need to be identified when developing a value and risk management tool for hybrid TE projects [28-30]. They should take into account the relationship between the components of the value of project stakeholders and the specifics of their formation, taking into account the risks that determine the project environment.

3. The purpose and objectives of the study

The aim of the paper is to substantiate the approach and software for risk assessment of stakeholders of hybrid projects of TE.
To achieve goal you need to solve the following tasks:
1. to propose an approach to risk assessment of stakeholders of hybrid projects of TE;
2. to develop software and perform a risk assessment of stakeholders of hybrid projects of TE.

4. Enterprises approach to quantitative risk assessment of stakeholders of hybrid projects of transport enterprises

First of all, we will define the concepts we use in this work [31]. The value of integrated TE projects includes the benefits that stakeholders receive from the product of these projects (created TE - for TE creation projects, or provided transport service - for hybrid projects implemented by TE).

The formation of values of hybrid projects implemented by TE is systemic and depends on the formation of values of TE creation projects [32]. The assessment of the created values of integrated TE projects is based on the benefits for their stakeholders. In order to define the values of integrated TE projects, first of all we will define their components and existing relationships between TE creation projects, hybrid projects implemented by TE and their project environment (Figure 1).

Hybrid projects - projects that arise during the operational activities of enterprises and organizations, have unique products (services) and are characterized by properties that can be predicted using the knowledge and experience of previous projects.

Hybrid projects of transport enterprises (HPTE) are projects that arise during the operational activities of TE, provide a limited set of actions aimed at providing transport services with signs of uniqueness, limited resources, clarity of requirements for the duration of their implementation and quality of the product. form a value for stakeholders.
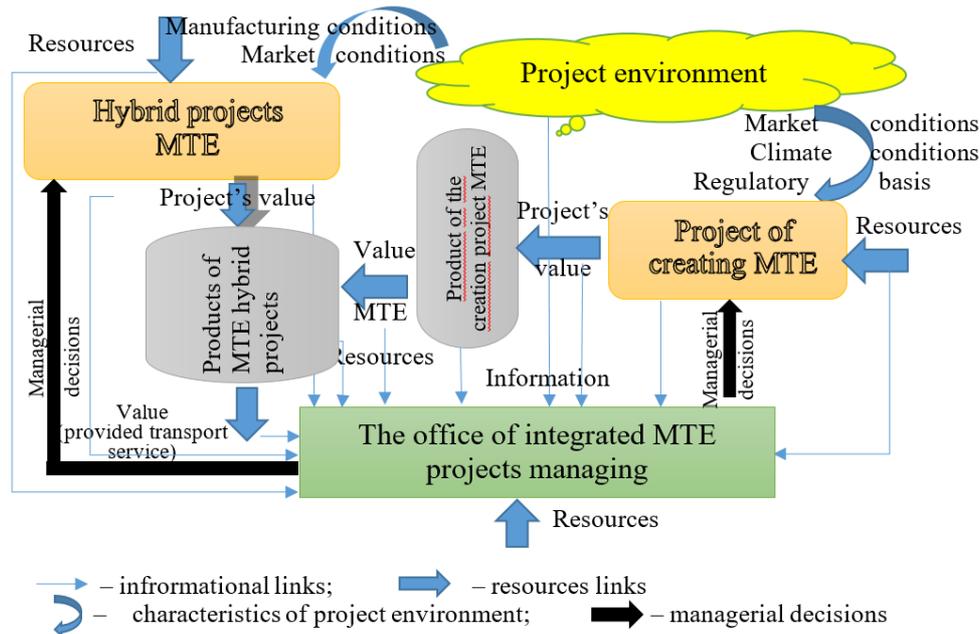
Figure 1: Structural model of value formation for stakeholders in integrated projects in transport enterprises (TE)

Hundreds of hybrid projects of TE, leather, of which there are signs of timeliness, unrepeatability and uniqueness, and they are also characterized by the interconnection of vicious resources (transport means, water, materials) [33-35]. Besides, the TE has a lot of resources that can zoom in on the number of hybrid projects in one hour. The product of the hybrid TE project is the price of a transport service, which will ensure the loss of value for stakeholders (TE and client of transport services). The project of the TE stem is a unique one, as well as a team-building project, the stem of a local enterprise will be based on the limited resources and will be focused on the stem of the value of a given middle-sized product (a specific design for a specific project). The product of the TE project is the TE system, which will provide transport services as far as possible, and will be intertwined with dignified demands and obvious resources.

Effortless TE projects are promoted in classifications for ten classical signs, which lie in the basis of their identification and tools for managing them. In particular, offered signs of hybrid TE projects can be characterized by their features (scale, resources, triviality, folding, adaptability, knowledge), product (type of service, support of service) and the number of drivers conducted works) [36-38]. The skin is characterized from the proponated classification signs of the identification.

The design middle of the TE's hybrid projects includes the design and internal warehouses, such as changeable speeches, energy and information links, and the basis for the formulation of values for the project stakeholders. Outside project environment- the chain of finishing of hybrid projects of TE, through analogous changeable links injected into its implementation. The internal design center includes the surroundings of warehouses (elements), which can also be used for small speeches, energy and information links. The vision of the internal warehouse design center of the hybrid projects of the TE let's clear up, as well as the view of these projects, some of them can go from the external warehouse to the internal warehouses. Apart from that, near the warehouses of hybrid projects of the TE, one can immediately take part in the implementation of several projects of one level of view (motor vehicles, performers etc) [39-41].

These projects and their components are interconnected by various links. In particular, there are four types of connections that reflect:
1. the receipt of information (information);
2. supply of resources (resource);
3. the impact of the project environment (information);
4. management decisions (information).

Most of the connections are observed in the TE portfolio management office and hybrid projects implemented by TE. They are connected by information links with each of the components of the TE

projects and hybrid projects implemented by the TE. Information about their status is sent to the project portfolio management office, where it is processed with the help of available resources (project managers, office computers, management tools, etc.), and based on it management decisions are made on the specifics of TE and hybrid projects. Which implements TE. In terms of resource connections, each of these components requires the use of different types of resources. In particular, material, technical, human and financial resources are required for the implementation of TE creation projects and hybrid projects implemented by TE.

By changing these links (volumes, deadlines, timeliness, etc.) it is possible to achieve maximum value for stakeholders from the implementation of integrated TE projects in a given project environment (individual enterprise). At the same time, the project environment is changeable, which determines the risk of the value of stakeholders of TE creation projects and hybrid projects implemented by TE. Hybrid TE projects are derived from TE creation projects. Without assessing the hybrid TE projects and the possible value and their stakeholders, it is impossible to achieve maximum value from the implementation of TE projects.

Let's define components of values of stakeholders at system realization of projects of creation of TE and hybrid projects which are realized by TE. In particular, they are based on the value of management decisions, which is obtained through the temporary operation of the portfolio management office of these projects. It has two components - value V_{MTE}^m of management decisions on the peculiarities of the implementation of TE projects and value V_{HP}^m of management decisions on the features of the implementation of hybrid projects implemented by TE. Derivatives of these values are the values of action V_{MTE}^a and V_{HP}^a, which are implemented in each of these projects, which in turn determine the value of the products of the respective projects – V_{MTE}^p, V_{HP}^p.

Thanks to the products of TE creation projects and hybrid projects implemented by TE, the values of their intended use are obtained - respectively V_{MTE}^u and V_{HP}^u. At the same time, value V_{MTE}^u significantly affects many values V_{HP}^u. The ultimate values in these projects are values V_{HP}^u, created by obtaining a set of products of hybrid project projects implemented by TE, and they relate to the provided transport services of a given volume and quality. The relationship between these values of TE projects and hybrid projects implemented by TE and their products can be described by the following chain, which is shown in Figure 2.
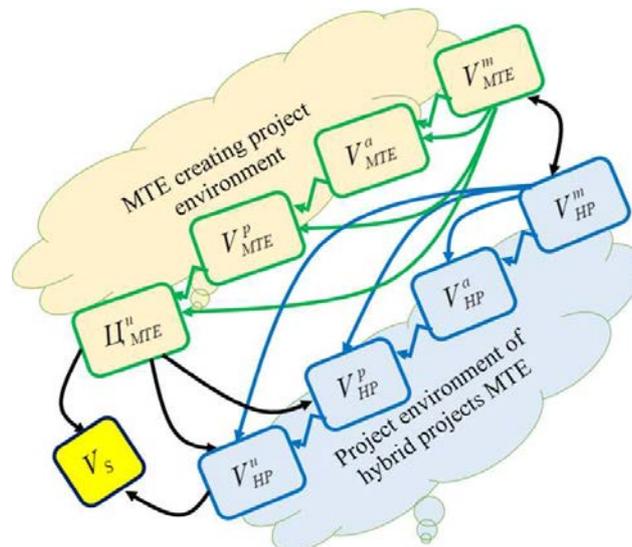

Figure 2: Scheme of relationships between the values of integrated TE projects and their products: V_{MTE}^m, V_{HP}^m – respectively, the value of management decisions on the implementation of projects to create TE and their hybrid projects; V_{MTE}^a, V_{HP}^a – respectively, the value of actions in TE projects and their hybrid projects; V_{MTE}^p, V_{HP}^p – respectively, the value of the product of TE projects and their hybrid projects; V_{MTE}^u, V_{HP}^u – respectively, the value of using the products of TE projects and their hybrid projects

Regarding TE creation projects and hybrid projects implemented by TE, the values V_{MTE}^m and V_{HP}^m of managerial decisions determine all other components of values within the chains of formation of these integrated projects. All other types of values have a consistent impact of previous values on the next, only the value of using the product of the TE project (resource potential of TE), has an impact on the value of products of hybrid projects implemented by TE (volume and quality of transport services).

Risk management of each of these values of TE projects and hybrid projects implemented by TE requires consideration of its features. To do this, we must develop an algorithm for evaluating them and establishing reactions to them. The basis of this algorithm are the patterns of value formation. The risk of values related to stakeholders of one level systematically affects the risk of values obtained for stakeholders of projects of other levels.

To quantify the risks of stakeholders of hybrid projects of TE, we propose to use a well-known model, which provides a combination of separate normal laws of distribution of random variables. Random amount of profit (P_r) from hybrid projects of TE is described by the normal distribution law. Mathematical expectation of profit $M(P_r)$ from hybrid projects of TE can be determined by the formula:

$$M(P_r) = M(M_v) - M(V_i),\qquad(1)$$

where $M(M_v), M(V_i)$ – accordingly, the mathematical expectation of the specific market value of transport services provided on the basis of the implementation of hybrid projects of TE and the volume of investment in them, Euro/km. Provided that there is a close correlation between the specific market value of transport services provided on the basis of the implementation of hybrid projects of TE and the volume of investment in them in a particular calendar year, the standard deviation of profit (P_r) from hybrid projects of TE will be determined by the formula:

$$\sigma(P_r) = \sqrt{\sigma^2(M_v) + \sigma^2(V_i) - 2r \cdot \sigma(M_v) + \sigma(V_i)},\qquad(2)$$

where r – the correlation coefficient between the mathematical expectation of the specific market value of transport services provided on the basis of the implementation of hybrid projects of TE, and the amount of investment in them in a particular calendar year. When quantifying value risks $R(P_r)$ of stakeholders of TE integrated projects fulfill a condition that reflects the risk of the received system value $R(P_r)$, for a given quantitative value for TE (P_s):

$$R(P_s < P_r < \infty) = \frac{1}{\sigma(P_r) \cdot \sqrt{2\pi}} \cdot \int_{P_s}^{\infty} exp\left[-\frac{\left[P_{rj} - M(P_r)\right]^2}{2 \cdot \sigma^2(P_r)} \right] dP_r.\qquad(3)$$

Using the known Laplace function we obtain:

$$R(P_s < P_r < \infty) = \Phi_o\left(\frac{\infty - M(P_r)}{\sigma(P_r)} \right) - \Phi_o\left(\frac{\Pi_s - M(P_r)}{\sigma(P_r)} \right),\qquad(4)$$

where Φ_o – Laplace function, reflecting the probability integral of a given quantitative value (P_s) for TE. Values for TE will be obtained if the condition is met – $P_s \geq 0$. Hybrid projects in which the condition $P_s = 0$ is met, don't have value for TE. If condition $P_s < 0$ is met, the hybrid project is unprofitable and therefore will have no value for TE. To quantify value risks $R(P_r)$ stakeholders of TE integrated projects use a scale that assumes finding the probability of the planned unit cost of providing transport services $P(P_l)$: 1) $P(P_l) = 0...0,2$ – minimal risk $R(P_s)$; 2) $P(P_l) = 0,21...0,4$ – possible risk $R(P_s)$; 3) $P(P_l) = 0,41...0,6$ – average risk $R(P_s)$; 4) $P(P_l) = 0,61...0,8$ – high risk $R(P_s)$; 5) $P(P_l) = 0,81...1,0$ – critical risk $R(P_s)$ [42]. When assessing the risks of the values of hybrid TE projects, the product configuration of the TE creation project and the configuration of their design environment are taken into account. The product configuration of the TE project, which is characterized by their type (production functions), which are created by business structures for profit or service, to serve individual enterprises or industries. An important component of them is the availability of resource potential (structure and configuration of vehicles, production facilities,

technical and technological support, etc.), which affect the value for stakeholders of hybrid TE projects. Accordingly, they affect certain types of value risks and features of their management. The configuration of the design environment of hybrid TE projects has two components (internal and external) and determines both the types of value risks, and their features of their formation and their quantitative value.

5. Results of software development and quantitative risk assessment of stakeholders of hybrid projects of motor transport enterprises

Based on the presented scheme of relationships between the values of integrated TE projects (Figure 2), we substantiate the affiliation of these values to individual stakeholders of hybrid TE projects. Each of the above values of TE hybrid projects is characterized by benefits that are different vector for individual stakeholders. The stakeholders of TE hybrid projects are the state, TE, customers, suppliers and project managers. For each of these stakeholders, we formulated the affiliation of the constituent values to them and their risk components (Table 1).

Table 1

Attribution of values to stakeholders of hybrid TE projects and their risk indicators

Stakeholders	Stakeholder value risk components			
	V_{HP}^{m}	V_{HP}^{a}	V_{HP}^{p}	V_{HP}^{u}
State	Regulatory basis	Market conditions	Market value of consumables	Creating social benefits
TE	Basic structure of TE and resource base	Changing the structure of TE and resource base	Compliance with the needs of customers of the TE resource base	Volume, quality and cost of provided transport services
Customers of transport services	The amount of investment	Stages and amount of funding	Compliance of the order with current requirements	Expenses for transport services
Suppliers	Correspondence of materials and resources to the performed works	Timeliness, quality and cost of delivery of materials and resources	Cost of materials and resources	–
Project managers	Quality of management decisions	Consistency of resources with the configuration, content and timing of actions	Project effectiveness	–

Each of the stakeholders is interested in gaining value from the implementation of hybrid TE projects, which are mostly multi-vector. Without the intervention of a single project office for the management of integrated TE projects, it is impossible to obtain the declared maximum system value for stakeholders from their product - the creation of TE and the provision of transport services with maximum value for each stakeholder. The TE Portfolio Integrated Project Management Office

provides regulatory influence on the formation of system values for stakeholders. In addition, the state ensures the coordination of the interests of stakeholders of TE projects and hybrid projects implemented by TE, through the creation of regulations governing their activities and the use of motivational levers for them, which significantly affects the risk of these projects. Software on the Python 3.9 language (Figure 3) has been developed for qualitative and accelerated quantitative risk assessment of stakeholders of hybrid projects of TE on the basis of the reasonable approach described above.

Figure 3: Software window for quantitative risk assessment of stakeholders of hybrid projects of TE
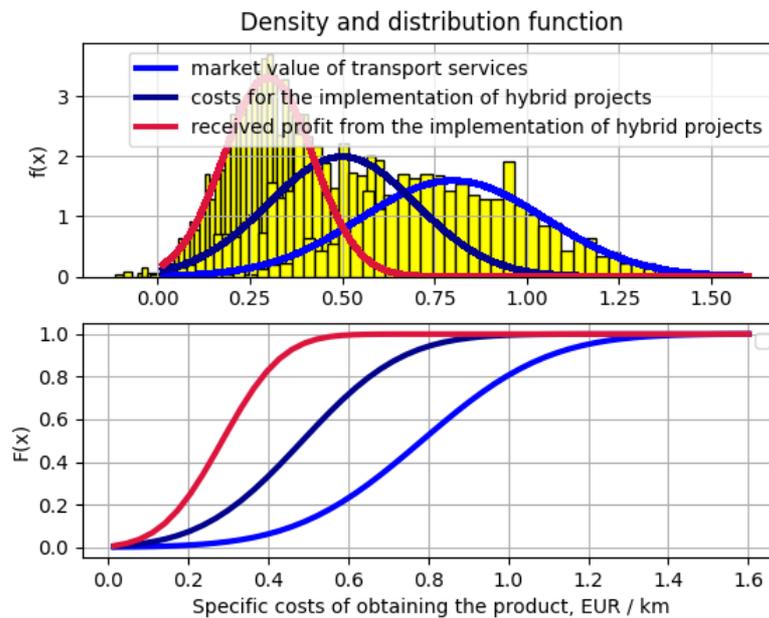

Figure 4: Densities and functions of value distributions of hybrid TE projects

We will perform a quantitative assessment of the value risks of stakeholders of hybrid TE projects. The main stakeholders of such projects are TE, which provide transport services and their customers. At the same time, the customer wants to receive transport services of the highest quality in the shortest possible time with minimal costs. At the same time, TE wants to implement a hybrid project with a minimum budget, in the shortest possible time and use as few resources as possible. For example, take the design environment of Mustang Trans LLC (Ustyluh, Volyn region). This company mainly provides transport services in Ukraine, so consider hybrid projects at the state level. Computer

experiments provided predictions of quantitative indicators of value risks $R(P_r)$ of stakeholders of hybrid TE projects (Table 2).

Table 2

The results of forecasting quantitative indicators of value risks $R(P_r)$ of stakeholders of hybrid TE projects

Indicator	Scenario for the implementation of hybrid TE projects									
	1	2	3	4	5	6	7	8	9	10
Planned system value for TE and customers, Euro / km.	0,1	0,15	0,2	0,25	0,3	0,35	0,4	0,45	0,5	0,6
The probability of obtaining the desired value from the product of hybrid projects	0,99	0,91	0,78	0,65	0,48	0,33	0,18	0,1	0,06	0
The probability of not obtaining the desired value from the product of hybrid projects	0,01	0,09	0,22	0,35	0,52	0,67	0,82	0,9	0,94	1,0
The risk of obtaining the desired value from the product of hybrid projects	minimal	minimal	minimal	minimal	possible	average	high	high	critical	critical

We accept that vehicles (DAF XF 105.460 truck tractors) available in the base company are involved for the implementation of such projects. After analyzing the statistical data on the specific market value of freight transportation [43-44], as well as data from Mustang Trans LLC and conducting calculations, the stochastic characteristics of the specific market value of freight transport services and hybrid projects in the base company were quantified. It is established that these indicators are described by the normal distribution law. Based on the analysis of the obtained data, they were visualized in the Python 3.9 programming language using matplotlib, numpy and scipy libraries, which provided the distribution of specific market value of freight transport services, the cost of hybrid projects in the base company and the system value of these projects. customers (Figure 4). Based on forecasting quantitative indicators of value risks $R(P_r)$ of stakeholders of hybrid TE projects found that the risk of obtaining the desired value is minimal at the planned system value, which is in the range of 0.1… 0.25 Euro / km. At the same time, for 0.3 Euro / km ¬– average, within 0.4… 0.45 Euro / km - high, and more than 0.45 Euro / km - critical. The results of forecasting quantitative indicators of value risks $R(P_r)$ stakeholders of hybrid TE projects are the basis of justification against risky measures and increase the efficiency of management during the implementation of hybrid TE projects.

6. Conclusions

1. The proposed approach to the formation of values of stakeholders of integrated projects of transport enterprises is based on the structural model of their formation, which provides for the allocation of two types of projects and their project environment. Between which there are systemic relationships, the disclosure of which provides a quantitative assessment of the risks of these values for stakeholders.

2. The substantiated affiliation of values of hybrid projects of transport enterprises for stakeholders is based on the given scheme of interrelations between components of values of projects of creation of

TE and hybrid projects which are realized by TE. It is established that there are causal links (volumes, terms, timeliness, etc.) between the values of hybrid projects of transport enterprises, by changing which it is possible to achieve maximum value from the implementation of these projects in a given project environment, minimizing their risk.

3. Based on a sound approach, as well as developed software for quantitative risk assessment of stakeholders of hybrid projects of trucking companies, it is established that for Mustang Trans LLC the risk of stakeholders of hybrid projects of trucking companies is minimal at the planned system value which is in the range of 0.1… 0.25 Euro/km. The results of forecasting quantitative indicators of risk values of stakeholders of hybrid TE projects are the basis for substantiation against risk measures and increase the efficiency of management during the implementation of hybrid TE projects.

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