This study considers an agile model for the organization of activities of a project-oriented transport company.

Building a project-oriented company (project-oriented management) requires an appropriate theoretical base. The agile model of transport company operation has been developed, for which the cycles have been determined, the content of each cycle has been defined, and the flow of information has been simulated. The transformation of information in each cycle of the model has been characterized, taking into consideration the operational specificity of transport companies' activities. A given model was compared to the main stages of a project's lifecycle. Two indicators have been proposed such as the degree of project uniqueness and the degree of project complexity that reflect the corresponding project characteristics. The complexity of the project's operational activities refers to the number of elements and their alternatives. Part of the project is an «operation» that forms a unit of the project's network schedule. The uniqueness of the project of operational activities means the difference between the current project and other projects, already implemented or is being implemented by the company. The estimation formulae for these indicators have been derived. The proposed indicators for the given example have been calculated; the interpretation of the results has been proposed. The calculation results have demonstrated the adequacy of input-output data and the practical applicability of these indicators. These metrics are not limited to the context of an additional project specification. Their level is proposed to be used in the processes of estimating the time of individual project periods and the agile model's cycles within the initial stage – creating a product concept model and preparing for implementation. In addition, these indicators could be used effectively for employee remuneration

Keywords: project product, project uniqueness degree, project complexity degree, time management

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CREATING THE AGILE-MODEL TO MANAGE THE ACTIVITIES OF PROJECT-ORIENTED TRANSPORT COMPANIES

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1. Introduction

Starting off the projects related to information and software, the Agile philosophy rapidly penetrates other areas of activity. Moreover, this penetration is observed both at the level of projects and in the organization of operational activities, including the service sector. The main advantages of the Agile approach are reducing the period before the product of the project is delivered, as well as better compliance of the resulting product to the expectations of customers. These advantages are especially relevant in situations where the customer is not ready to fully articulate all the requirements for the final product at the time of the order. This is particularly the case in the transportation sector when it comes to the delivery of cargoes by international traffic involving several modes of transport.

Thus, modern transport and forwarding companies are the organizers and «holders» of intermodal and mixed transport, which is associated with the involvement and coordination of a significant number of participants. The presence of all the features of a project at the delivery of goods [1] makes it possible for transport and forwarding companies to transform into project-oriented ones. To further use the full range of available practical tools and theoretical framework for project management to ensure the effectiveness of management processes, including agile-philosophy. This requires, first of all, the construction of an agile model that shows how operational projects should be worked out. Ensuring the success of the agile model requires the use of appropriate tools that could make it possible, specifically, to manage the timing of individual cycles or phases of the model.

Having an appropriate theoretical framework to solve this problem will allow transport companies to practically implement project-oriented management using an agile approach, ensuring the effectiveness and benefits provided by the project management methodology and agile-philosophy.

2. Literature review and problem statement

The Agile-philosophy, which has been followed for a long time in the development of software, and that has received wide practical application since the publishing of Agile-manifesto [2], is developing at an accelerated pace, being one of the most successful from a practical point of view. Note that while papers use the terms «agile-methodology» [3–5], «agile approach» [6], or «agile project management» [7, 8], the essence of what their authors put into these concepts is almost identical. This situation is explained by the fact that the agile-philosophy as a universal methodology of project management is only being formed. Therefore, in fact, research into this topic employs a certain view/concept/approach in accordance with the idea of agile.

Most publications and available studies related to agile project management address IT (Information Technologies) projects, for example [4, 5, 9]. The cited works summarize the practical experience of using the Agile approach in the implementation of this category of projects. The benefits of Agile project management are described in [6, 7] where the agile advantages are specified in non-IT areas. Paper [8] substantiates the effectiveness of agile «customer orientation» in principle for project management, regardless of the industry specificity of the project. The possibility of using agile project management in various fields was discussed in [10]. The Agile approach could also be widely used in the development of road maps [11], special strategic landmarks.

The modern world is a world in which the boundaries between different fields of knowledge are blurred, and the results from different sciences are transferred [12]. Therefore, it is natural that the ideas of agile project management have begun to be tested in those areas where previously it seemed impractical, moreover, the project approach was not used in principle.

For example, the issues of project management in the construction sector based on agile have been investigated in [13], in the public sector – in [14], when creating a distance learning system – in [15]. The specificity of changing the emphasis in the development process and in the design of goals under the agile approach to infrastructure project management was presented in [16].

Risks in agile project management have been identified in [17] and, in comparison, with the traditional (not agile) approach to project management.

The introduction of agile into practical activities also requires a certain scheme; these issues have been addressed in papers [18–20].

Although work [21] is not explicitly devoted to the issues of agile, the «consumer-supplier» strategy tool it proposes could serve as a means to implement the agile ideology to establish, for example, competitive time-delivery of services (as is relevant to the transport sector).

The agile approach involves increasing the focus on managing the time of the project: finding options to reduce the time each operation is done; limiting each sprint (cycle) when it comes to, for example, a scrum framework of the agile family.

In this regard, it is worth noting works [22, 23], which, for example, reports interesting results in finding the earliest deadlines for project operations, taking into consideration the various requirements for the project as a whole.

The central categories of agile management development are not only time but also the product. But their specificity (the duration of operations, and a product) are inherent in each specific area. Therefore, everyone needs to take this specificity into consideration when developing Agile tools.

Thus, there is a significant theoretical framework for project management. It is formed by international standards (for example, [24]), including for the transport sector [25]. The advantages of the practical use of the project methodology and related methods in the «traditional project fields» were preconditions for the development and extension to various areas, including transport, of the ideas of project-oriented management. According to this idea, the operations of enterprises, companies, and organizations are structured in the form of a portfolio of projects. The development of science and the results of the practical use of agile form the essence of a new stage in the development of project management – agile project management.

Since transport companies have also been involved in the transformation processes changing into project-oriented ones [1], the next logical step is to use the idea of the agile-methodology. However, it should be noted that for the transport sector, project-oriented management is in principle only fragmentedly considered in theoretical studies. At the same time, many transport companies «unknowingly» use elements of the project approach, including agile, in practical activities.

Therefore, the construction and organization of the operation of project-oriented companies in the transport sector could and should be carried out considering the agile-methodology. This will make it possible to form a modern theoretical base of project-oriented management of operational activities of transport companies, taking into consideration the tools based on the agile frameworks. Appropriate time management tools are needed to make it more efficient to use project management in practical activities. Even though a series of studies addressing this topic are available, for example [22, 23], nevertheless, for transport companies that organize delivery, the network schedule «starts» after the agreement with the client. Thus, the companies in question need specific time control tools as part of the alignment of the «project product» with the customer.

3. The aim and objectives of the study

The aim of this study is to develop an agile model for the organization of activities by project-oriented transport companies based on the Scrum framework to ensure its effectiveness in the fuzzy formulation of the initial requirements for the product of the project.

To accomplish the aim, the following tasks have been set:

– to define the content of sprints (cycles) in the agile model of transport companies' activities;

– to devise indicators that reflect the specificity of projects from the point of view of the agile model, and ensure its efficient functioning, to develop a method of their evaluation;

– to calculate indicators that reflect the specificity of projects from an agile model perspective, for a specific example,

4. The identification of cycles within an Agile-model of transport companies

In this study, «transport companies» are to be understood as multimodal transport operators, transport and forwarding companies, transport and logistics companies, that is, a wide range of companies whose activities are related to the organization of cargo delivery within the framework of transport or logistics services. For carrier companies, the proposed results could also be used with some adaptation for situations where «transportation» could be interpreted as a project (for example, when the carrier takes over other types of delivery-related operations). But, often, «transportation» itself is not a «project product». Thus, if we consider the delivery of oversized goods (for example, industrial wind turbines, which are most often transported on ro-ro vessels), the sea transport itself does not produce a finished «product» [1]. The company that undertakes the delivery of these wind turbines must ensure their loading/unloading, delivery to a port/from port to destination. It is the wind generators delivered to the place of installation (on time and undamaged) that have value for the customer.

Similarly, when delivering, for example, grain for export. Under certain conditions of the contract (to be delivered CIF), the exporter must have the entire contract shipment delivered to the ports of destination within the specified time, that is, in the railway-sea or river-sea communication. The product of such delivery is a batch of grain (of necessary quality). delivered to the established ports (port) in the required volume in accordance with the timing of the shipment.

So, we shall clearly define what we should understand by the product of projects from project-oriented transport companies. According to the project management methodology, «the project product is the object that appears after the project: the material object, the service provided, etc.» [13]. Thus, the product of projects by project-oriented transport companies is the service provided – the delivered cargo. The process of rendering service is a set of agreed operations, which are the essence of operations within the network schedule of the project. Note that customers are primarily interested in certain parameters of the product of the project – the result of delivery (cost, time, quality). The delivery organizer should form a combination of operations that would ensure that the product requirements of the project are met.

When ordering for delivery, as a rule, the customer can quite «vaguely» formulate the basic requirements/conditions for delivery – the limitation on time and money (cost). The wording «as quickly as possible for reasonable value» is the most common among customers. And only in the process of the organization, all the details related to the readiness and location of the cargo, some of its specificity, etc. are clarified. And this, in turn, affects both the time and the cost of delivery. Therefore, the agile approach is required to apply to a delivery organization so that all customer requirements are taken into consideration within a limited period without unnecessary organizational activities. For example, there should be no such a situation when all delivery activities are organized and prepared, and it turns out that the features of the cargo or its whereabouts do not make it possible to implement the version of delivery in question.

Moreover, the transport market makes it possible to use not only a wide variety of suppliers but also various technological solutions in the delivery process [27]. This should also be discussed with the customer and usually cannot be offered initially during the order placement process.

The Agile family of frameworks includes extreme programming, DSDM, Scrum, FDD, BDD, etc. Most of them are largely applicable for software development (for which, in fact, they were developed). But Scrum and Kanban today are the most applied given their universal nature for projects of different content. Our study is based on the Scrum framework, the essence of which is that all activities are divided into sprints – time intervals. As soon as the sprint is completed, the operation is evaluated and analyzed to understand what could be improved [28]. According to Scrum specificity, each sprint should be evaluated in hours (days). Typically, one to three people work on projects in a transport company, so Scrum is more appropriate given the daily discussion of sprint results.

So, the agile model of a project-oriented transport company operation should be understood as the scheme and the corresponding description of the essence of the sequence of sprints and the appropriate exchange of information with the customer in the process of delivery, as well as a system of indicators that determine the maximum duration of sprints.

Thus, the agile-model of transport companies' activities with the customer involves consistent detailing and specification, on the one hand, of the information from the customer, on the other hand, offers on delivery options from the transport company. The practical implementation of a given model is possible in the presence of a virtual project management office [1]. It provides not only access to the information base for transport company suppliers but also the integration of information on projects implemented or planned in order to create maximum synergies.

The proposed agile model for the implementation of project-oriented management in the transport sector is shown in Fig. 1. The cycles (sprints) of the agile-model are reflected in the relationship with the life cycle of the project, which highlights the main key events – the formation of the product concept model, the start of implementation, and the receipt of the product of the project.

In the first cycle of the model, when receiving an application by the project manager, the customer forms the basic terms of delivery $\langle C^z \rangle$, $z=\overline{1,Z}$, or, in terms of the project, the requirements for the product of the project. Z is the number of the set conditions. Based on these conditions, the manager forms product variants (delivery options) in the amount of m, the characteristics of the options are set by a set $\langle \tau_j \rangle$, $j=\overline{1,m}$. Additional request for information (for example, the location of the cargo, possible timing adjustments, etc.) would allow the customer to select m' options that they consider acceptable as alternatives. According to these options, he receives already specific information about the main characteristics of the product $\langle R_j, T_j, \Delta R_j, \Delta T_j \rangle$, $j=\overline{1,m'}$, where, respectively, R_j, T_j, $j=\overline{1,m'}$ is the time of delivery and the cost of delivery, ΔR_j, ΔT_j, $j=\overline{1,m'}$ is the possible change in shipping costs and delivery times.

As a rule, possible deviations in time are an integral specificity of transportation, especially involving several modes of transport. Cost deviations occur at this stage, before the final option is chosen, due to the lack of reliable information at the time of negotiations with the customer on the cost of all transactions during the delivery process. At this stage, it is not advisable to waste time refining all the information to form the characteristics $\langle R_j, T_j, \Delta R_j, \Delta T_j \rangle$, $j=\overline{1,m'}$, as many variants from this set could be rejected by the customer in principle. This approach is consistent with the Agile methodology, saving time and gradually defining specific characteristics of product options for the project. For transport companies, a specified set of product characteristics is used, for other areas of activity, without changing the essence of the proposed model, this set should be adjusted to the specificity of the activity.

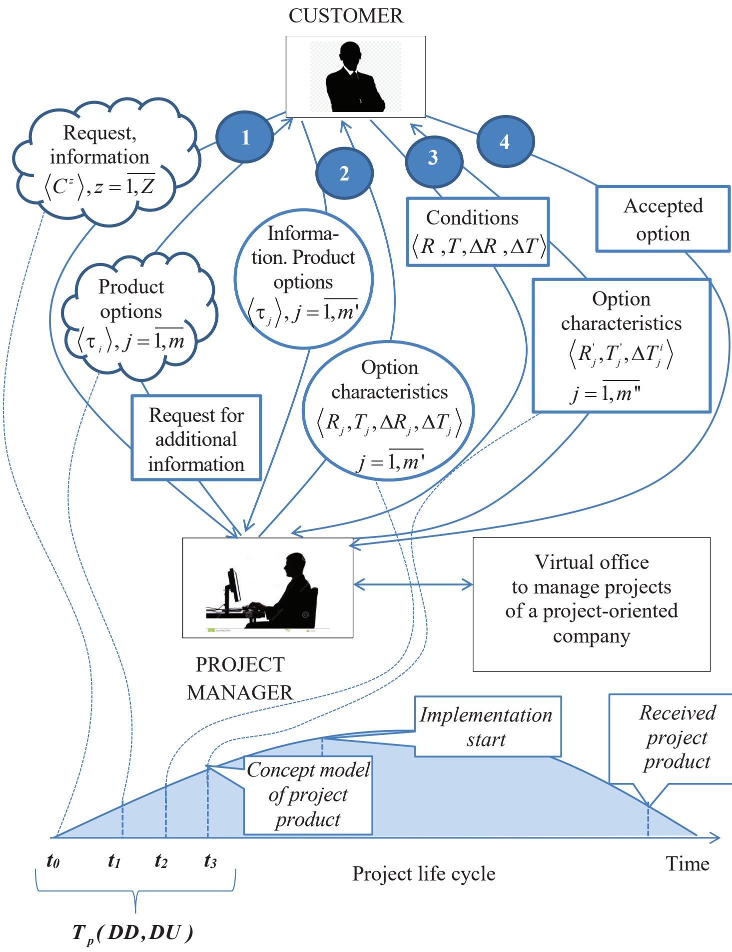

Fig. 1. The agile model of transport company operation

In the third cycle of the model, the customer specifies the requirements for the product R, T, ΔR, ΔT, which allows the manager to select m'' options from m, request up-to-date information from suppliers, and form the sets $\langle R'_j, T'_j, \Delta T'_j \rangle$, $j=\overline{1,m''}$, which characterize the cost R'_j, time T'_j, and possible time deviation $\Delta T'$ for each option. The third cycle could be repeated if necessary, taking into consideration, for example, sudden adjustments by the customer, or changes in supplier conditions, etc. The result of this cycle is the choice of the option by the customer, which is accepted for implementation. Thus, the characteristics of the product of the project for each of its variants (in this case, the time, its deviations, and the cost of delivery) are specified in each cycle; graphically, it could be represented in the form shown in Fig. 2.

Each sprint (cycle) of the agile model, or at least the time of obtaining the product prototype, should be limited in time. It is the project approach to delivery that allows its development and implementation to be considered within the well-defined limits of the life cycle stages. And here there is a need for differentiation of the time set aside for the cycle or development stage in terms of the specificity of the project. Even the delivery of cargo could be of varying complexity in terms of cargo specificity (for example, hazardous), in terms of a dispatch point, the need for maritime transportation in the main-feeder communication, etc.

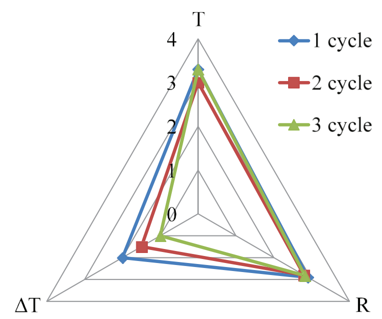

Fig. 2. Gradual specification of project product characteristics

5. The indicators that make the agile model performance efficient

So, the practical implementation of the agile-model requires appropriate time management tools for the project, because without setting some time limits [29] for each cycle (sprint) in a given model, it is impossible to receive the project product in a timely manner. At the same time, the time limits of each cycle should take into consideration the specificity of the project.

Such an assessment is necessary, on the one hand, for the management of project time, and, on the other hand, for managing human resources.

Projects that are relevant to operational activities, however, as well as any other projects, in addition to traditional indicators, could be evaluated from two more positions – from the point of view of complexity and uniqueness.

The complexity of the operating project is to be understood as the number of elements and their alternatives. An element of the project is «operation» – forming a unit of the classic network schedule of the project.

The uniqueness of the operating project is to be understood as the difference between the current project and other projects, already implemented or is being implemented in the company.

It is proposed to introduce appropriate indicators for use in management processes: the degree of complexity DD and the degree of uniqueness DU. These metrics should form the basis for determining time limits for the cycles and development phases of the conceptual model of the product T_p, that is, $T_p(DD, DU)$.

The method of calculating the indicators under consideration, of course, should take into consideration the specificity of the organization's activities and the project's product. For transport companies, the product of the project is characterized by a set of parameters $\langle C^z \rangle$, $z=\overline{1,Z}$, which could include within the minimum set, for example, C^1, C^2, C^3, where $C^1 \langle C^z \rangle$, $z=\overline{1,Z}$, is the point of departure, C^2 is the destination, C^3 is the cargo. At the same time, the «cargo» is characterized in terms of the specificity of delivery, for example, as a practical implementation of C^3 the following could be used:

– $C^3=1$ – tare-piece goods in the package;
– $C^3=2$ – bulk cargoes in tanks;
– $C^3=3$ – loads in refrigeration container, etc.

Based on these initial data on the product of the project, the specialist forms the «frame» of future delivery, which already includes the ports of departure and destination, ports of transshipment, if necessary. That is the manager details the «product» in terms of the physical movement of the cargo. The result is (at least) a set of C^1, A^1, C^2, A^2, C^3, where A^1, A^2 are, respectively, the ports of departure and destination. Naturally, the proposed version is the simplest (minimum) set that could be expanded.

The uniqueness of the project corresponds to the uniqueness of the set C^1, A^1, C^2, A^2, C^3 for the company. It should be noted here that a product that is a product of a high degree of uniqueness for one company may be of average uniqueness for another company. Everything is determined by the company's experience in certain products.

Assessing the degree of uniqueness is especially important for project-oriented companies, that is, companies that follow the project methodology in the course of their operations. For the transport companies in question, many of the services provided may be fairly «repetitive». Thus, the delivery of goods (textiles, household appliances, etc.) in a container from the port of Shanghai to Kyiv is characterized by a low degree of uniqueness. As a rule, employees in transport companies are clearly aware of who should be involved in this delivery and what its approximate cost is. Conversely, the above example of delivery of so-called projected goods (for example, industrial wind turbines) shows a high degree of uniqueness. This delivery requires the involvement of both a specific maritime carrier and a carrier specializing in oversized cargo transportation. In addition, the loading/unloading process in this situation is rather non-trivial and requires the development of appropriate technology, which entails the choice of port terminals where such a possibility exists. Organizing such delivery requires, of course, more time for each sprint.

On the other hand, under the conditions of the high level of competition in the transport services market, where thousands of companies (only in Ukraine) work today, time control within each sprint provides management with an opportunity to provide, ultimately, a competitive time of delivery organization.

The following is proposed as an assessment of the uniqueness of the project:

$$DU = \frac{1}{1 + N\left(C^1\right)\cdot N\left(A^1\right)\cdot N\left(C^2\right)\cdot N\left(A^2\right)\cdot N\left(C^3\right)}, \quad (1)$$

where $N(C^1)$, $N(A^1)$, $N(C^2)$, $N(A^2)$, $N(C^3)$, respectively, is the number of products (deliveries), where C^1 is the departure point, A^1 is the departure port, etc.

In this case, C^1, A^1, C^2, A^2, C^3 take very specific values and (1) are based not on the number of such sets in the background of the company but on the number of sets that included individual elements of the set C^1, A^1, C^2, A^2, C^3. If all the elements of this set are completely unique, that is, the company did not have projects with partial product matching, then $N(C^1)=N(A^1)=N(C^2)=N(A^2)=N(C^3)=0$, respectively, $DU=1$, that is, the project is quite unique for a given company. Conversely, the more «traditional» the product elements are the more $DU \to 0$.

It should be noted that the interpretation of DU calculations implies the existence of a certain estimation scale in the following form:

– $DU \geq DU^A$ – a project with a uniqueness of high degree;

– $DU^B \leq DU < DU^A$ – a project with a uniqueness of medium degree;

– $DU < DU^B$ – a project with a uniqueness of low degree.

The boundary values DU^A, DU^B are determined for each company individually based on its size, experience, number of employees, etc.

In the area under consideration, the product of the project (project product technology) involves agreeing on a large number of operations between different participants in the delivery process, then naturally, the larger the number of them, the more complex the negotiation process. Thus, only the port component of delivery involves, in addition to cargo operations, for example, phytosanitary control, customs control, etc. Therefore, the main task of the delivery organizer is not only to select the composition of participants, which provides for meeting the necessary conditions (costs and time of delivery) but to coordinate their activities. Any inconsistencies result in delays in the progress of operations and/or additional costs.

Any delivery (project) could be characterized, on the one hand, by the number of operations (they form the network schedule of the project), on the other hand, some of these operations have an alternative from the point of view of performers (suppliers). Thus, sea or trucking at a particular delivery site could be performed by different carriers, and the time, cost, and reliability of the services of these companies (reliability in terms of punctuality, in this case) is different. And the organizer considers all alternatives, gradually coming with the customer to the option that best meets the conditions put forward (Fig. 1).

Therefore, an assessment of the complexity of the project is proposed as follows:

$$DD = \frac{\sum_{v=1}^{V} N_v^a}{\sum_{v=1}^{V_s} N_{sv}^a}, \quad (2)$$

where V is the number of operations on the project; N_v^a is the number of alternatives to fulfill an operation $v = \overline{1,V}$; V_s is the number of operations within a «typical» project; N_{sv}^a is the number of alternatives for a «typical» project.

A «typical» project is to be understood as the average project for a given sector. For transport companies, a typical project is the delivery of tare-piece cargo in a container, providing for one vehicle-based and one shipping delivery and related operations, and an alternative for operations within 1–2. Thus, for each company, as part of the analysis of its operating activities, it could be determined that $\sum_{v=1}^{V_s} N_{sv}^a$, which acts as a «co-measurer» for the remaining projects.

Thus, (3) takes into consideration both the total number of operations on the project and the number of alternatives for each operation in comparison with the typical project.

It was mentioned above that the modern transport market also offers a variety of technological solutions for the delivery, especially for bulk goods [27]. Therefore, in the case of alternatives in this aspect, each technological solution considers its own version of operations and alternatives for their implementation. Therefore, (2) can be adjusted to reflect this as follows:

$$DD = \frac{\sum_{k=1}^{K} \sum_{v=1}^{V_k} N_{kv}^a}{\sum_{v=1}^{V_s} N_{sv}^a}, \quad (3)$$

where K is the number of variants of technological solutions (project product technology), V_k is the number of operations for the k-th version of the technology to receive the product of the project; N_{kv}^{a} is the number of alternatives to perform operations on each variant of the technology of obtaining the product of the project.

Thus, we have introduced the indicators that ensure the efficient functioning of the proposed agile-model and derived their estimation formulae.

6. Experimental calculations of indicators that reflect the specificity of projects from the point of view of the agile-model

Consider the following baseline data for the three projects given in Table 1.

Table 1

Frequency of project product components (situation 1)

Product component	Project 1	Project 2	Project 3
$C1$	2	3	5
$A1$	1	4	5
$C2$	3	4	5
$A2$	1	10	3
$C3$	2	20	20

The calculation using (1) produced the following results:

$DU_1=0.0769$; $DU_2=0.000104$; $DU_3=0.000133$.

Thus, the first project has the highest level of uniqueness, the other two projects are almost of the same level of uniqueness, which can be categorized as «low».

Note that for relatively small values for the project product component, formula (1) produces acceptable results in terms of the order of the values received. However, for large companies, with a significant number of projects implemented (with the value of components C^1, A^1, C^2, A^2, C^3 above 100), the results obtained from (1) are not convenient for practical use. This is due to the fact that one obtains values that have 8–10 «0» after the comma to the first significant figure. In such situations and for such companies, a «modification» of (1) of the following type is proposed:

$$DU=\frac{1}{1+N\left(C^1\right)+N\left(A^1\right)+N\left(C^2\right)+N\left(A^2\right)+N\left(C^3\right)}. \quad (4)$$

The results of calculations using (2) at large enough values of C^1, A^1, C^2, A^2, C^3 give the level of values of the indicator quite acceptable for analysis. So, for the initial data on the projects in Table 2, based on (4), we obtained the following results (Fig. 3).

Table 2

Frequency of project product components (situation 2)

Product component	Project 1	Project 2	Project 3
$C1$	30	100	50
$A1$	200	400	50
$C2$	200	400	50
$A2$	30	10	30
$C3$	500	300	200

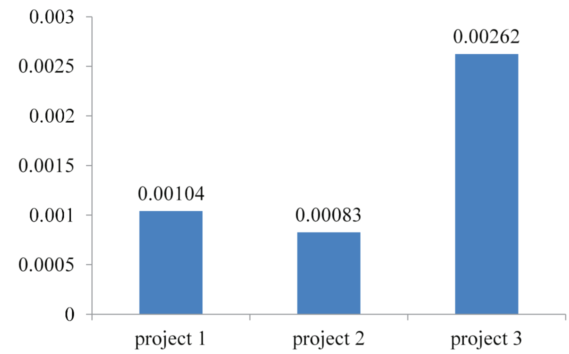

Fig. 3. Project uniqueness degrees

It should be noted that with a small number of projects implemented, the «multiplier» of the proposed formula (1) «enhances» the differences between projects and gives a more «tangible» differentiation in terms of uniqueness. Whereas when formula (4) is used in such situations, the «difference» in uniqueness does not get so pronounced. That is why, as a tool to assess the uniqueness of a project, two options are offered, each of which better reflects the uniqueness for two types of conditions.

Table 3 gives the initial data to assess the complexity of projects. As the parameters of a typical project, we adopt $V_s=8$; $N_{sv}^{a}=1$.

Table 3

Initial data to assess the complexity of a project

Operations	Project 1	Project 2	Project 3
1	1	2	3
2	1	2	3
3	3	3	2
4	3	4	4
5	4	1	1
6	2	1	2
7	5	5	1
8	2	1	–
9	2	–	–
10	1	–	–

As a result of the calculations, the following values for the complexity of projects were obtained:

$DD_1=3$; $DD_2=2.75$; $DD_3=2$.

Thus, the most difficult is the first project due to the number of operations larger than 8, with the number of alternatives for most operations exceeding 1. The second project, even though it has the same number of operations as a typical project, has a significant level of «alternatives» for many operations.

Note that the «level of alternative» operations on the project could act as an independent indicator APW, showing the average number of alternatives for each operation within a project:

$$APW=\frac{\sum_{v=1}^{V} N_v^a}{V}. \quad (5)$$

Thus, in order to implement effective time management within the agile model, new indicators are offered for project-oriented transport companies – the degree of uniqueness and the degree of complexity of the project. We have derived formulae for calculating these indicators, which is demonstrated using a specific numerical example.

7. Discussion of results of devising and investigating the components of an agile model

Building a project-oriented company (project-oriented management) requires an appropriate theoretical base. This study proposes an agile model for project-oriented transport companies and an appropriate toolset in the form of a set of indicators to ensure the effectiveness of the use of a given model.

Our model is in line with the 12 Agile Manifesto principles [2]. Table 4 gives the conformity of a given model to each of these principles.

The developed agile model for a transport company structures the processes of information exchange with the customer and implements multi-stage accounting of all requirements (including their changes). To ensure its effectiveness, we have proposed the indicators that determine the time parameters of sprints. The model makes it possible to improve the operational efficiency of a transport company, as well as a service delivery process, by clearly agreeing on the stages in determining the final parameters of the project product. Using the reasonable «limiting» of each sprint in the model makes it possible to minimize the timing of service rendering, which ensures its competitiveness.

The scope of this model application is project-oriented service companies, for which the identification of the product of the project (before its physical implementation) cannot be carried out based on a network schedule. Thus, a given model is meant for the conceptual design stage, before the start of operations on the project to actually obtain the project product.

Thus, our results could be used not only for transport companies but also in various areas of activities, taking into consideration the appropriate adjustments to the parameters of the project product. The application scope of the project complexity and project uniqueness indicators is broader; in particular, they could be used for various projects as a basis for the formation of a system of staff remuneration.

Table 4

Compliance of the developed Agile model for organizing the activities of a project-oriented transport company with the principles of the Agile Manifesto

Agile Principle (according to [2])	Matching the proposed model
1. The highest priority is to meet the needs of the customer	The model takes into consideration the customer's delivery requirements and maintains the competitive deadlines of the organization
2. Changing requirements are welcome, even in the later stages of development	Each sprint under consideration provides for a change in customer requirements
3. A working product should be released as often as possible	«Limiting» time based on the degree of uniqueness and complexity makes it possible to increase the productivity of the transport company
4. Throughout the project, developers and business representatives must work together every day	The model provides for information exchange with the customer within each sprint
5. Motivated professionals should work on the project	Taking into consideration the degree of complexity and uniqueness of the project in the formation of remuneration is an effective mechanism for motivating staff
6. Direct communication is the most practical and effective way to share information both with the team and within the team	The proposed exchange of information is carried out by «direct communication» with both the customer and other involved participants
7. An operable product is a key indicator of progress	In this case, an «operable product» is a formed delivery system, which should be the result of the first sprint, and its composition could change depending on the change in customer requirements within each sprint
8. Investors, developers, and users should be able to maintain a constant rhythm indefinitely	The model contains 4 main sprints, with 1–3 that could be repeated the required number of times
9. Constant focus on technical excellence and design quality increases project flexibility	The quality in the context of reliability of delivery (performance and cost compliance) is taken into consideration in each sprint in the form of conditions $\left\langle R_j, T_j, \Delta R_j, \Delta T_j \right\rangle$
10. Simplicity, the art of minimizing unnecessary work, is essential	All proposed procedures are not redundant, are focused on sharing only the necessary information
11. The best requirements, architectural and technical solutions are born to self-organizing teams	As part of the project-oriented approach, the project team is formed for each delivery (project) taking into consideration its specificity. The employee who receives the order could form the team considering the above, or be nominated for this purpose by the head of the company. This approach is in line with the project-oriented approach. The proposed model was developed for such companies
12. The team should systematically analyze possible ways to improve efficiency and adjust the style of their work accordingly	The experience of each sprint and its analysis reveals «undesirable» and «constructive» approaches in the process of working on the project. In addition, the project approach implies analyzing and discussing the results of the project. All this makes it possible to adjust the style of work of the company

The disadvantage of the proposed results is that they do not consider a link to the next stage of transport services. Even though the main interaction and all coordination with the customer take place at the stage before the start of direct transportation, nevertheless, in the future, such models could be used for the interaction with suppliers of various services (sea transportation, trucking, loading, paperwork, etc.). This is the direction for advancing the proposed results for the formation of an agile model covering all stages of the transport company's activities.

8. Conclusions

1. Based on the idea of the scrum framework, we have developed an agile model of transport companies' activities. A given model defines the content of each sprint (cycle) and the structure of the information exchange. Its basis is the varied parameters of the project – the characteristics of future delivery, namely, price, time, possible deviations in time and cost. At some point, these parameters are supplemented with the departure and destination ports. The model refers to the conceptual design phase of the project's lifecycle.

2. Two indicators have been proposed such as the degree of project uniqueness and the degree of project complexity, reflecting the corresponding characteristics of the project. The complexity of the operating project refers to the number of elements and their alternatives. An element of the project is an «operation» – forming a unit of the classic network schedule of the project. The uniqueness of the operating project means the difference between the current project and other projects, already implemented, or being implemented in the company. The estimation formulae of these indicators have been derived. The degree of uniqueness is based on the comparison of the project's set of characteristics (dispatch, destination, transshipment ports, cargo specificity) with other projects already implemented. The complexity indicator takes into consideration the variability of the project product: the number of variants of technological solutions, the number of operations for each variant; the number of alternatives to operation execution for each variant of the project product technology.

3. The calculations of the proposed indicators for the set example, three projects, have been performed. The results of the calculations demonstrated the adequacy of the input indicators received and the practical possibility of establishing the specificity of projects in terms of their complexity and uniqueness. The result of our calculations is the proposed modification of the project's uniqueness indicator for large companies with significant project experience. A given modification makes it possible to obtain the values of the indicator convenient for practical use (an acceptable number of decimal places).

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