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Монографія містить наукові дослідження авторів. Може бути корисна для керівників, інженерів, юристів, економістів та інших працівників підприємств і організацій, а також викладачів, здобувачів, аспірантів, магістрантів і студентів вищих навчальних закладів.

The monograph contains scientific studies of authors. It may be useful for managers, engineers, lawyers, economists and others employees of enterprises and organizations, as well as teachers, applicants, graduate students, undergraduates and students of higher educational institutions.

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Content

CHAPTER I.
ORGANIZATIONAL PRINCIPLES OF MANAGEMENT IN THE SERVICE SPHERE CLUSTER

Introduction.

Problem setting (description of the problem being analyzed in general and its connection with important academic or practical tasks). The clustering of service enterprises is considered objectively the basis that provides the conditions for the emergence of a qualitatively new concept of organizational management – integrative. The negative feature of this concept is its orientation to different organizational types of physical, and virtual networks and innovation of organizational development (which consists of the refusal of business objects from the rigid determinative hierarchy of management systems). Such specificity of management organization requires operation of management apparatus (separate employees, their groups) with large masses of structured and non-structured data, and therefore use of such basic instruments of management organization of participants of clusters as: computing (hardware) resources to which multiaccess is possible (or access for many users); servers, storage, and databases; physical and virtual networks; software; Internet-based analysis and intellectual analysis.

Cloud services become the basis of management, as they accelerate innovation, increase the flexibility of the organizational structure of the service sphere cluster and provide economies of scale. The best access to computing services can be provided by full or partial migration of organizational systems of cluster management and organizational structure of cluster participants to cloud services. An additional advantage of migration in public networks is the presence of nodes and hubs that unite internal managers of different services, which are jointly organized by the Supervisory Board of clusters and external data stores.

Analyzing the latest studies and publications which launched research in this field and to which the author refers. Among the research and publications on the solution to the problem of management organization in service sphere clusters, we have allocated works A. Morgulets, O. Artemenko, V. Pasichnik, V. Egorova,

O. Maslyhan, O. Kasinets and others. Despite the considerable number of publications, there are no fundamental works that would enable a systematic outline of organizational priorities of management of services sphere clusters, among which the combination of centralization and autonomy, legality, planning of activity organization, the objectivity of the basic link, optimization and efficiency of activity organization, regulation of tasks and functions of activity organization, continuity of processes.

Formulation of goals (setting a task). Since the above provisions, the research is aimed at systematization and systematic study of organizational principles of service sphere cluster management. The following research tasks should be addressed to achieve the target:

1. description conception of organization management of service sphere clusters;
2. identification and description of the concepts of organizational activity of clusters in the services sphere;
3. description of general specificity of organization of management of service sphere clusters as a multi-goals system.

1.1. Conception of organization management of service sphere clusters

The organization of management of clusters of service sphere concept is quite specific, as each cluster participant is an open, rather individual service system. Thus, the participants of the service sphere clusters are oriented on economic activity related to services (among them public catering services, financial services, information services, housing and communal services, household and rent services, tourist services, legal services, hotel services, security services, services of translators, trade services, transport services, entertainment and remote access to cybersports facilities, administrative services; medical services, construction services; hairdresser services, services of transportation maintenance; educational services; services of repair of

digital and household appliances; cleaning services [1; 2; 3]). The specific operation of each services sphere enterprise as a service system, provides consideration of components, among which:

- clients (buyers, patients, students, etc.);
- service personnel and networks of its interaction;
- a system of rendering specific services and specific physical and/or virtual environments determined by the type of services. For example, trade enterprises are oriented on goods exchange, services, values, and money, in which the buyers, experts in trade, marketing, engineering, finance, technical support, and even managers of the higher level, interact in the premises for trade.

The service sphere enterprises oriente on the organization of a tour for a person from a permanent residence with health, cognitive, professional-business engaged the person who carries out a journey (tourist) and the tourism experts interacting in a specific tourist attraction. All the components outlined define the content of the division of work between individual employees (their groups) and the coordination of their activities (Table 1).

Table 1 - Components of the service sector enterprises

Components	Specificity of the component	Distinctive sign
client of the service sector enterprises	the most important element, which determines the target orientation of the service system of the enterprise	the purpose of the work distribution is to satisfy the client's needs
service personnel and networks of its interaction	distribution of work to components, departments, delegation of authority	the purpose of execution of individual works according to his qualification and abilities
system of providing specific services	defining the customer’s needs	ensuring vertical and horizontal coordination of works and activities
specific physical and/or virtual environment	creation of coordination mechanisms	

Source: formed on the basis of [1; 2]

Thus, the interaction of the selected Table 1. components for a particular service system formed several distinctive features. These features include:

1) social-oriented combination with collective behavior (on which the goal is

required);

2) orientation toward the provision of services, which leads to the embedded in the economic system of the country, region, and city;

3) consumption of a rather differentiated pool of resources and resource provision and management to achieve the expected result.

All the peculiarities are relevant for service sphere enterprises united by cooperation and require a joint management organization. The concept of organization of service sphere clusters management shown in figure 1.

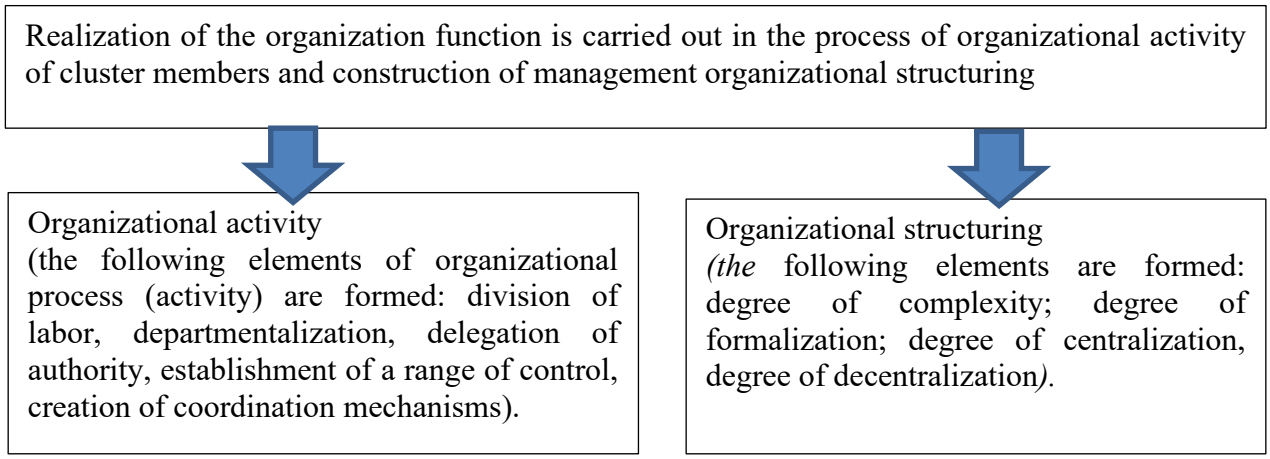

Fig. 1. The concept of organization of service sphere clusters management

Source: formed on the basis of [1; 2]

Thus, the realization of the function of the organization is carried out in the process of organizational activity of the cluster participants and building organizational management structures. At the same time, the process of organizational activity is a function of joint management of services sphere clusters, which is carried out by the cluster Supervisory Board (which constantly acting collective management body) and services sphere cluster members. The Supervisory Board consists of representatives of companies, local authorities, and representatives of educational institutions, which provide specialists in the sphere of services.

The complexity of the organization of the joint management system of clusters of the service sector consists in:

1) the necessity of choice of numerous alternatives to the development of service systems of its participants, according to an orientation on the provision of services

(each of the alternatives of the development of service systems of the participants should not compromise the rest, but from the point of view of rationality of decision-making, should not contradict goals of cooperation);

2) the necessity of choosing a certain position in the range of all elements of the services sphere enterprises, the result of which is a joint organization of the participants' activities, regardless of the type of service system they have formed.

The chosen directions are summarized and form the organizational structure of the clusters of the service sector and the process of joint organization of the cluster participants' activities.

Thus, the process of joint organization of the activity of the participants of the cluster is as follows:

- joint internal regulation, coordination of mutually dependent elements of service systems of participants;

- a processes or actions combination that ensures the achievement of common goals of the service systems of the participants' associations;

- activities of the participants aimed at the realization of the established plans and implementation of organizational regulations, which outline the content of management rules and procedures.

The organizational structure of service clusters in the management theory is interpreted as an abstract category characterized by four organizational parameters:

- degree of complexity of joint actions of participants;

- degree of formalization of joint actions of participants;

- degree of centralization of joint actions of the participants (taking into account the needs of concentration of the right to make decisions);

- degree of decentralization of participants' actions (account for their desire to preserve independence).

Each organizational parameter has internal characteristics and influences the format of the organizational structure of clusters of the service sector, illustrated according to the data in Fig. 2.

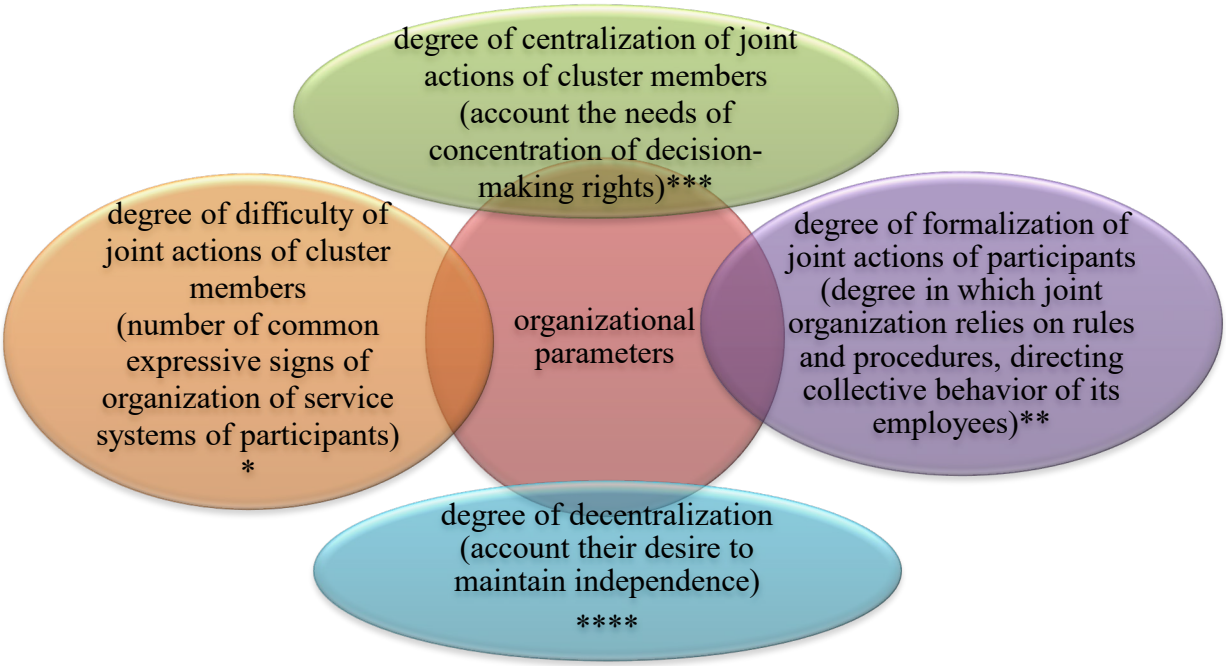

Fig. 2. Organizational parameters that define the format of the service sphere clusters organizational structure

Note
* The more undeveloped vertical levels in the hierarchy of management and diverse subdivisions of the participants at the same level, the more difficult it is to coordinate the joint activity of the organization.
** The more common and individualized rules and regulations in the organization, the more formalized is the organizational structure of clusters.
*** In order for cluster members to develop on a single course and focus of decision-making.
**** The setting is determined by the need to preserve the right to make most decisions at the level of a separate cluster member (wants to maintain its independence).
Source: formed based on [1; 4-5].

Organizational parameters are fixed by organizational rules of the cluster (or normative documents regulating the functioning of the cluster control apparatus and its accounting and analytical processes [1; 4-5]). Taking into account the sufficient specificity and diversity of organizational parameters that define the format of the organizational structure of clusters, as well as the constant gap in the balance between centralization and decentralization the cluster participants initiated the process of evolution of the generally accepted structural-functional approach to the joint organization of the activities of the participants (oriented on local tourism enterprises development) to the exported indeterminism (based on the application of flexible networks of hierarchical management systems of groups of enterprises within a cluster with partial migration of management systems in cloud services).

The above-mentioned elements of the management system organizational activity, and structure forms the organizational activity concept of service sector clusters.

1.2. Concepts of organizational activity of services sphere clusters

The concept of organizational activity of service sphere clusters is based on the system of concepts inherent to it. The category of concepts is interpreted by us as the content of the main category and meaning. We state that the classical content of any concept is interpreted through the content of the basic concept "system" (the form of organization of someone, which has certain peculiarities). Thus, it should be noted that any system, including organizational one, has peculiarities. We note that under the "feature" of organizational activity of clusters of the service sector understand a stable system of significant traits, which characterize it as a special function of management, within which division of works between individual participants and coordination of their activity is carried out [4].

The main element of organizational activity in the service sphere cluster management is 2-a basic types of structures (which can also be considered as concepts): 1) formal (official) structure of the cluster; 2) informal (unofficial) structure of the cluster.

Thus, the concept of a formal (official) structure of service spheres cluster is interpreted through internal business relations and relations of participants and their employees, arising in the performance of internal functions of the chain of creation of cost of a common product of a cluster or service functions of individual employees, according to the official character [4-5]. According to this structure, there are always:

- reflects the official division of work among the members of the team of a separate member of the cluster (under the agreed division of labor relations and relations that arise in the process of labor activity);

- reflects the official distribution of works among the cluster members, which

includes incoming logistics, separate operations, outgoing logistics, marketing and sales, and service processes (according to the agreed distribution of the motor in the joint chain of the Porter value).

The elements of the formal (official) structure of the service spheres cluster are the management links (represented by all the existing variety of horizontal management structures of the cluster) and the management stages (represented by all the existing variety of management structures formed at the same level, if they reflect the sequence of subarrangement from bottom to top on the vertical). The characteristic features of such formal structures of the cluster of services in management organization are the importance of internal hierarchy (characterized by the order, the organization of interaction between separate levels on the vertical, and the form of relations of subordination).

The concept of the informal (unofficial) structure of the service spheres cluster areas is interpreted as a spontaneous category, as a result of cluster participants joining the service group by stroke operations or services belonging to the total chain of the cost of Porter. It's combined with approaches to process management, which transforms invested resources (in the form of raw materials, labor, and energy) into output (in goods and/or services forms) according to established informal statuses in the management of processes of transformation of invested resources (informal leader, innovator, etc.) [4]. Such informal associations are created in all distribution spheres of the movement in the joint chain of the cost of Porter, complement and develop the official structure of the cluster. Sometimes informal relations of cluster members are based on egoistic aspirations, and opposition of individual participants or their groups or cluster as a whole, resulting in conflicts (deployment of which can lead to the breakdown of the cluster or their resolution under influence of leadership, prestige, sympathy). The characteristic features of informal cluster groups are the ability to self-organization, self-regulation of internal relations of the participants in the development of one of the participants as a leader, or prestige, sympathy to the individual participant is managed.

Interaction of formal and informal) structures of the service sphere cluster require

an arrangement of the basic principles of their organization, in particular, hierarchy and self-regulation of internal relations of the participants. Therefore, the outlined principles should: (1) regulate and formalize the management structures; (2) ensure the joint distribution of the scope of work, powers, and responsibilities; (3) ensure joint mutual subordination and interdependency of participants and their employees; (4) ensure joint arrangement of occupied areas of work, regulation of the management equipment; (5) establish relations between participants, their employees, etc. Given the specifics of the work, they should be carried out, uses:

- common principles of their organization;

- physical and virtual networks (formed using fast access to cloud services (or services connected with constant access to remote Internet resources) connected with them it-technologies (search service, file storage, table, and text processors, cloud disks, etc.).

Thus, additional zones for identification of concepts in management activity organization are [1, 4-5]:

1. Providing quick access to IT-services**.** This area is determined by the possibilities of the cluster participants: (a) rationalization of the organizational structure of management; (b) mutual division of work, powers, and responsibility between individual managers and specialists; (c) fixing of mutual subordination of the cluster members' employees; (d) formalization of the interdependency of the cluster members' employees; (i) rational placement of employed workers on separate work areas. Therefore, the concepts of this zone are: (a) division of work (interfaced as differentiation, specialization of the participants' work); (b) systems of executive powers and responsibilities; (c) areas of work (manipulation, fixed based on monotony or monotony work).

2. Providing central administration of organizational activity through the cloud IT-infrastructure of the participant and the whole cluster. This area is determined by the possibilities of the Cluster Supervisory Board centralized, from one workplace and/or by the efforts of one expert to regulate the participation of the participants in the single cost-generating chain (in particular, the development of the site’s movement

according to their qualifications, specialization, and service orientation). Therefore, the concepts of this zone are: (1) a working place (an elementary unit of the organizational structure, which is necessary for the performance of labor operation or management [6-7]); (2) a single chain of value creation (a combination of activities, which the participants of the cluster working in the services sphere, carry out for delivery of service).

3. To reduce the cost of IT-infrastructure of organizational activity. This zone is determined by the capabilities of cluster members and the Cluster Supervisory Board to use cloud services, and account for the Internet access possibilities. This area is allocated because to use cluster clouds do not need to create its IT infrastructure in each location of presence, to pay for the services of experts on the server and network equipment. The cost of access to the cluster cloud can be evenly divided among all members of the cluster and can be attributed to operational rather than capital expenditures. Therefore, the concepts of this zone are: (1) cloud cluster (modern it-solution or cloud infrastructure deployment model, in which calculation and services are turned in a separate environment); (2) access to cloud (access to clouds from devices participants).

4. External service of the infrastructure of cloud services of organizational activity. This area is determined by the ability of cluster members and the Cluster Supervisory Board to form a cluster IT-infrastructure based on several data centers outside the cluster that have a reliability standard above the Tier II + data protection rating (provided that all data centers are connected with high-bandwidth links). Therefore, the concepts of this zone are: (1) cluster IT-infrastructure (interpreted as software of cluster participants, specialized computing programs that form the necessary resources for solving business problems of the cluster); (2) communication channels of participants (devices with access to the Internet or private cloud, joint databases, corporate mail, etc.).

5. High elasticity and scale of services of organizational activity. This zone is determined by the possibilities of cluster members to redistribute computing resources and services efficiently provided between cluster members, to easily provide scalability

of cloud services, to implement the organization of the regulation of cluster management equipment, and to provide adjustment and establishment of mutual relations between participants. Therefore, the concepts of this zone are:

- computational resources (opportunities provided by components of the computing system, which are spent (occupied) in the process of its work);
- cloud services (services related to providing users with permanent access to remote internet resources);
- cloud technologies (information and communication technologies providing for remote data processing and storage);
- scalability (the ability of the system of activity organization and its networks to cope with the increase of working load at the addition of resources);
- organization of norms (type of activity organization, establishment of necessary costs and labor results, control over the degree of labor, determination of the correlation between the number of employees of different groups and the number of units of equipment);
- organization of mutual relations of participants (type of activity organization, establishment, and support of necessary relations between participants).

6. A clear accounting of the computing resources of organizational activity. This zone is determined by the possibilities of the Cluster Supervisory Board to determine the constant fee from the cluster participants, which is charged only for the resources used (during the processing time) and the possibility of using free services. Therefore, the concepts of this zone are:

- used computing resources (services with payment for the processing time);
- free services (services free of charge for all and everywhere or the team work);
- processing time (time spent by the server processor for task/operation processing).

1.3. General specificity of organization management of service sphere clusters as a multi-purpose system.

The clusters of the service sphere are a multi-purpose system**.** This is because each cluster member has a system of goals, which is rather detailed. The system of goals of cluster members can be classified:

- by the criterion of the action directions of the cluster member (goals of external, cluster, and internal);
- by the direction of the service activity of the cluster member (transport service, business, and personal, personal, cultural and recreational services, etc.);
- by the character of realization of goals ("goals of creation" and "goals of development");
- by the objectives of the levels of management (goals of the participant or their groups, separate subdivisions, and groups or individuals);
- by the time criterion (short-, medium- and long-term goals);
- by the criterion of novelty (goals of support of the existing level, goals of gradual development of individual elements of the service system, and goals of renewal);
- by the criterion of measurement and qualitative (quantitative).

The system of cluster goals can be classified: (1) by the direction of the types of activity (joint strategic, joint tactical, joint operational); (2) by the influence on individual elements of the cluster (service (production of services), managerial (which can be divided into administrative (planning, organization, motivation, control) and functional (marketing, technological, sales, financial, supply, personnel, etc.); (3) by the nature of the cooperation development the participant (goals of joint operation, goals of development (expansion) of labor); (4) by the priority criterion (basic, side-by-side and supporting goals); (5) by the measure criterion (quantitative and qualitative).

To ensure the effective functioning of the cluster of services, the organizational goals of all its participants must be properly formulated. It’s important to comply with the requirements of properly formulated organizational goals. Among these

requirements, identified:

- specificity and measurement;

-balance (necessary pre-condition balance (achievement of non-contradiction) goals of the participants);

-orientation in time;

-realism (reach and not exceed the capabilities of cluster members);

- interrelation.

The organization of the management system of the cluster of services sphere should be implemented in a legal way using the methods of setting goals and evaluating the activity of managers, namely based on "management by objectives" (MBO). Under these conditions, the organization of cluster members' activities should be guided by the overall organizational objectives of the cluster.

The essence of the "management by objectives" concept is as follows:

- for each participant, the purpose of the service activity is defined;
- each participant shall be provided with a relationship between cluster goals and the goals of other participants.

It is assumed that the Cluster Supervisory Board and each participant cooperate, defining the common goals of the activity [1].

For example, the general specificity of the organization of cluster management in the service sphere as a multi-level system will be as follows [8-9; 10-11]:

1) the activities of cluster members should be oriented to the overall organizational objectives of the cluster;

2) the general organizational goals should be divided into several secondary goals of separate garlic, their structural units;

3) secondary goals should be transformed into individual groups of participants and groups of subdivisions and detailed to the level of goals of individual performers;

4) the objectives of each executive should contribute to the achievement of the goals of its cluster members and their structural units.

The MBO tools used to set the goals of cluster members are listed in Table 2.

Table 2. - Management by objectives tools used to set goals for cluster members

MBO tools	The purpose of the instrument	The result
Cluster members"Goal Tree"	a visual graphical representation of subordination and correlation of goals, showing the distribution of the overall (general) goal or mission to the subgoals, objectives and individual actions	Formation of a “target frame” of a cluster and cluster member
Decomposition (disassembly) of goals	a detailed structure of the whole system of the cluster and a member of the cluster, where it is divided into separate components by one sign.	
Cluster members responsibility	responsibility to the set tasks and esponsibility for their positive decision	Formation of the "structure of performers" of a cluster and cluster member The organizational structure of cluster management and cluster member
Cluster members delegation	the transfer of tasks and the authority to solve them to a person who takes responsibility for their implementation.	
Cluster members authority	limited right to use the resources of cluster participants and to direct their efforts to fulfill joint tasks. limited right to use own resources and to direct efforts to fulfill individual tasks.	

Source: formed on the basis of [1; 10-15]

The general specificity of the service cluster management organization is focused on the formation of balanced cascade goals for its participants. At the same time, if each member of the cluster reaches the set goals, then the group of participants and the cluster as a whole achieve their goals. The degree of achievement of the goal will be the main criterion of distribution of the movement from the cluster activity.

Conclusions.

The organization of the management system of the service sphere cluster is not possible without the joint organization of its participants, which in aggregate form a multi-goals system.

Thus, the management system regulation breaks down the joint development, coordination, and execution of the aggregate organizational regulations (rules, norms, beliefs, management standards, regulations on structural subdivisions, service instructions, etc.), organizational structures of cluster participants, and cluster.

Thus, the organization, as a function of management of the cluster of services, is connected with systematic co-ordination of many goals, tasks, and relations between the participants that form and execute the management by objectives tools used.

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CHAPTER II.
GENERAL LOGIC OF MANAGEMENT ORGANIZATION ON THE EXAMPLE OF TOURIST CLUSTERS

Introduction.

Problem setting (description of the problem being analyzed in general and its connection with important academic or practical tasks). The most specific management of clusters in the service sector can be identified and systematically characterized by the example of tourist clusters. These services sphere clusters, in general logic, are interpreted by us as voluntary associations of tourism enterprises and other subjects of service economic activity, for the production of a joint tourist product. Such clusters are oriented on shared resources, which are used to meet the needs of the population in recreation and recreation. It should be noted that the organization of the activity of such clusters is provided based on the obligatory consideration of their properties, concerning the assistance of system development of participants (based on integration management). The logical proof of the judgment is the integration of different aspects of the activity of independent cluster participants into a single aggregate (organizational structure, main principles of formation, and essence of which were developed in chapter 1).

It should be noted that economic clustering is objectively considered the basis that provides conditions for the emergence of a qualitatively new organizational specificity of management of economic activities objects of the service sector – integrative, based on different organizational types of physical, virtual networks and innovative approach to organizational development, consists in the refusal of the rigid determinative hierarchy of formal organizational structures (although the preservation of the hierarchy). Such specificity helps to organize the activity of participants of the cluster, which is oriented on the operation by large numbers of structured and non-structured data and therefore requires the use of computing resources, and servers. At the same time, it cannot be ignored in the general specificity of the organization of activity of the cluster and its participants, which cannot exist isolated from organizational elements (departments of services, groups, separate executors), their roles, mutual

relations, defined by the formal hierarchy (vertical management levels), the polyarchive (horizontal coordination of the activity of cluster participants and employees of the same hierarchical level, regulations), written and unwritten rules (codes) of behavior and interaction.

Analyzing the latest studies and publications which launched research in this field and to which the author refers. Among the latest research and publications, which initiated the solution of the problem of management organization dedicated best practices Artemenko, V. Pasichnik, V. Egorova, V. Kostinets, M. Lendiel, N. Garden, M. Soldak, and others. The processes of digitalization of management and routing of the services sphere cluster are revealed. In most studies, their authors pay attention to the fact that there is a gradual transformation of local processes of planning, organization, motivation, and control of participants in the integrated, which form a unified route of information flow between networks of the services sphere cluster. Nevertheless, the general logic of such management is unallocated. In this case, taking into account the need for the maximum concretization of such logic, the most developed and perspective direction of the service sector, which in our opinion is the sphere of tourism, should be chosen as an example (in many developed countries, it forms significant source of income).

This is quite actual for Ukraine, where the following tourism clusters are formed: Gorbohori (Semenivska Village Council, Solonkivska UTC), Boykiv Gazddy (Skole region); "COWBOYKY: Ukrainian Wild West" (Novomiska UTC); "Lvivske Opillya " (Bibrka, Davydivska, Rozvadivska, Trostyanetska UTC); Lviv Tourist Alliance (Lviv), Tourist cluster "Slavutich" (Slavutych city, Kyiv region); Cluster of eco- agro-tourism " Oberih " (Grytsiv, Khmelnytsk area) .

Formulation of goals (setting a task). According to the above-mentioned provisions, the research is aimed at studying the general logic of the management of tourist clusters. The outlined goal is achieved based on the solution of the following research tasks:

-a general description of the management organization logic of tourist clusters;

-a description of the physical and virtual organizational management network of

the tourist cluster;

-identification of the basic features and results of organizational structure development of tourist clusters**;**

- description of evolution process of the organizational structure of the tourist cluster**.**

2.1. The general description of management organization logic of tourist clusters

The logic of management organization of tourist clusters is based on the physical and virtual networks formed by physical proximity to a certain territory and quick access to cloud services supplied mainly by AWS, Azure, and Google Cloud (which occupy the lion's share of the market all over the world, except for China, where Alibaba Cloud is the leader). Such services are a tool that allows the management of the cluster and its participants to influence organizational activity and organizational structures as quickly, efficiently and with minimal capital expenditures, namely to solve the organizational task, from the ones outlined in the figure. 1. The organizational tasks of the cluster include coordination and planning of activities, distribution of works, evaluation of works, solution of common problems of development, regulation of participants' activities, etc. [1]. In particular, the basic tasks are organizational tasks, such as:

1) ensuring rapid adoption of organizational structures of the cluster and its participants (the priority is to ensure that the organizational structures of the cluster and its members can adapt quickly to changes in the external environment);

2) high flexibility, dynamics of activity in the cluster (priority is to acquire the ability of cluster members to react quickly to changing demand, improvement of technology of tourist product production, the emergence of innovations);

3) maximum adequacy of the organizational structures of the cluster (the priority is the constant correspondence of the organizational structure of the participants to the parameters of the managed system);

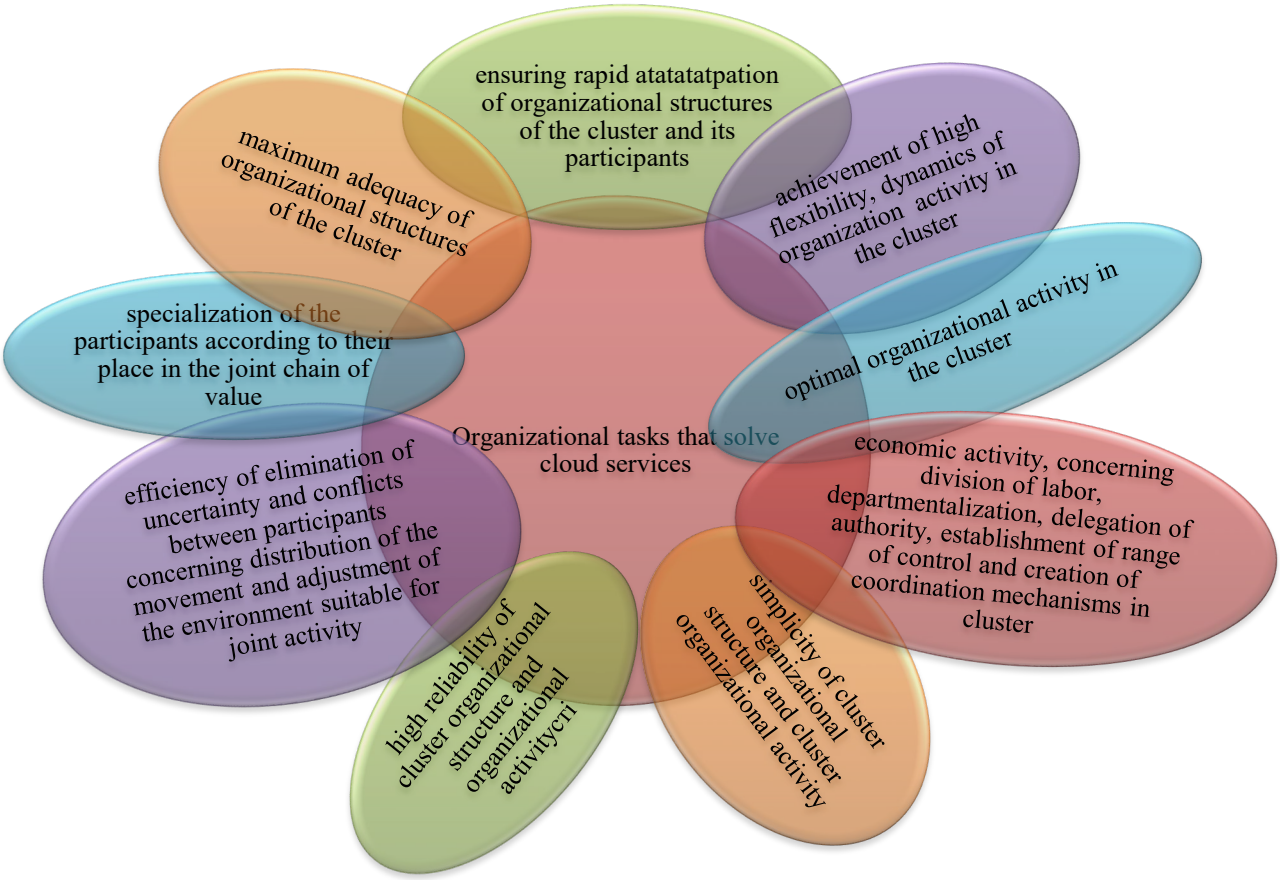

Fig. 1. Organizational tasks, which solve cloud services in organization of management of tourist clusters

Source: formed on the basis of [1; 2]

4) specialization of the cluster participants according to their place in the joint value chain (priority is functional isolation of the structural subdivisions of the participants, limitation, and concretization of the sphere of activity of each managing link of the participant; limitation and concretization of the activity sphere of each control link of the cluster);

5) optimal organizational activity in the cluster (priority is the establishment of rational links between levels and control lines);

6) efficiency of elimination of uncertainties and conflicts between participants about the distribution of movements and adjustment of the environment suitable for their joint activity (priority is to prevent irrevocable changes in the management system during the decision-making process);

7) high reliability of cluster organizational structure and cluster organizational

activity (priority is to ensure the reliability of information transmission in the formal (official) cluster structure);

8) economic activity, concerning the division of labor, departmentalization, a delegation of authority, the establishment of a range of control, and the creation of coordination mechanisms in the cluster (important compliance of expenses for maintenance of cluster management bodies with the possibilities of organization);

9) simplicity of cluster organizational structure and organizational activity of cluster (priority is to understand the personnel and, as a result, ease of adaptation to this form of management and active participation in the achievement of organization goals).

In addition to addressing the above organizational tasks, it is important to accelerate innovation and minimize management costs through the high scale of the structure on which it is based.

According to the content of the defined organizational tasks, it's obvious that the process of management organization is rather a complex type of activity, oriented on multi-task. Its complexity increases the need to choose from a variety of alternatives to solving organizational tasks.

The final result of management organization is a choice of a certain position in the range of all elements of organizational activity. Such a choice, as a result, forms its organizational structure. Thus, simplifying the organizational tasks outlined by us without narrowing the alternative of their decision is possible based on cloud services and access to all their computing services.

The best access to computing services can be provided by full or partial migration of the organization of the tourist cluster and its participants in the cloud services. Currently, three types of structures are suitable for this: Infrastructure as a Service; Platform as a Service; Software as a Service.

All types of Claud are provided by the subscription model, which uses them only when necessary exists. An additional advantage of the migration to public networks is the creation of virtual nodes and hubs that connect participants and external data stores.

The systemic property obtained from the migration of the organization of tourist

cluster participants in the cloud services is the effect of synergy, which is the basis for the integration of its elements. This organizational unity is provided by a certain system of networks, which are specific sets of formal or informal agreements, which provide for the implementation of certain management actions or the joint use of resources and competence of the cluster participants (within one or several tourist attractions), to achieve a common goal [2].

The cluster's organizational network itself, as a phenomenon, is not new in economic science and has appeared for a long time. Network — a combination of anyways, communication lines, channels, etc. others, located on a certain territory. A typical example is the global financial network of the Tampliers order, whose infrastructure, already in 1096, contained elements that use the modern banking system. In addition, today there are: (1) networks of offshore jurisdictions; (2) networks of international religious and charitable organizations (for example, an international network of charitable organizations "Caritas" etc.); (3) networks of educational institutions, etc.

2.2. The description of physical and virtual organizational management network of the tourist cluster

The physical organizational network of the tourist cluster is formed as an aggregate of the workplaces formed for the organizational-separate participants within the framework of separate structural subdivisions (services, departments, groups, sectors) and structural subdivisions of the cluster, which perform one or several management functions. The network includes a combination of working places formed within the framework of: (1) tourism enterprises; (2) suppliers of tourist equipment; (3) producers of specialized restaurants, transportation, and other services. The network should include only the jobs formed by subjects connected with relations of territorial proximity and functional dependence in the sphere of production of the tourist product and its realization. The unit of the physical network of the cluster is a

workplace, in particular:

1. a simple workplace (which is an employee who serves one activity or is involved by one member of the cluster);
2. a multitasking workplace — one worker serves several types of activities and works in automatic mode or is involved by several members of the cluster);
3. a complex workplace (typical for continuous production processes) is a few types of activity served by a team of specialists.

In clusters that are in the service sector, including tourists, depending on the fixing at the working place of service or other activity, allocate stationary and moving jobs. Moving jobs concern such categories of employees as excursion workers, repair workers, and transport workers. There is no permanent localization area for such workplaces. At the level of specialization, the jobs are divided into specialized (at the working place the execution of three-five single operations is fixed) and universal (the consolidation of uniform operations is absent or their number is significant).

Although the unit of the physical network is a separate workplace, organizational, this network is combined with vertical management relations (vertical connections to the bottom) and horizontal connections of workplaces. Vertical management relations of participants are relations of subordination between the chains of the cluster management system, participants, functional relations between participants, and experts of cluster management [1]. The horizontal connections are the relationship between the links of the same level of economic hierarchy (between participants, their employees, etc.) [1]. Thus, within the physical organizational network of the tourist cluster, it is possible to separate nodes and hubble. Nodes and hubble of the physical network form a local combination of control units (structural subdivisions of cluster management or workplaces of a certain type), amalgamated on the sign of similarity of executed functions. Nodes and hubble of the physical network form a management service with a limited area of influence.

For the physical network of the tourism cluster, there is a strict connection to the parameters of the tourist attraction (or to sources of resources), so it is classically a problem of locality, which causes a limited influence on the formed management

system.

It is important to note that when cluster members begin to use cloud services, along with vertical management relations and horizontal connections, the jobs associated with cloud relations are formed. These relationships will provide a parallel physical, virtual organizational network, where all data can quickly move between different cloud through voice mail, conferencing, personal communications control panels, and IVR.

The creation of a virtual organizational network of a cluster requires its members to register and authorize in the cloud service and to re-design the organization of the workplace of each employee (involved by cluster members). Re-designing the workplace must pass on:

1. transformation of the general content of work (cloud service should be developed as a rock and with the help of which work is performed);
2. establishing technological, information, and other connections with cloud services and their applications (including remote ones for file storage, editing, and synchronization, etc.);
3. formation of new equipment sketch provided that some are replaced with software and technical resources of the user's computer device (using virtual environment informational means);
4. switch to the business and maintenance services for which the user has access to his data, but cannot manage and should not care about the infrastructure, operating system, and software with which he works;
5. changing employee requirements, including the need to provide network-wide, shared access to the cluster compute pool to be configured (cluster communications networks, servers, cluster storage, applications, and cluster services). To create an account, an employee is enough authorized on Google, Twitter, or Facebook, and then adds a phone number and password for data security.

Thus, the physical organizational network of the tourist cluster in the conditions of application of cloud services loses the sign of territorial limitation.

The virtual organizational structure of the management of the tourist cluster increases the opportunities for its participants using the synergy effect and integration of its elements. However, its presence is not a guarantee of the solution given in fig. 1, which shows the organizational tasks of management. To solve the whole set of organizational tasks is necessary:

1. creation of opportunities for quick access of workplaces to the resources of cluster members, based on a variety of internal methods of connection such as nodes (methods of connecting linear type) and hubs (methods of connecting similar participants of the network). It is possible in multi-functional, corporate cloud services;
2. creating opportunities to provide a rational cost structure based on effective management and the formation of a system of protection against failures in cloud services for small, medium, and large businesses.

The virtual organizational network of the tourist cluster is the interaction of the cluster participants and their structural subsystems, individual members through different working ways connected to the common clouds provided by the subscription model, their infrastructure, and technologies.

The most famous types of hmar are Software as a Service. These are cloud, delivering a ready-to-use solution to a customer with minimal configuration requirements. That is, theoretically, signing for such a service, any user with minimal involvement of the system administrator or without it can control it. Therefore, these clouds and their services are ideal for cluster members, who are small business entities (they are the same as other clouds, including business mail, online storage, video conferences, and other useful services). The most famous representatives of such service in the corporate environment are Office 365 (the cloud provides access to various programs and services based on the Microsoft Office platform, business-class e-mail, functionality for communication, and document management). If we talk about SMB, we should mention such cloud services as Dropbox (Dropbox Inc.'s file hosting, which includes personal cloud storage, file synchronization, and client software), Evernote (a set of software for creating and storing notes. Notes can also contain

attachments with other types of files. Notes can be sorted by a pad, tagged, edited and exported), Trello (Cloud program for small group project management) and others.

For mid-market participants, the most acceptable cloud with PaaS-type services, the suite of applications is complex and includes Workday HR and Finance, accounting Simply. In addition, the clouds contain sets of ready-made components for creating plugins, as well as frameworks for managing employee-provided workplaces. In this case, the components will also be data services, repositories, automated deploy tools, testing environment, and so similar services in the given working places. Examples of cloud with PaaS suites include Google AppEngine (web hosting service on Google servers), VMware Pivotal Cloud Foundry (open source multi-cloud application platform as a service managed by Cloud Foundry Foundati), Red Hat's OpenShift (Public Cloud Solution Red Hat OpenShift Online), Heroku, and others. Services that offer an integrated set of additional tools required to deploy and maintain clusters and corporate environments include network tools, graphical management interfaces, monitoring tools, and interfaces with permanent integration systems.

For large business participants, ideal clouds contain cloud IaaS, as they offer numerous programs from regulation of relationships related to the formation of accounts payable and receivables to inventory. This public cloud is the closest to owning its own "iron" and virtualization. In the case of IaaS, it can also be used by cluster management bodies, as it opens up opportunities for sharing certain information resources and competition between participants. Users receive the cloud processors, memory, disks, and networks they use to create server-based routers and configure the network topology as needed. Examples of cloud with IaaS - are CRM systems, time-trackers, task management platforms, etc.

The organization of the management structure, which combines physical and virtual organizational networks, is not expedient to associate with similar organizational structures, which already for some time apply industrial-financial groups, associations, conformers, corporations, holdings, etc. They also combine physical and virtual organizational networks, but with a specific feature that does not allow them to be identified with those that will be used by clusters. The systematization

of the differences between the models of the organizational structure of management, within the framework of the outlined models, is shown in table 1.

Table 1 - Systematization of basic differences in organizational structure of management of tourist cluster and other associations

The elements of comparison	The models of organizational structure of management:	
	Application of flexible networks of hierarchical management systems of enterprise groups (within cluster)	Participation of the enterprise in industrial and financial groups, associations, consortiums, corporations, holdings etc.
1	2	3
the purpose of existence	creating opportunities for all participants	development in favor of several dominant participants, the main enterprise (subject to participation in the financial-industrial group or consortium) or the parent company (within the holding)
involved in the structure*	voluntary (2)	voluntary (1)
The composition of elements	variable	relatively constant
key players	enterprises, their interconnected complexes conduct joint work and related organizations, institutions in other spheres of activity	the composition of the participants depends on the form of unification**
a means of increasing security	the system of defense against the failures is aimed at mutual dependence and mutual relations between the participants	interdependency and interrelation with other participants is based on different methods of coordination***
linking to a certain territory and resources ***	connected to parameters of tourist attraction and cloud services.	location is significantly less important, provided the transport and communication accessibility and connectivity of the participants (1)
the driving force of development **	innovation (1).	exceptional performance (2).

Note

* (1) in some cases is limited in time. Each participant offers unique or standard competencies. However, its terms of participation in the networks are difficult to review; (2) each member of the management offers unique competencies, and the conditions of participation can be reviewed.

** (1) introduction of new products that can provide a qualitative increase of efficiency of separate or all processes on the production of tourist services and efficiency (or general economy of resources, as a result of the application of certain measures); (2) general economy of resources or public labor, as a result of the application of certain measures.

*** (1) the availability of tourist resources is one of the factors of development, but not the main condition of its development. This leads to the formation of its megacentric spatial organization; (2) determines the development of the tourism cluster. This leads to the formation of its monocentric spatial organization.

Source: formed based on [3-6]

The defined network discrepancies in the organizational structure of management of the tourist cluster and other associations (industrial-financial groups, associations, etc.) are basic, but not the only ones. For example, the participation of the enterprise in the organizational structure of cluster management is voluntary, each participant offers unique competencies, and the conditions of participation can be reviewed. Participation of the enterprise in the organizational structure of management of industrial and financial groups, associations, consortiums, corporations, and holdings, is also voluntary, however, in some cases is limited in time. For example, the organizational structures of financial and industrial groups are created only for a certain period and with the purpose of realization of state programs of development of priority branches of production and structural reconstruction of the economy of Ukraine (in particular, programs, according to interstate agreements, as well as production of finished products). Each participant offers unique or standard competencies. However, it is difficult to review its terms of participation (they are stipulated by contracts). Within the framework of the organizational structure models of tourist clusters, the key participants are variable, and key participants are enterprises, interconnected complexes of enterprises that work together or serve separate segments of the industry and related organizations and institutions in other spheres of activity.

Within the framework of the organizational structure models of industrial and financial groups, associations, consortiums, corporations, and holdings, the composition of the elements is relatively constant (as defined by the agreement), and key participants are determined by the form of association.

For example, in vertical concerts, the key participants are the association of companies that cover the whole cycle from purchasing materials and raw materials to manufacturing and selling one type of tourist service. Within the model of the organizational structure of horizontal concerts, similar firms are combined with different clients. Within the framework of the organizational structure of the holdings, the circle of key participants is limited by the parent company and its subsidiaries.

The means of increasing the security of functioning of the organizational structure of the cluster is a system of protection against failures, which is aimed at mutual

dependence and mutual relations with other participants. Other models of the organizational structure of associations, mutual dependence, and interrelation with other participants, are based on different methods of coordination.

For example, for holdings, the means of enhancing the security of the organizational structure is a single strategy and strategy of global activity, provision of internal consulting and technical services, and financing of capital investments in new services, for the concerts, it's the coordination of actions of participants from the part of financial structures that dominate. For the financial and industrial groups, it is the only program of development of priority branches of production and structural reconstruction of the economy of Ukraine, in particular, programs, according to interstate agreements, as well as production of finished products, etc.

2.3. The identification the basic features and results of organizational structure development of tourist clusters

The decision on the organizational structure of tourist clusters is made by the top management, and its design is based on the strategic plans of the organization [1]. Organizational planning defines the format of development of the organizational structure of tourist clusters and includes the following stages [1]:

1) the distribution of the cluster organization horizontally on blocks that correspond to the most important directions of its participants' service activity;

2) establishing a correlation between the powers of the participants and the powers of the cluster management bodies (according to the established list of posts);

3) determination of the duties of cluster management bodies (according to the established list of posts);

4) determination of the rights and duties of cluster members.

The process of dividing organizational structures of tourist clusters and their participants into separate blocks (separate departments or sectors) is called a department. Clusters in which management concentrates a large part of the authority

to make the most important decisions are centralized. Clusters in which the management does not concentrate a significant part of the powers, which are distributed among the participants – decentralized. However, any tourist cluster can be characterized as centralized or decentralized only in comparison with other such clusters of the service sector (comparing the powers concentrated in the participants and in Supervisory Board of the cluster).

Results of the development of the decentralized organizational structure of tourist clusters are shown in the uneven and varied interaction of participants, which is not characteristic of other organizations (for which there are several leaders and a significant number of business entities dependent on them, are outsiders or follow leaders). Also, differences are reflected in the organizational development of centralization.

The organizational structure of tourist clusters is dynamic, which creates an opportunity for such structures to change quickly and transform. At that, the process of development of the organizational structure of the cluster is provided by the formation of structures, which can correct productivity proportional to metamorphoses of resources of influence (in contrast to other associations). The main features of the organizational structure of tourist clusters are as follows:

1) a mandatory orientation on the multiplication of transaction flows in different functional areas. The process of forming the organizational structure of the tourist cluster is shown by us in Table 2.

The process of forming the organizational structure of the tourist cluster determines the organizational aspect of uniting the participants' efforts. For example, a joint organizational interaction between at least four large groups – manufacturers, enterprises, and organizations in the field of fundamental science and developers of complex technological solutions, dealers, and others (forming network "nodes" and "hubble", their basis) is envisaged. To ensure the qualitative correlation of the mentioned components, there is a cluster core (a superstructure, which can be the quality of corporate governance bodies). To ensure synergy, cluster members must know what is expected of them. To do this, you need:

Table 2. - The process of forming the organizational structure of the tourist cluster

Typology of functional direction	Functional direction characteristic	Organizational specificity in the direction
technological	provides identification and next choice of technology type and cloud technology that can be created and applied within the tourism cluster based on fundamental knowledge	determines the necessity of application of means of interaction of independent participants in the field of fundamental science and developers of complex technological solutions, and manufacturers
organizational and production	provides a choice of the type of series production of tourist services by complex efforts of autonomous cluster participants	the “hubs”, which unites producers, is formed on the basis of research and experimental plans of autonomous participants in the field of fundamental science
marketing	provides definition of possible demand for each tourist service or technological infrastructure, positioning of autonomous participants of the cluster as a group of enterprises on the market	defines dealers ("nodes" of marketing networks) to create conditions for effective operation of the cluster
investment	provides for monitoring of the project’s prospects for creating a tourist service (or product), defining a set of organizational projects and their alternative variants, implemented by the cluster, and risk assessment	it will be appropriate to create a special engineering company or group within a cluster (hub)
personnel	assumes the training of people able to work in conditions of high uncertainty, cross-cultural interaction, and technological flexibility of production	it will be appropriate to create within a cluster a special company for training personnel or their group (hub)

Source: formed based on [7-12]

- to formulate the goals to which all participants aspire;
- identify ways to achieve common goals;
- set tasks for cluster members, their sub-units, and specific actors.

Cinergianism is not characteristic of other associations, where the outlined functions are realized by the participants independently of each other, and their connection is supported legally (valid agreements);

2) fast process of absorption by the network of all metamorphosis arising at passing certain stages of a life cycle of a cluster, in the process of existence. This forms a different specificity of organizational development of the structure. At the same time, we state that the problems that arise in the outlined area can be systematized within the

framework of models of development of the organizational structure of cluster cooperation.

So interesting is the model of Isaac, which provides that the organizational structure of cluster cooperation is considered as a "living organism", available within the framework of the system, whose biochemistry can be characterized by one of the phases of the life cycle [13, C. 43]: 1) birth of organizational structure; 2) childhood of organizational structure; 3) maturity of organizational structure; 4) heyday of organizational structure; 5) persistence (with the main problem to ensure the longest duration of this phase); 6) aging (decline) of organizational structure; 7) bureaucracy of organizational structure; 8) disintegration on several clusters or termination of existence.

Within these phases, there are typical risks for the development of the organizational structure of cluster cooperation, interpreted as: "early death" or "death in infancy", collapse, and "early bureaucracy". At the same time, the disadvantage of such a model is that specifying the typical risks of the organizational structure of cluster cooperation does not separate the desired organizational conditions necessary for achievement and a long stay in the phase of sustainability (as the basic, to which, according to the model, autonomous participants of the cluster should strive).

You can select model L. Grayner describes the development of the organizational structure of the cluster due to the gradual change of crisis points, when reaching, the expedient transition to a new phase of the life cycle, on which the transformation of the appropriate organizational structure should be carried out, through the collapse and corresponding formation of new "nodes" and "hubs" [14, p. 76-92]. Note that model L. Grayner envisages allocation of stages of development of the organizational structure of the cluster, which differ in moments of occurrence of organizational crisis (at that the path of participants of tourist cluster, from one phase to another, can be carried out using overcoming crisis phenomena). Yes, the typical crisis points of model L. Grayner, shown in Table 3. These are in particular phases of the life cycle of the organizational structure of cluster cooperation, such as the stage of active development of the organizational structure of the cluster and cooperation, which may include the

Table 3 - Typical crisis points of the model of development of organizational structure of cluster L. Grayner

Life cycle phase	Crisis point of development	Means of overcoming crises of development of organizational structure of cluster	Organizational instruments of the structure
Phase of active cluster structure expansion	Power crisis	Self-improvement of autonomous cluster members and development of creative environment	Development of creativity [1]
	Autonomy crisis	Development based on government	Development of management [2]
Sustainability of organizational structure	Control crisis	Development based on delegation of authority between autonomous members of the cluster	Development of delegation [3]
Maturity of the organizational structure	Borders crisis	Development based on coordination of the activities of autonomous cluster participants by corporate governance bodies	Development of coordination [4]
Organizational structure decline	Interaction crisis	Development based on the development of cooperation between the autonomous members of the cluster	Development of interaction [5]

Note.
1 focus of creativity on: 1) accumulation of financial assets; 2) formation of an informal organizational structure; 3) application of a style of influence; 4) control of internal transactions.
2 focus of managemen on: 1) efficiency of capital use of participants; 2) application of the policy style of regulation of the cluster by its board; 3) control of functioning of internal "nodes", "hubs"; 4) formation of systems of motivation of participants for cooperation; 5) formation of the official network organizational structure.
3 focus of delegation on: (1) expansion of cooperation between cluster participants and formation of algorithms, rules, procedures of participants' work; (2) influence on cluster systems is based on delegation; (3) control of development scenarios;
4 focus of coordination on: 1) consolidation of participants; 2) orientation of control systems on planning investment in the newest tourist product; 3) motivation of participants for cooperation;
5 focus of interactio on: 1) self-financing and transformation of non-adaptive organizational structures of participants into adaptive; 2) formation of corporate regulation style based on observation of achievement of cluster cooperation goals; 3) motivation of participants for cooperation, on the basis of group reward..
Source: formed on the basis of [14, p. 76-92; 15; 13, p. 41]

crisis of power and the crisis of autonomy of the participants [14, p. 41]. Organizational instruments of the phase, which prevents the emergence of a crisis of power, are the development of creativity, which envisages the concentration of organizational activity on:

1) accumulation of financial funds for further development of cluster cooperation and the official organizational structure of the cluster;

2) formation of an unofficial organizational structure of cluster cooperation;

3) applying the individual management style of the top management within the

organizational structure of the cluster;

4) control the volume of internal transactions within the organizational structure of the cluster.

The organizational tool of the phase prevents the development of the crisis of power, is the development of the leadership, which envisages its focus on:

1) the efficiency of capital use of autonomous cluster members;

2) applying the policy management style of the cluster by its corporate body;

3) control of the functioning of internal "nodes" and "hubs";

4) formation of systems of motivation of autonomous participants for cooperation;

5) formation of the official network organizational structure of the cluster.

Thus, the organizational structure of the cluster in the process of functioning passes the following phases of the life cycle:

- The phase of sustainability that can include the crisis of control and borders crisis. The organizational tool of the phase that stops the border crisis is delegation. Namely, management concentration on:

1) expansion of participants' cooperation in cluster and formation of algorithms, rules, and procedures of work of independent participants;

2) formation of the style of corporate management based on delegation;

3) control of the points of mutual teaching of several scenarios of corporate work;

- The maturity phase within the development of the borders crisis is possible. The organizational tool of the phase during which the borders crisis stops is coordination, which envisages management concentration on:

1) consolidation of autonomous cluster participants;

2) orientation of control systems on planning investment in the newest tourist product or services;

3) motivation of autonomous participants for cooperation based on individual awards;

- The decline phase, within which the crisis of interaction is possible. The organizational tool of the phase stops the interaction crisis is the establishment of cooperation, which envisages the management's focus on:

1) self-financing and transformation of the non-adaptive organizational structures of the cluster participants into adaptive ones;

2) formation of a regulation style based on observation of achievement of the goals of cluster cooperation;

3) motivation of the participants to cooperate within the organizational structure of the cluster, based on group reward.

The change of the defined phases is interpreted as an evolution of the life cycle of the organizational structure of the tourist cluster. The change of the defined phases is interpreted as the evolutionary passage of stages of the life cycle of the organizational structure of the tourist cluster. For this purpose, we offer to use different types of plans, among which are:

- strategic plans of the cluster and their directions (which are the nature of the direction of action);
- operational plans of the cluster;
- short-term plans of the cluster and their implementation (clear, unambiguous, specific targets, which cannot be seen in two-fold).

The specific thing about the cluster is that its development should take into account a lot of alternative variants of their development, so each of the outlined plans has a different component, which is based on the description of the expenses that the cluster participants should or may incur.

Interestingly enough, there is a model based on the description of expenses that participants of the cluster should bear to develop their cooperation organizationally. It assumed that the stated expenses are constant and comparable with the volume of tourist services (or products) realized [16; 5-6]. According to the model, the transition from one operational cycle of organizational development of cluster management to another requires an evaluation of the efficiency of the realized expenses [16; 5-6] for this process. The list of these costs is shown in Table 4.

Table 4 - Description of the costs that participants should bear to develop the tourism cluster organizational

Results that integrate costs	Cluster management model in the interests of organizational development	Scenarios
1	2	3
Results: Creation of a cluster, formation of the basic idea of existence, realization of the basic idea *	The mission of the cluster is not defined, but its market position is defined as goals. Planning is a reaction to external phenomena. All decisions of the management are made by the initiator of cluster creation	Mechanical growth
	The external vision of the cluster mission is formal (indicated by the goals for which the cluster is created), the goals are declarative, and the planning is based on the formal operational plans of the participants - "from the current results of the past". The organization of strategic and operational regulation is based on formalization of cluster structure. The system of control and regulation of cluster activity is based on	
	the reporting data of the participants. Decisions are made in the interests of capital owners	
Results: Optimization of activity, structuring - formation of structure and management **	Along with the external one, an internal idea about the cluster's mission (concretization of target groups of clients) is formed. The cluster's objectives are summarized within the goal tree. Planning is carried out within the framework of the general strategy of activity for long-term perspective; control and coordination are delegated by the Board to the cluster, in order to increase profitability of production of tourist services or product	Expert development
Results: Organization of management actions by processes – optimization of self-financing processes of cluster activity ***	The mission is regularly adjusted (an internal understanding of it contains a detailed description of the principles of cluster activity). The mission-related goals reflect the directions of activity and are aimed at rational use of resources. The strategy of cluster activity is defined for long-term perspective with rational redistribution of available resources. The organization of strategic and operational activity of the cluster is directed on optimization of resource use. There is a system of flexible budgeting of the activities of autonomous cluster participants. Can be formed on the balanced scorecard cluster (oriented on participation of labor capital in the increased image of the cluster among its investors)	
Results: Strategic regulatory influence, regulation of income from the sale of tourist product and intangible assets of the cluster ****	The mission becomes a tool for building the cluster's activities, and its objectives are aimed at reducing costs (through efficient use of intangible assets); the strategy is defined for the long-term perspective (this is possible by rational redistribution of resources to the cluster, as part of associations with other clusters); the organization of strategic and operational activities of the cluster is aimed at optimization of human capital (by increasing its competence and professionalism). At this stage a model of system description of activity can be formed, oriented on participation of labor capital in increase and preservation of cluster image among its clients (on the basis of regular strategic analysis)	Systemic growth

Note.

*Cost of cluster and organizational expenses fund creation.

** Cost of optimization of operations of autonomous participants.

*** Cost of optimization of operations of autonomous participants and cluster.

**** Cost of optimize strategic cluster management. Such a cluster system is considered perfect.

Source: formed on the basis of [16; 5-6; 17]

According to the expenses that the participants should bear for the tourist cluster to develop organizationally, it is necessary to include: the cost of cluster and organizational expenses fund creation, cost of optimization of operations of autonomous participants, cost of optimization of operations of autonomous participants and cluster, cost of optimize strategic cluster management (such a cluster system is considered perfect).

2.4. Evolution of the organizational structure of the tourist cluster.

Unlike the traditional process of setting development goals, when organizing activities in a cluster, the goals for the participants are not set by the Cluster Supervisory Board one-on-one. At the same time, the degree of achievement by the participant of his goal is the main criterion of estimation and distribution of the benefits formed in the cluster. According to the above-mentioned evolutionary passage of the stages of the life cycle of the organizational structure of the tourist cluster is directed according to the following algorithm [1]:

1) establishing development goals for the participants, which include the following actions: (a) developing long-term goals, and strategies of the participants and each of the hired workers; (c) developing specific overall goals of the cluster; (d) defining the goals of the cluster's groups;

2) action planning of participants: (a) determination of actions (tasks) that will direct achievement of goals; (b) establishment of mutual relations between the goals of the cluster participants (formation of a common goal tree); (c) delegation of authority to collegiate bodies, individual employees, determination of responsibility for action; (d) determination of time necessary for the execution of actions of individual employees;

3) intra-business control (self-control), which provides for systematic observation and evaluation of changes in stages of the life cycle of the organizational structure of the tourist cluster and achievement of goals by participants and responsible persons

without external interference;

4) periodic reporting, which provides a re-assessment of progress in achieving the goals of each of its participants, as well as monitoring the achievement of the cluster's overall goal and strengthening of influence.

The defined management can be realized using the processes of defining specific goals based on the introduction of a Balanced Scorecard into the organizational activity of the tourist cluster, as it can complement the planning of actions of participants with the help of the system description of the organizational activity (on the content of the definition of goals, order of managerial actions on stages of life cycle). The advantages of the system description of organizational activity are as follows [1; 5-6]:

1) optimization of the organizational structure of the cluster and its participant's management (due to the use of a Balanced Scorecard the system of responsibility in the process of achievement of the general goal of the cluster is formalized);

2) providing the balanced Scorecard creates a sense of personal interest of the participants in the results of the cluster activity due to their participation in the process of distribution of the movement and set of goals (at the same time there is an opportunity to influence the cluster development, realize their ideas using collective efforts);

3) effective methods of control (balanced Scorecard forms a system in which the result influences the distribution of the movement, not the process of the participant's activity).

The Balanced Scorecard must eliminate the complexity of quantitative determination of the goals of the activity for certain works of the participants and each of its subordinates, as well as the difficulty of achieving the balance of different goals [1; 5-6]. Thus, the structural scheme of the system description of the tourism cluster activity is shown in figure 2.

Balanced Scorecard, as the main elements of which, according to the etymological value, are allocated:

- the enterprise's capabilities for targeted development;
- the external environment ("input", "output" of the system, feedback);

- the internal structure (scientific substantiation subsystem; target subsystem; functional subsystem; control subsystem).

The system description of the cluster is realized through the structural scheme However, the updated process of the system description of organizational activity requires of Balanced Scorecard setting under the conditions of tourist clusters in the region. To this end, within the organizational structure of the tourist cluster, critical organizational points identification (from the point of view of the definition of objectives and the order of management actions, expansion of organizational regulation of development, and provision of general standardization of management actions in the cluster).

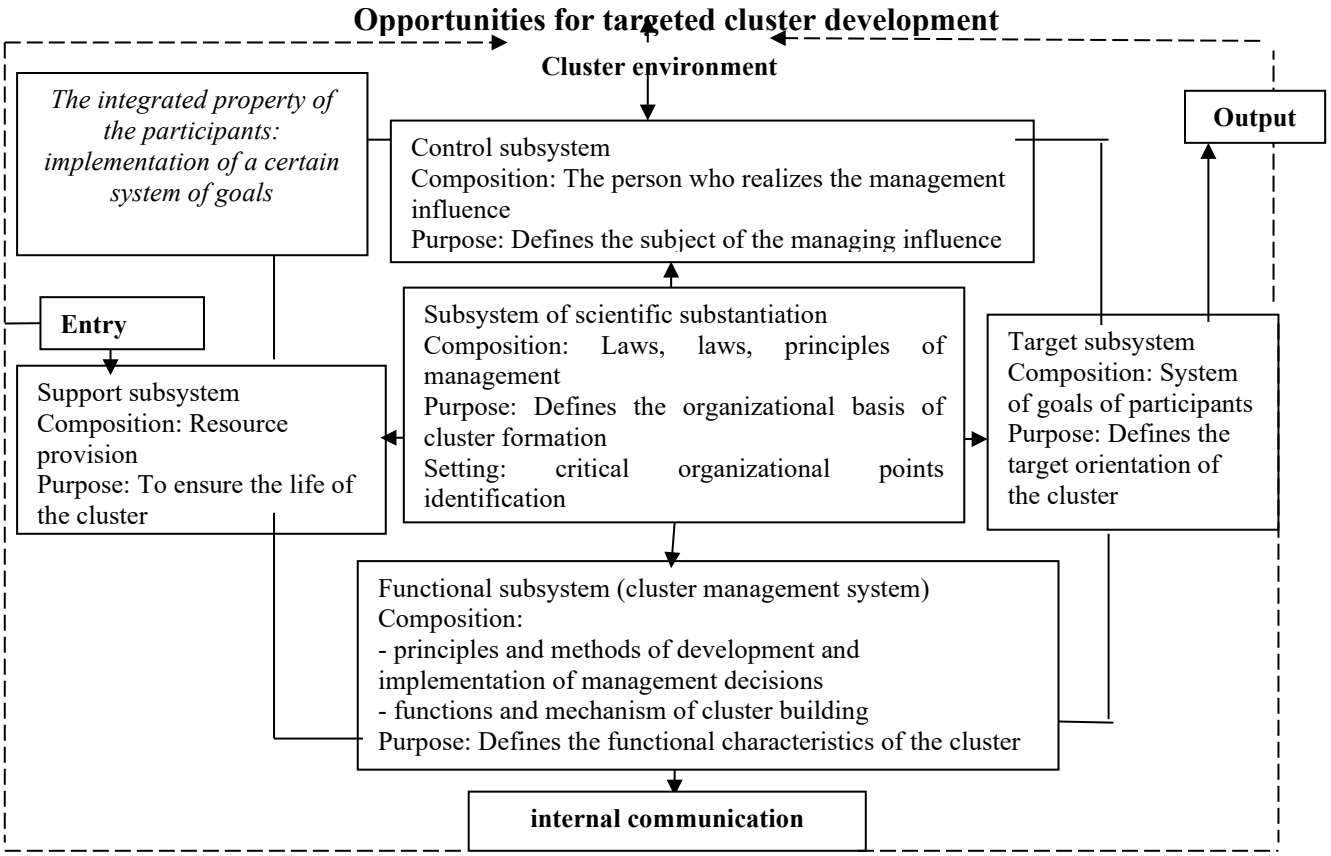

Figure 2. The structural scheme of the system description of the tourism cluster activity

Source: formed on the basis of [16; 5-6; 18-20]

The evolution of the stage of the life cycle of the organizational structure of the tourist cluster (or the level of organizational development of the cluster) can be determined by the:

- the total volume of organizational costs;

- costs for improvement of the organizational management system (in contrast to other associations, in the composition of industrial-financial groups, associations, etc. – where the corresponding expenses of several dominant participants, the main enterprise, or the parent company are important).

The development of the organizational structure of tourist clusters is realized through the formation of the vision of future development and realization of planned organizational changes, while the virtual network structure of their functioning should be horizontal and vertically scaled.

Implementation of planned organizational changes in the cluster is possible in one of 3 expressed votes (which change one in the process of improvement of the organizational system of regulation and launch processes of scaling):

1) mechanical, which provides growth, based on the constant increase of cooperation, processes of commercialization, and introduction of innovative ideas in the sphere of tourism and temporary involvement of personnel for solving urgent problems (including external consultants). The scenario outlined may be applied at the beginning of the cluster's organizational structure, because aimed at minimizing the costs of organizational development (minimum cost for achieving the planned result) and does not guarantee the professionalism of the human capital involved;

2) expert–organizational development of cluster management, based on the opinion of expert groups, as of which qualified human capital of the cluster can be used (for example, local authorities). The scenario creates a high probability of forming a vision for changes based on the authority of individual clusters. It is expedient to use it for optimization of processes of self-financing of cluster activity, as it provides for the introduction of "internal taxes" from participants on maintenance of management bodies of cluster and financing of expenses on optimization of operational activity (such decisions should come from an authoritative participant of the cluster, with high moral authority);

3) system or development that allows linking all organizational changes of the tourist cluster with its development, provided that the external environment and internal management influence are considered in interaction. The model is based on a

systematic description of organizational activity in management, which requires an advanced organizational system [6].

Conclusions.

According to the results of the study it is stated that the general logic of management organization on the example of tourist clusters determines exactly that system of relations and dependencies of elements of business management and rules of processing of these data, which in case of application of abstraction technique, can become generally accepted for all service sphere clusters.

Studying the peculiarities of the organizational structure of the tourist cluster allows to state that this process is connected with parallel deployment of its physical and virtual networks, which are able to scale up. Such structure of the cluster, organizational, is a dynamic entity, the specificity of which can change quickly, transform, and the process of its development is provided by formation of a structure that can correct productivity proportional to metamorphosis in resources of influence.

The peculiarities of the organizational structure of the tourist cluster are: The obligatory orientation on the multiple flows of operations in different functional directions; the fast process of absorption by the organizational network of the structure of all metamorphosis that arise during the stages of life cycle.

The virtual network of the organizational structure of the tourist cluster should scale horizontally and vertically (increase productivity of the proportional additional resources by the components of the system and increase additional resources by small structural components without structural changes of the central site with organizational regulation).

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CHAPTER III.
INFORMATION AND FORMALIZATION OF REGULATORY REGULATION OF MANAGEMENT IN THE SPHERE SERVICES CLUSTER

Introduction.

The outlined goal is achieved on the basis of the solution of the following research tasks. We initiated the procedure of identification and formalization of organizational resources and regulation of services sphere clusters due to their importance in ensuring the steady functioning of the management apparatus and implementation of accounting and analytical processes. We state that although the process of identification and formalization of organizational resources and regulation was applied exclusively to the organization of work of state officials, later (due to its high efficiency) it was integrated into the sphere of material production, where its initial object is hired workers, who perform monotonous production functions. The next stage in application identification and formalization of organizational resources and regulation became their uses to the labor of managers of enterprises; managers of production and non-production organizations. Organizational regulations are the main subject of the regulation (now, the greatest application found labor organization cards, regulations on departments, job tools, methodological materials on functions, and organization of work of accounting personnel in the conditions of automated accounting). Organizational resources are the main subject of the formation of organizational structures. So identification and formalization of organizational resources and organizational regulation will be important for clusters of services, both natural and artificial, as they allow to organize and organize the activities of participants and their staff within the common value chain (namely, to determine how, when, how and how many participants and their employees should perform their functions and duties). A special multilevel model of organizational resources and regulation of the functioning of service sphere clusters is formed.

It should be noted that today Ukraine has a large number of service clusters, including Kyiv IT-cluster, Kharkiv IT-cluster, Lviv IT-cluster, Kherson business

cluster (engineering), Odesa IT-cluster, Zakarpattya IT-cluster, Lviv medical business cluster, Gorbogori rural tourism cluster, Lviv tourism Alliance urban tourism cluster, etc.

Analyzing the latest studies and publications which launched research in this field and to which the author refers. The trends of cluster formation have been popularly promoted for research identification and formalization of organizational resources and regulation of service sphere clusters and their participants are devoted to an insufficient number of scientific works. For example, several scientific works (Gromyko Yu., Voynarenko M., Sokolenko S.), which outlined organizational bases of cluster structure formation on organizational production, marketing, investment, technology, and other directions, can be selected. Note that some issues concerning the transition to the use of networks, highlighted by Paturel R. "Creation of network organizational structures", which is allocated, also the mechanism and forms of transition of the traditional enterprise (which is cluster member) to the network structure and outlined the specificity of re-thinking of target orientations. However, it is the essence of the hierarchical and functional structure, in this area, not covered enough.

Formulation of goals (setting a task). According to the above, the research is aimed at information and formalization of the regulatory model of service sphere clusters. The following research tasks must be addressed to achieve the set goal:

- definition of the regulatory model of service sphere clusters forming;
- organizational resources of service sphere clusters description;
- centric and organic network of service sphere clusters description.

3.1. Definition of regulatory model of service sphere clusters

The regulatory model of clusters in the service sector ensures rationalization of their organizational structure by forming and using the system of multi-level regulation of the activities of the participants and the Supervisory Board of the cluster. The basis

of such regulation is the "hierarchical regulation", namely, the aggregate of rules and provisions that according to the order of subordination of lower legs to higher ones, determine the internal organization and the procedure of activity of participants and the supervisory board of the cluster (including the procedure of meetings and conferences) [1]. Thus, to determine the regulatory model of service clusters, its participants are recommended to form systems:

- internal organizational regulations of management, or documents that organize the process and procedure of work within the cluster (at the corporate level) and at the level of each particular participant. The main purpose of the following regulations: (1) regulation of cluster management activity (defines its main objectives, tasks of founders, managers, and staff); (2) specific management work (defines rights and duties); (3) organizational reinforcement of rational division of labor and, ultimately, to ensure effective organization and coordination of managers' work, transliteration of regulatory influence;

- internal organizational regulations, or documents that provide for the labor regulation of workers of employees cluster members. The main purpose of the following regulations [1]: (1) regulation of individual employees' activity; (2) management of concrete works; (3) organizational reinforcement of rational division of labor; (4) ensuring effective organization and coordination of managers' work; (5) transliteration of regulatory influence;

- systems of regulatory influence in the "cloud" structure of responsibility. To minimize the costs of such systems, the service clusters participants have to simultaneously expand the network of organizational regulations or documents in large-scale clouds (public, hybrid, etc.) or create their clouds. It's important to transfer all participant's data to the cloud operator's platform (however, with the lowest costs and risks).

The concept of effectiveness of the regulatory model of clusters of the service sector can be considered as the property of sub-systems-administrators of clusters of the service sector to organize the management process and the procedure of work to the level of each particular participant, with minimal expenses for organization and

planning, motivation and control. The solution to this issue is possible based on application of a balanced scorecard (as a model of system description of organizational activity), which improves the transliteration of regulatory influence and forms a specific structure of organizational regulations in the management system (which is oriented, exclusively, on specific needs of clusters), which, in a structured form, should be investigated as a synthesized combination [1-2]:

1) functional component as a logical scheme of the organizational structure of management and its characteristics definition;

2) the hierarchical component, as a component of the hierarchical levels of the cluster and its internal subdivisions of independent participants (which should be considered as participants with the definition of the main links between them and the regulatory procedure).

Each component can be duplicated in a cloud environment with a "cloud designer" and open source programs that are easily scaled across the network and provide high availability of organizational regulations for participants. Outlined components, it is advisable to structure under needs, as to:

1) separation of functions on local (cluster participants), corporate (cluster) levels and on the level of management influence transmission in the "cloud" structure (should be oriented on the cross-border of spheres of responsibility and authority);

2) creation of an organizational structure capable to provide integrated management within the cluster and delegation of cloud operations account for the cluster management hierarchy and cluster organizational structure. This can best be presented in the categories of virtual teams provide for the formalization of persons charged with the necessary tasks;

3) to ensure the adoption and implementation of management decisions (on all aspects of cluster activity in the region, in general, and its independent participants: financial, marketing, organizational, informational, technical, and production). In the network with organizational regulation of development in the cloud, there is a need for a clear description of expected technical teams for making managerial decisions (for example, formation of mathematical substantiation of expediency, coordination, etc.)

and creation of "road map of migration" of cluster participants in the cloud service.

3.2. Organizational resources of service sphere clusters description

The basis for the procedure of identification and formalization of organizational resources and regulation of services sphere clusters there are the organizational resources of tourist clusters. Within the framework of the research under the organizational resources of the cluster, the author understates the precise and fast distribution of organizational tasks, powers, and responsibilities among the participants and feedback for their control or regulation. The organizational resources of service sphere clusters or the process of prototype development are to be realized in the framework of several basic blocks, namely:

1) organizational structure of management of a cluster member determines subordination of tasks, positions, powers, and responsibilities, proceeding from which such unit (enterprise or organization) carries out its independent management activity within the cluster and transacting influences through the cloud structure [1, p. 284-286]. This structure is individually formed by each member of the cluster and its organizational resources relevant to his alone;

2) organizational structure of cluster management, which defines the system of powers and responsibilities, relations and relations arising in the process of cluster activity, among its participants according to the strategy of development. This structure is formed by all cluster members and their organizational resources relevant to each of them.

As for the project of the organizational structure of cluster participant management, we note that its typology and specificity depend on the business size.

A small amount of activity allows the subject to abandon organizational structuring, as such, since all functions will be performed by their owner or authorized person. According to article 55 of the Commercial Code of Ukraine, such a volume of activity determines the ownership of the object to:

1) individuals-entrepreneurs if the average number of employees involved for the reporting period does not exceed 50 persons and the annual income from any activity, does not exceed the amount equivalent to EUR 10 million;

2) Legal Personality if the average number of employees for the reporting period does not exceed 50 persons and the annual income from any activity does not exceed the amount equivalent to 10 million euros. It accounts for that annual income is determined by the average annual rate of the National Bank of Ukraine. The volume of business is typical for a larger share of service cluster participants. To connect to the system of a cluster with organizational regulation such a participant simply receives certain SAAS-based software (Software as a Service).

SaaS (Software as a Service) is a business model of software deployment and implementation, in which a supplier (provider) develops an application, licenses it, manages it, and gives consumers (business clients) access to the software via the Internet and the structure of impact transliteration. Software as a Service provider provides the client with business functions, and business applications functionality solves the issue of integration of its service into the IT system of the consumer, takes on all functions of development, support of solutions, and their scaling. Thus, the member, uses SaaS, remotely interacts with the services of the cluster placed in a cloud environment and can manage their separate functions (through specialized programs, which do not need to be installed). The general specifics of using SaaS connection in the organizational structure of the participant's development regulation are presented in Table 1.

Table 1 - General specificity of SaaS usage in the organizational structure of regulation of development of the member of the cluster of services sphere

Specific impact on organizational structure	Advantages and benefits of SaaS	Disadvantages SaaS
1	2	3
The software and dynamically scaled resources are attached to the working places of employees and provided to the user via the Internet as a service	Limitation of broadcasting management influence the content of the software used and the corresponding license.	IT- personnel, which consults managers and receives salaries, are not interested in technological SaaS development, due to possible pay cut and reduction of staff. Fear of information and

Continuation of the Table 1

1	2	3
subordination of tasks, posts, powers and responsibilities is determined from the working places that have the appropriate powers broadcasting management influence in real time (through a chaotic structure), global availability of workplaces	Small periodic costs of regulation, instead of substantial ones. The absence of the need in server-based, data security, and administration. Increase of speed of deployment of solutions, ensuring efficiency in short term	commercial data leakage, with outputin formation outside of its network, on a remote service. The activity of potential customers is not transparent enough, double accounting, unlicensed software, etc. The data transmission channels are not functioning properly, as a result of possible failures in the transmission of management influence, there is a need to duplicate regulations.

Source: formed on the basis of [1].

The Software as a Service model with different types of applications is the most common to connect to a network cluster with organizational development regulations. SaaS uses almost all business entities that have access to the Internet. It is currently SaaSt provides a higher level of data security and data integrity. For example, 78,67% of small business cluster members use this access. The confirmation of such a conclusion is the analysis of the types of connections to the network of a cluster of small business participants operating in the domestic clusters of the service sector (Table 2).

Table 2 - Analysis of connection to the cluster network of small business participants operating in the domestic service sphere clusters, 2020

Clusters	Share of small business clusters participants	The type of connection to the clusters network	Cloud service of cluster participants uses
1	2	3	4
KYIV IT Cluster	Share of small business – 80 %	SaaSt connection, SaaS connection	cloud service Такcер, GitLab, cloud service iFin, hybrid different types of cloud service (Такcер, GitLab)
Kharkiv IT Cluster	Share of small business – 95 %	SaaS connection	cloud service bpm'online sales, cloud service GitLab, cloud service iFin
Lviv IT Cluster	Share of small business – 90 %	SaaS connection	cloud service Binotel, GitLab, cloud service iFin
Odessa IT Cluster	Share of small business – 85 %	SaaS connection	cloud service Serpstat, cloud service Worksection
Kherson Business Cluster (engineering)	Share of small business – 84 %	SaaS connection	cloud service YouScan, cloud service Zadarma, Binotel

Continuation of the Table 2

1	2	3	4
Transcarpathian IT Cluster	Share of small business – 80%	SaaS connection	cloud service Yaware, hybrid different types of cloud service (GitLab, Yaware, iFin)
Lviv Medical Business Cluster	Share of small business – 83%	SaaS connection	cloud service Binotel, cloud service Zadarma, hybrid different types of cloud service (Zadarma, Binotel)
Cluster of rural tourism "Gorbohori"	Share of small business – 80 %	SaaS connection	cloud service Reply.io, cloud service Worksection
Cluster of city tourism "Lviv Tourist Alliance"	Share of small business – 95 %	SaaS connection	cloud service PromoRepublic, cloud service bpm'online sales, hybrid different types of cloud service (PromoRepublic, Worksection)
tourist cluster Mahura	Share of small business – 96 %	SaaS connection	cloud service Zadarma, cloud service Binotel, cloud service WORKABOX, hybrid different types of cloud service (PromoRepublic, WORKABOX)
"Dniprovsky Medical Cluster	Share of small business – 76 %	SaaSt connection, SaaS connection	cloud service Serpstat, cloud service Worksection, hybrid different types of cloud service (PromoRepublic, Worksection)
On average, by clusters	Average share of small business – 78,67 %		

Note

* connect to a network of an organizational-regulatory cluster

Source: Formed according to the data of the cluster participants for 2020 (due to the military actions data updates are not possible at this time)

The type of SAAS-based connection of the cluster network of small business participants operating in the domestic service sphere clusters provided the following types of Cloud service: cloud service Таксер, cloud service GitLab, cloud service iFin, cloud service bpm'online sales, cloud service GitLab, cloud service iFin, cloud service Zadarma, cloud service Binotel, cloud service WORKABOX, cloud service PromoRepublic, cloud service Serpstat, cloud service Worksection, cloud service bpm'online sales, hybrid different types of cloud service.

Note that connection to the cluster network is carried out by orientation to certain types of organizational structures of participants belonging to small businesses on linear or linear-functional. It's expected due to their ability to form conditions for a

single command and functional distribution combination of rights and duties of employees with the possibility of parallel leadership of subdivisions.

The Software as a Service connection to the network with organizational regulation of the services sphere cluster development is simple programs and services for the cluster activity and development (installed, and supported by the provider).

The cluster participant only broadcasts the regulations in the cloud environment to the end user (via browser or application on his personal computer).

Each cluster member only makes a subscription fee (or uses the service free of charge), and the service provider is engaged in updating and technical support of the programs.

The average activity of the participant requires the formation of an organizational structure of management with several structural subdivisions on which the realization of all functions of regulation of development is based. At the same time, the statistical definition of the average business (as enterprises with several employed from 51 to 250 persons), which appeared in 2008 corresponds to the definition in other countries. For such a business there is a possibility to use bureaucratic organizational structures, which are characterized [1, p. 286-288]:

1) functionality, centralization, hierarchy, stability;

2) detailed division of labor and narrow specialization of activity;

3) consolidation of duties in standard organizational documents;

4) centralized control mechanism (using their forms and methods).

At that, necessary to connect to the regulation system via IaaS – a service model within which the participant is allowed to manage the means of processing, storage, communication networks, and other computing resources based on which expand and execute arbitrary software, which can include their operating systems and apps.

The general specifics of using Infrastructure-as-a-Service in the organizational structure of the member development regulation are shown in Table 3.

Given the complexity, Infrastructure-as-a-Service (with different types of applications) has not been widely adopted to connect to the network cluster with organizational development regulations.

Table 3 - General specifics of using IaaS in the organizational structure of regulation of development of a member of a cluster of services sphere

Specific impact on organizational structure	Advantages and benefits of IaaS	Disadvantages IaaS
software and dynamically-scaled resources are attached to the working places of employees	Allows you to connect new or disconnect unused workplaces in a few minutes *. Small periodic costs of regulation, instead of significant one-time costs. There is no need for server placement and administration. High level of data protection **. Increase of speed of deployment of solutions, ensuring efficiency in short term. Allows staff to focus on profile tasks, prevents duplication of regulatory instructions	IT- personnel, which consults managers and receives salaries, are not interested in technological SaaS development, due to possible pay cut and reduction of staff.. The activity of potential customers is not transparent enough, double accounting, unlicensed software, etc. The need to work with Big Data increases the requirements for staff qualification.
the subordination of tasks, positions, powers and responsibilities is determined from the working places by their degree to specific structural subdivisions, groups, sectors, etc.		
use of remote matrix-designers with responsibilities visualization for transliteration use of the job classifiers of direct executors.		
remote routers using to broadcasting management impact (with the delimitation data access levels)		

Note

* provides the opportunity to save on scale, provide uninterrupted work during traffic surges, and support growing business needs in significant capacities

** date-centers, in which servers are placed, are guarded objects with a bypass mode

Source: formed on the basis of [2]

For example, this type uses up to 3% of the cluster participants, who have a staff of 50 to 250 individuals. Other participants are oriented to connect to cluster networks using SaaS. Direct confirmation of this conclusion is to analyze the connection types to the cluster network of middle-sized business participants operating in domestic service sphere clusters (Table 4).

The type of SAAS-based and IaaS -based connection of the cluster network of middle-sized business operating in domestic service sphere clusters provided the following types of Cloud service: cloud service Axigen Hosted SP Platform; cloud service Yaware; cloud service Scalix Hosting Edition; cloud service Open-Xchange Hosting Edition; cloud service Tobit David.zehn!; cloud service Jedem Das Seine; cloud service Zarafa Multitenant Edition; cloud service WaveMaker; hybrid different types of cloud service. It mentioned that connection to the cluster network is carried out mainly on the orientation of bureaucratic types of organizational structures linear or

Table 4 - Analysis of connection to the cluster network of middle-sized business operating in domestic service sphere clusters, 2020

Clusters	Share of middle-sized business clusters participants	The type of connection to the clusters network	Cloud service of cluster participants uses
1	2	3	4
KYIV IT Cluster	Share of middle-sized business - 10 %	IaaS connection (3%), SaaS connection (97%)	cloud service Tobit David.zehn!
Kharkiv IT Cluster	Share of middle-sized business - 4 %	IaaS connection (2,1%), connection SaaS	cloud service Jedem Das Seine
Lviv IT Cluster	Share of middle-sized business - 6 %	IaaS connection (1,1%), SaaS connection (98,9%)	cloud service Zarafa Multitenant Edition, cloud service Axigen Hosted SP Platform, cloud service Zimbra Collaboration Suite, hybrid different types of cloud service (Zarafa, Zimbra Collaboration Suite)
Odessa IT Cluster	Share of middle-sized business - 11 %	IaaS connection (1%), SaaS connection (99%)	
Kherson Business Cluster (engineering)	Share of middle-sized business - 9 %	IaaS connection (2,1%), SaaS connection (97,8%)	
Transcarpathian IT Cluster	Share of middle-sized business - 12 %	IaaS connection (2,6%), SaaS connection (97,4%)	
Lviv Medical Business Cluster	Share of middle-sized business - 15 %	IaaS connection (2 %), SaaS connection (98%)	cloud service Open-Xchange Hosting Edition
Cluster of rural tourism "Gorbohori"	Share of middle-sized business - 17 %	SaaS connection (100%)	cloud service Yaware, hybrid different types of cloud service (Zarafa, Yaware)
Cluster of city tourism "Lviv Tourist Alliance"	Share of middle-sized business - 3 %	IaaS connection (2,2%), SaaS connection (97,8%)	cloud service Scalix Hosting Edition
tourist cluster Mahura	Share of middle-sized business - 3 %	SaaS connection	cloud service Yaware
"Dniprovsky Medical Cluster	Share of middle-sized business - 11 %	IaaS connection (2%), SaaS connection (98%)	cloud service Axigen Hosted SP Platform
On average, by clusters	Average share of middle-sized business 8,42 %		

Note
* connect to a network of an organizational-regulatory cluster
Source: Formed according to the data of the cluster participants for 2020 (due to the military actions data updates are not possible at this time)

linear-functional, business-oriented. Although, there is the practice of applying adaptive organizational structures.

For large businesses (with a staff of 250 people), connecting to a cluster network with organizational regulation of cluster development is more diverse and complex. Can be used SaaS (Software as a Service), SaaSt (Software as a Service with extended function), PaaS (Platform as a Service) with various tools and services.

By using PaaS a big business gets access to the use of information and technology platforms: (1) operating systems; (2) database management systems; (3) communication software; (4) development and testing facilities located in cloud providers (at the same time, the general specificity of use is similar to IaaS is shown in Table. 3); (5) IaaS (Infrastructure as a Service) as a virtual infrastructure with cluster cloud-based functionality.

This conclusion is confirmed by the analysis of the connection types to the cluster network of big business participants operating in the domestic service sphere clusters (Table 5).

The type of SAAS-based, PaaS-based, IaaS-based **or** hybrid connection of the cluster network of big business participants, operating in the domestic service sphere clusters clusters provided the following types of Cloud service: cloud service Yaware; cloud service Open-Xchange Hosting Edition; cloud service Tobit David.zehn!; cloud service OpenShift; cloud service Scalix Hosting Edition; cloud service Salesforce; cloud service Tobit; cloud service WaveMaker; hybrid different types of cloud service. Significant volumes of participants' activity determine the necessity of management organizational structures with organizational regulation of the development of a significant quantity of structural subdivisions. In this case, attention is drawn to the dependence of their types on the systematization of environmental changes and, accordingly, requirements regarding the speed of reactions at each level of cluster management [2, p. 280-300]. Thus, typologically, structures:

1) can be bureaucratic (linear, linear-functional, or business-like)

2) can be adaptive (objective, matrix or network).

Organizational structures of management of the member's development can be bureaucratic or adaptive, with risk types of connections to the cluster network.

Table 5 - Analysis of connection to the cluster network of big business participants, operating in the domestic service sphere clusters, 2020

Clusters	Share of big business participants	The type of connection to the clusters network	Cloud service of cluster participants uses
1	2	3	4
KYIV IT Cluster	Share of big business – 10%	SaaS connection, hybrid connection	cloud service Yaware
Kharkiv IT Cluster	Share of big business – 1%	IaaS connection	cloud service Open-Xchange Hosting Edition
Lviv IT Cluster	Share of big business – 4 %	IaaS connection, hybrid connection	cloud service Tobit David.zehn!
Odessa IT Cluster	Share of big business – 4 %	PaaS connection, hybrid connection	cloud service OpenShift, hybrid different types of cloud service (OpenShif, Yaware)
Kherson Business Cluster (engineering)	Share of big business - 7 %	IaaS connection, hybrid connection	cloud service Scalix Hosting Edition, hybrid different types
Lviv Medical Business Cluster	Share of big business – 2 %	PaaS connection	cloud service Salesforce
Cluster of rural tourism "Gorbohori"	Share of big business – 3 %	IaaS connection, hybrid connection	cloud service Tobit
Cluster of city tourism "Lviv Tourist Alliance"	Share of big business – 2 %	SaaSt connection	cloud service Yaware
tourist cluster Mahura	Share of big business – 1 %	PaaS connection	cloud service WaveMaker
"Dniprovsky Medical Cluster	Share of big business – 13 %	IaaS connection, hybrid connection	cloud service Scalix Hosting Edition
On average, by clusters	Average share of big business - 4,58333		

Note
* connect to a network of an organizational-regulatory cluster
Source: Formed according to the data of the cluster participants for 2020 (due to the military actions data updates are not possible at this time)

The bureaucratic organizational structures of the participants differ by a high level of division of labor, the developed hierarchy of management of the chain of teams, numerous rules development, and norms of personnel behavior.

Thus, in the conditions of application of cloud services, the following structures have the following special features:

1. regulations defining the rights, obligations, and tasks of a member of a cluster

are distributed to a considerable number of small tasks which are brought to the workplaces of individual workers or workplaces groups (by subdivisions, sectors);

2. regulations defining the tasks of sectors and subdivisions are separate from the cluster member tasks in general (in fact, separate levels of organizational regulations create);

3. the regulations that define the rights and duties of each employee are carefully, and strictly defined. These regulations are permanent not changed;

4. the top management of the cluster member is the main operator of the regulations. There is a single workplace that transacts management influence (including determining how many tasks are solved by subdivisions, meeting the organization's goals, establishing links between departments belonging to the same level of management structure, and connecting and disconnecting from the workplace structure).

These structures are available in clusters of services and connected to the cluster network (because of the baseline level of cloud solutions) and are divided into the following types: linear; linear-functional; divisional.

At the same time, the risk of rigid, incompetent, routine regulations still occurs. The advantages and disadvantages of the main types of bureaucratic organizational structures of the participants of the cluster are shown in Table 6.

Adaptive organizational structures of the participants are most suitable for modern realities of the services sphere cluster (operating in the conditions of a dynamic internal environment), in connection with considerable flexibility and universality (due to the possibility of using temporary varnishes created "for a certain purpose"), absence of rigid, incompetent, routine, regulations.

These structures can use the basic, baseline level of cloud-based solutions for network connectivity with organizational regulation of cluster development, which contains everything:

1) server infrastructure;

2) communications, and storage;

3) necessary for software operation.

Table 6 - The advantages and disadvantages of the main types of bureaucratic organizational structures of the cluster participants

Type of structures	Important advantages for joint activity of autonomous units	Complexity of cluster development
linear	1) clear, simple connections between divisions; 2) unity, clarity of the head of instructions; 3) coordination of executive actions; 4) personal responsibility of the executive for the results of activity and efficiency of decision-making; 5) executors receive of instructions and tasks connected with each other, provided with resources	Networks connected to the network with organizational regulation of cluster development lead to a significant overload of information due to a large flow of documentation and a large number of contacts with subordinates, higher and related organizations, and other members of the cluster. In the linear-functional structure, the redrawn phenomenon is further enhanced by the excessive development of the vertical component of the regulatory system. For such structures, the provider often offers a platform on which it is possible to deploy all necessary applications. Such participants do not have the opportunity to scale up the system of organizational regulations.
linear-functional	1) competence of specialists responsible for implementation of specific functions; 2) conformity of structure of chosen strategy of activity; 3) integration of management specialization	
divisational	1) decentralization of power; 2) clear reporting system for profit units (losses); 3) rapid response to changing conditions of competition and demand; 4) good coordination of work	Possible causes of excessive competition between subdivisions for resources. Given that the cluster participants can compete with each other [2], there is a possibility of considerable aggravation of external and internal competition. The structure with an additional connection to the network with organizational regulation of cluster development leads to the formation of networks with complex access systems.

Source: formed based on [2; 3]

Through a virtual interface, this organizational structure easily interacts with IaaS configuration, adds installed software, and includes additional services, extending resources depending on the functional load on subdivisions and internal responsibility system.

Thus, in the conditions of application of cloud services, the following structures have the following special features:

1) regulations defining the rights, obligations, and tasks of a cluster member are developed mildly or moderately (in practice, there is no use of formal rules and procedures);

2) the rules that define the tasks of sectors and subdivisions are not permanent

(assigned for a certain time), separated from the tasks of the cluster member in general, and are characterized by flexibility of the structure;

3) the main operator of the regulations is the whole structure of power with a small number of levels of hierarchy (the performers interact both horizontally and vertically, and the system may remove the ban on acting, bypassing hierarchical levels of management);

4) the process of transmission of the management influence provides for the free movement of information in the organization;

5) the basic part of the responsibilities of the workplace is flexible and constantly changing due to the change in the conditions of operation of the cluster member.

Such structures are available in clusters of services. These structures are connected to the cluster network and are detailed in the following lines: project; matrix or network.

This leads to the formation of networks with complex architecture. The advantages and disadvantages of the main types of adaptive organizational structures of the participants of the services sphere cluster are shown in Table 7.

The network with organizational regulation of services sphere cluster development use may require adding software, and implementation for control of activity and compliance with security policies and rules in the cloud infrastructure. Any organizational structure type of cluster members creates both advantages and disadvantages of the action environment, not just market, but also cluster disadvantages are incompatible with effective regulation of development.

The priority for the cluster participants should be the application of adaptive types of organizational structures of the participants' activity regulation, in connection that the systems are flexible, and their disadvantages eliminated by the model of system description of activity and use of cloud service. This model, with the help of decomposition and cascading goals, forms a network of effective communications.

The organizational structure of the service sphere cluster management is the structure that ensures the integration functioning of the cluster, the elements of which are its participants (enterprises and organizations of the service sphere). This structure

Table 7 - Advantages and disadvantages of the main types of adaptive organizational structures of the participants of the services sphere cluster

Type of structures	Important advantages for joint activity of autonomous units	Complexity of cluster development
project [1]	1) reduction of terms of innovation creation, reduction of the number of regulations; 2) complication of production and commercial activity of participants; 3) introduction of different types of strategic initiative of the services sphere cluster.	The possibility of losing time to provide effective communications, which is however eliminated by the system description model. The high probability of conflicts between functional and project managers in the review of regulations or its set (if an imbalance between the scope of work is formed). Overload functional subdivisions with organizational regulations.
Matrix; Network[1]	1) creation, along with linear and functional regulations of temporary project regulations and responsibility structures; 2) temporary regulations and responsibility structures have selective action (formed for specialists of functional subdivisions)	The possibility of losing time to provide effective communications, which is however eliminated by the system description model. Overload functional subdivisions with organizational regulations.

Note

* deficiencies are effectively eliminated by the model of system description of activity and the use of cloud service

Source: formed based on [2; 3]

uses the network as the main alternative because the organizational unity of association ensures by the unified regulation of the system of networks of its participants. The differences in the cloud environment are due to who owns the infrastructure and who manages it.

If the cloud owner allows all participants who have paid for the service to get a virtual server, its virtual organizational structure operates on the principle of the public cloud. In this cloud, «iron», software and infrastructure belong to the provider, who also serves it through its staff of IT specialists. The cluster members only rent the necessary computing facilities. At the same time, the advantages are (fig. 1): (1) cost optimization; (2) re-distribution of tasks; (3) scalability; (4) reliability.

If the cluster participants using cloud technologies, built a virtual organizational structure on their equipment, for their needs - this structure acts based on a private cloud. A private cloud is a physically isolated infrastructure with exclusive access, increased productivity, and security. It can be connected to existing infrastructure or

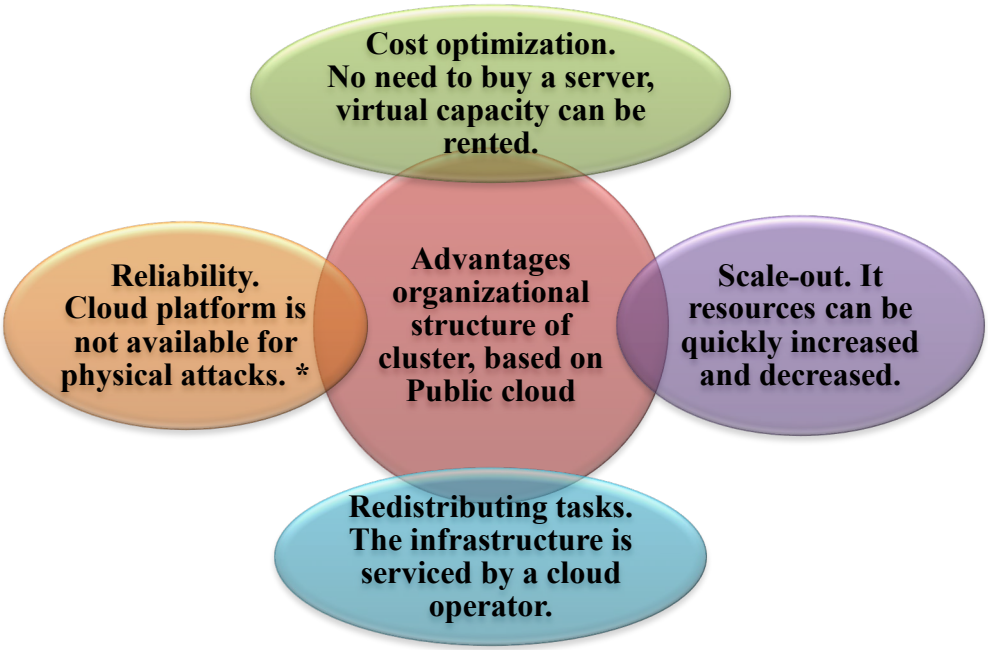

Fig 1. Advantages organizational structure of cluster management in the service sector, based on Public cloud

Note
* The data in the cloud is encrypted and protected from crime. Only the customer has access to the services.
Source: formed based on [4-5]

integrated with the public cloud. A private cloud is intended for large clusters formed with the participation of large businesses with a large number of IT services for which high information security and the ability to withstand peak loads on IT infrastructure are important. At the same time, the advantages are (fig. 2):

- fast start;
- full personalization;
- increased security;
- reliability;
- reduced total cost of ownership.

When the organizational structures placed in the private and public clouds are combined into one structure, a hybrid organizational structure of management of the service sphere cluster (based on the hybrid cloud) can be formed. Public cloud resources can be used to launch new or short-term regulations that are common to all stakeholders, gradually increasing cluster capacity. The private cloud can host

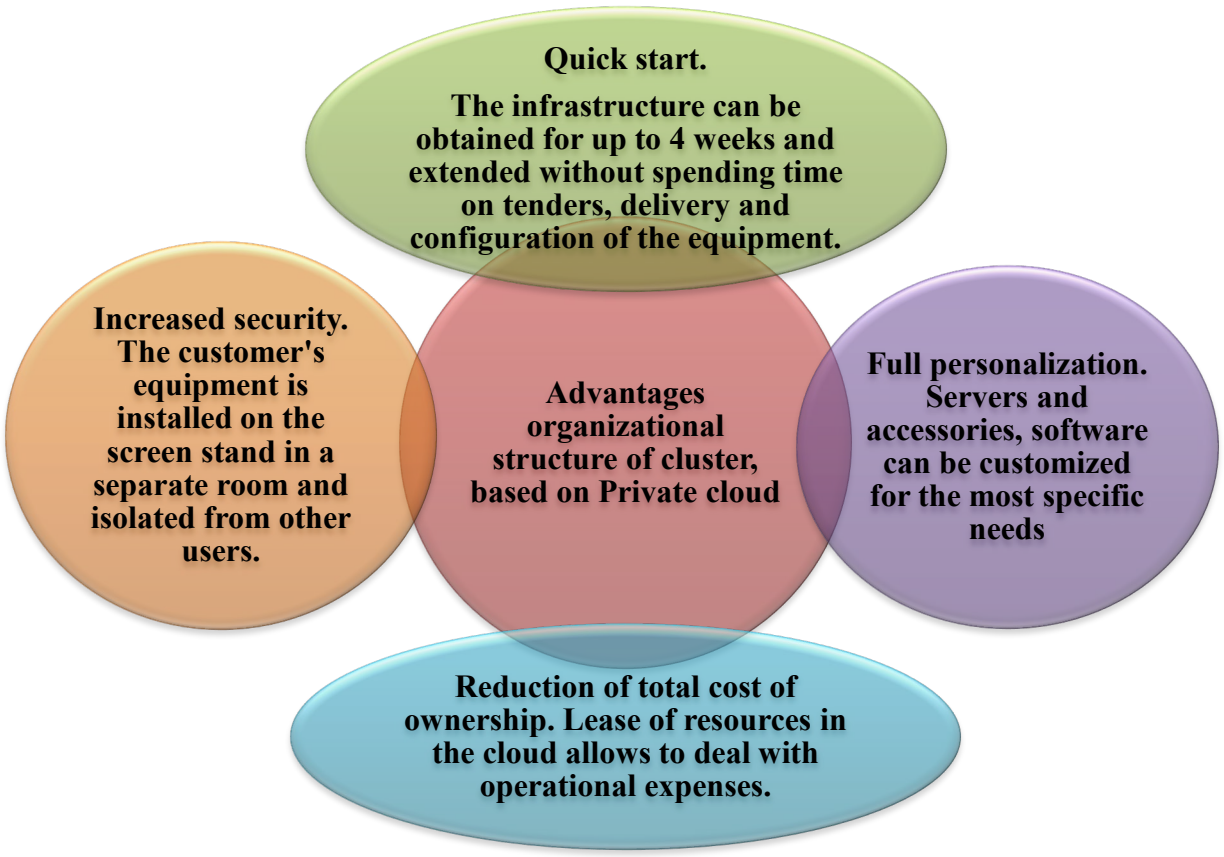

Fig 2. Advantages organizational structure of cluster management in the service sector, based on Private cloud

Source: formed based on [4-5]

business-critical applications and a productive cluster environment that requires high performance and security. The advantages of such structures are (Fig. 3):

- consolidation of strong parties of organizational structures based on two clouds;
- organizational structure variation; achieving optimization of costs for regulation and creation of organizational resources;
- increased security.

The peculiarity of the hybrid and other organizational structures of the cluster is that they act as the multi-cloud in most cases and involve the simultaneous use of cloud services (SaaS), platforms (PaaS), and infrastructure (IaaS) from several different providers simultaneously and independent of each other. This allows an account of the type of participant connection to the organizational structure of the service sphere cluster management [6-7].

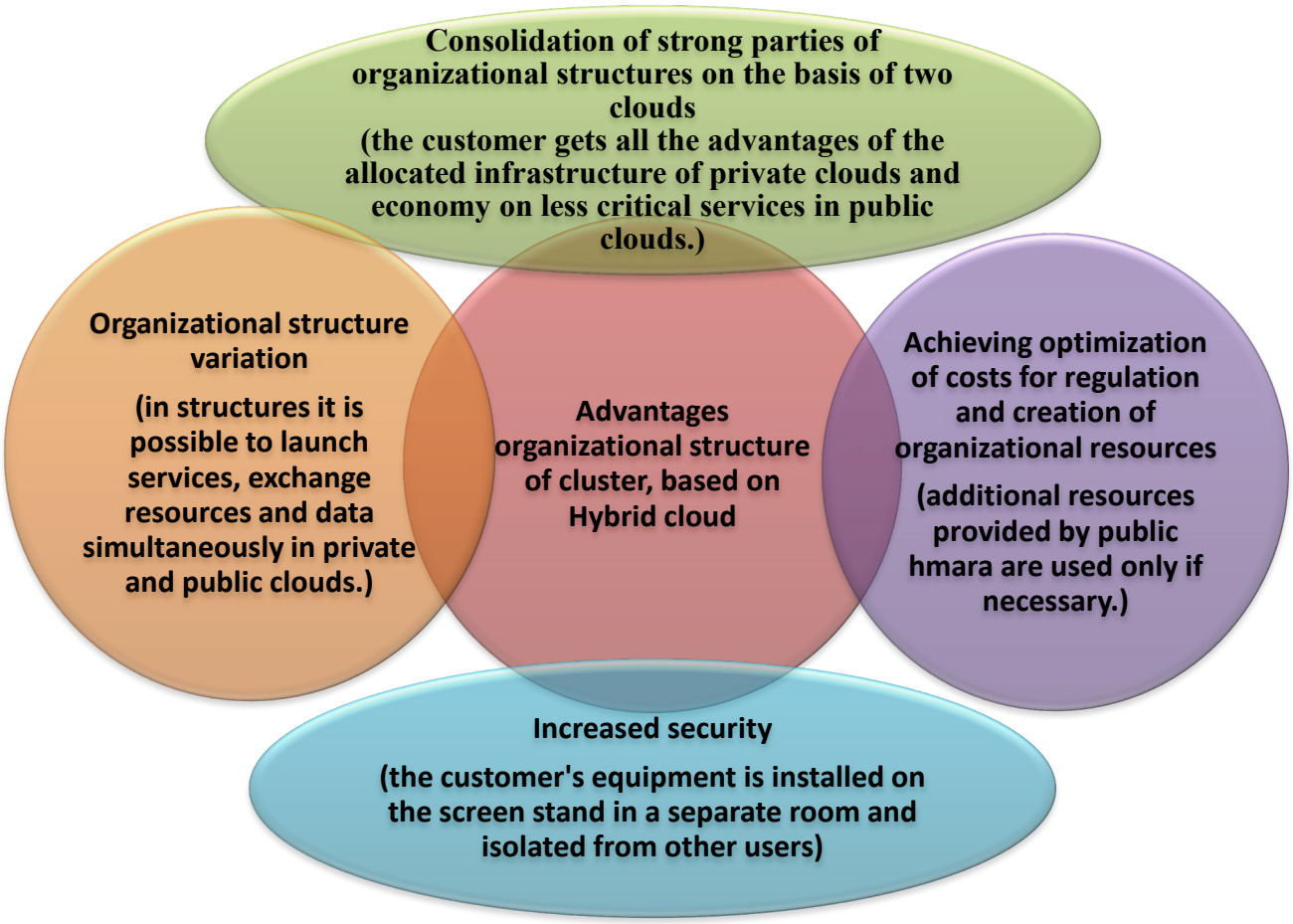

Fig 3. Advantages organizational structure of cluster management in the service sector, based on Hybrid cloud

Source: formed based on [4-6]

3.3. Centric and organic network of service sphere clusters description

The use of a cloud environment can lead to the formation of different subtypes of organizational networks [2, p. 26–31; 6], or member associations that:

-bring behavior rules inside (between cluster members) and outside networks (to a network unit or an aggregate), require rules for the use of network units and the entire network;

- unite single members (provides an opportunity to influence each of them by general rules or influence the network as one whole object).

It is possible to allocate various service networks (the format of any service is determined by the type of services), in particular: (1) transport service networks (with

the division on the networks of passenger and cargo transportation); (2) business and personal networks (with the division on networks of tourist attractions); (3) communication networks (with the division on networks of communication and mobile Internet); (4) insurance networks; (5) financial networks of computer and information services networks; (6) royalty networks and licensing networks of other business services, such as intermediary, technical, leasing, personal, cultural and recreational services; (7) networks of services of state institutions, etc. Such service networks provide quality of services, influence time and place of delivery, personnel structure, level of qualification, psychological features, and even the health and mood of the service producer.

It's possible to allocate networks of routine interaction of cluster members in its organizational structure (based on the regiments and internal protocols). The basis of interaction networks is the presence of interaction protocols. Each of the functions of the above network is based on central or/and organic elements (secondary networks).

The centric network, as an element of the model of management of clusters of the service sector, is based on small firms united around the core (one or several large firms). The cluster core helps members to perform various specific tasks (in fact, small firms serve certain market segments).

In this case, if these networks are passed by organizational regulation of cluster development in clouds, which use powerful servers, storage systems, virtual switches, routers (with internal streams), and service CaaS (Communications as a Service). This network is based on the hardware, which has a significant capacity due to the working load the service segment needs its subdivisions, which are necessary for the production of the cluster product (narrow specialization). Note that such a structure is hierarchical, as large travel firms occupy a minimal position in business operations, shown in the following [2; 3]):

1) large firms are the main producer allows them to influence independent participants, not through participation in the capital but through market mechanisms;

2) the corporate management bodies of the cluster act as an internal coordinators (coordinate the work of autonomous participants);

3) large firms (acting as network enterprises) choose service partners according to parameters of flexibility, adaptability to changes in the environment, and creative potential.

These networks require different tools and communication channels in the cloud (telephony, express messaging, or video call services). All necessary software security must be located in the provider cloud.

The organic network of the cluster acts as a union of close-sized autonomous producers, which maintain the stability of one another (in the economic plan), while the bankruptcy of one of the participants will inevitably affect the other. An organic network of the cluster has the following properties [2; 6-7]):

1) network operates within the thematic direction of activity (increasing its competitiveness);

2) links between autonomous units are permanent;

3) independent units are managed through the corporate management bodies of the cluster, which stimulates their innovation and commercial processes, and simplifies management processes within the association itself.

At the same time, organic networks are effective at the expense of total organizational regulation of cluster development, which we propose to provide for the active use of cloud technologies. Under these conditions, the participants are able not only to connect to the cluster databases in the cloud, but deploy a detailed database in it to control the current state of all the cluster participants [8-11]. Therefore, the network element is a database as a service. The cluster participants will have a lease fee, depending on the number of users and the volume of the base itself.

In the central and organic networks, which exist as elements of the cluster management model, temporary virtual structures of cluster members and their groups can be formed as the framework of business cooperation.

Centric and organic network of service sphere clusters:

1) are rapidly integrated to solve urgent problems of development of a part of the such association (for example, promotion of the newest service to the market);

2) are rapidly integrated to use the newest opportunities (which appeared due to

favorable changes in the external environment or modern achievements of technics and technologies);

3) are coordinated with the help of modern information technologies and telecommunication means.

In any case, such network structures can function only based on: 1) the managing core (one or more large firms or bodies of corporate cluster management); 2) clear program goals, ways of their achievement, and characteristics of the structure itself (which can change in time, by an open, defined and understandable procedure for all participants) [7, 12-13]. We believe that to achieve the completion of the definition of the regulatory service sphere cluster management models it is expedient to allocate its organizational regulations structure.

The standard organizational regulations for autonomous units are as follows [14-17]:

- the management model used by the service sphere clusters participants. We recommend Balanced Scorecard or other models for use. In particular: tableau de bord (Tb); Performance Pyramid; EP2M (or Effective Progress and Performance Measurement); Performance Measurement in Service Business; Productivity Measurement and Enhancement System (ProMES); J.I.Case, Caterpillar (Used by the division of tractor means "Caterpillar"), etc.);

- description of existing organizational structure of the service sphere clusters participants (description of the most important elements of the control system, including the defined composition, interaction, and its elements subordination);

- description of principles and approaches to building an organizational structure is observed by an autonomous unit. In particular, peculiarities of reflection of goals and tasks of the organization, peculiarities of management structure change at the passing of life cycle stages; reflection peculiarities of the functional division of labor and the volume of powers of management workers; reflection peculiarities of correspondence between functions, powers and between qualification and level of culture;

- distribution of functions, powers, and responsibilities between structural

subdivisions (in the responsibility matrix, in the position regulations (in job descriptions), in the structural subdivision regulations; in the sector (group) of the structural subdivision regulations);

- relations between structural units and subdivisions, number and post structure of structural units and subdivisions of the company (strategic map);

- relations between departments/employees and the competence of officials.

The standard organizational rules for a service sphere cluster are as follows:

- a model of corporate cluster management;

- description of the current organizational structure of the cluster and main tasks;

- description of principles approaches to building organizational structure of service sphere cluster and program principles of activity;

- distribution of functions, rights, and duties of cluster participants (including structural stabilization department);

- service sphere cluster members and their structural composition relationships.

Specific organizational regulations for autonomous units are as follows:

– regulations on the departments (according to the needs of an autonomous participant);

- charter or activities regulations of an autonomous participant;

- employee job descriptions and cascade performance systems (designed for each employee);

- provision of cloud service and road map migration to cloud service (description of peculiarities of cluster cloud approach and deployment of virtual organizational structure in the cloud).

The specific organizational regulations for a service sphere cluster are as follows:

- regulations on cluster subdivisions (including stabilization of cluster structure and organization structure)

- the cluster charter (during the drafting of the charter it is necessary to pay attention to the coordination with the current legislation of the specific activity of the structure). It is important to generate unambiguous algorithms, rules, and procedures that will ensure the implementation of cluster life processes.

- description of algorithms, rules, and procedures of self-managing profile working for groups within a cluster

- description of algorithms, rules, and procedures for transfer of managerial influence in the "cloud" structure of responsibility.

The organizational regulations system forms the possibility of transmission by the service sphere clusters management system of manage influence in the “cloud” structure of responsibility.

Conclusions.

The definition of the regulatory model of management of service sphere clusters forms the possibility of transmission by the management system of the manage influence in the "cloud" structure of responsibility that can scale up.

At the same time, the main attention should be paid to the peculiarities of their deployment in the infrastructure, which combines cloud services for business and database systems with flexible resources, possibilities of balancing computing capacities, bandwidth, number of users, and cost functions. This will allow performing tasks within the organizational network of the cluster.

Based on the obtained data, it's stated that the main tasks of the organizational structure of the service sphere cluster should be as follows:

1) to understand the general public interests, to formulate them, in the form of program principles, to lay moral principles, and ideals of work;

2) evaluate the external environment;

3) to identify effective rules of activity, establish the satisfaction of whose interests they are directed;

4) to identify the impact on the society, which has other players, which have the aim to realize their interests, at the expense of the general public;

5) systematically analyze the received information, and predict possible variants of events development;

6) to develop strategy and tactics of counteraction to destructive influences, by declaring goals, basic moral principles, and ideals;

7) to form and implement rules that will ensure the realization of the conscious structure of the general public interests;

8) to provide periodic assessment and self-evaluation of its activity and properties, to provide open mechanisms of adjustment of the course of development, and to build reliable feedback relations within the organization and with the external environment.

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CHAPTER IV.
ESSENCE, KEY PRINCIPLES OF CLUSTER MANAGEMENT VIRTUALIZATION IN THE SERVICE SPHERE AND CLOUD MIGRATION OF CLUSTER MEMBERS

Introduction.

Problem setting (description of the problem being analyzed in general and its connection with important academic or practical tasks). It should be noted that there is no doubt that there are peculiarities of moving physical or virtual IT-infrastructures of cluster members to the cloud of a third-party operator, on the capabilities of the virtual data center, which form a phenomenon of gradual virtualization of management of service sphere clusters and their participant. This virtualization extends the range of available technologies and changes the essence of the principles, methods, and management tools that are directed and integrated on platforms running on cloud provider servers. The main principles of virtualization of cluster management in the service sphere are formed during the consideration of possible migration and the more active use of managed cloud services, during and after migration of all its participants into the cloud environment of the cluster.

We believe that the prerequisites for management virtualization form a qualitative demonstration of its practical realization (approbation of the idea of migration of management system into a specific cloud, the approbation of cloud technologies). It is important to prove that the method, idea, or technology works. The basics of cluster member management system virtualization provide not only a breakdown of the available workplaces, placement of data in clouds and access to them from different devices, simplification of the organization of technological solutions, but also effective planning of the outlined process for adjustment of the cost function. Both the prerequisites and the basics of the management system virtualization aren't defined by the cluster member (in particular, there is virtually no good research in the area), so further research is needed.

Analyzing the latest studies and publications which launched research in this field and to which the author refers. The issues of using cloud services in the

management of the activity of certain business entities are covered by such scientists as O. Woit, O. Yakovici, D. Kharatishvili, N. Lavrenchuk, G. Josan, O. Garafonova, D. Chikirsov. That scientists pointed out that an important timely response to changes occurring in the environment of the subject of economic activity allows not only to avoid the potential threat but also to obtain new opportunities for continuous development of the enterprise. Such a development requires a specific change like the management's influence in the direction of continuous work. One of the ways of such response N. Lavrenchuk identifies a cloud migration that provides the ability to work continuously, to access a large amount of information everywhere at any point in time and place from any device with Internet access. It is incontestable that migration in the cloud changes the nature of management influence in a special way. So it should be a way of reacting to changes in the cluster environment because all its participants are in close contact and interaction therefore due to the management virtualization can establish internal interaction, and form a unified management system.

Formulation of goals (setting a task). Therefore, the material is aimed at highlighting the essence, key principles of service sphere cluster management virtualization, and peculiarities of migration in the participants' cloud. Achievement of the goal will be the allocation of the next research tasks:

1. definition of main principles and ways of migration of service sphere cluster participants into the cloud environment;

2. formation of a migration plan in the cloud of the management system of service sphere cluster members;

3. demonstration of practical implementation of cloud management.

4.1. Main principles and ways of migration of service sphere cluster participants into a cloud environment

Within the framework of the study, cloud migration refers to the transfer of physical or virtual IT-infrastructures of cluster members to the cloud of a third-party

operator of the virtual data center [1].

Currently, there are the following tools for cloud migration [1-3]: Backup-based migration, reflow migration, migration for Unix-like operating systems Cluster member (non-managed synchronization); vCloud Extender-based migration (managed synchronization).

Backup-based migration – this is the simplest technology that is suitable for cluster members in two cases:

1. to transfer data from a physical server to a cloud server based on Veeam Agent for Server. At that, the migration algorithm is strange: (1) a cluster member installs Veeam Agent on his physical server; (2) Veeam Agent starts the process of copying data and sends it to the repository (or to the cloud storage of backup copies); (3) the provider estimate (determines how much database resources, operating resources need to be allocated); (4) creating an image or reserve (for a client) by a virtual server operator of the required capacity and launching a virtual machine using the Veeam Recovery Media image; (5) restoring all data from the database that is in the repository. In this case, if virtual machines are more than one, the running operations are repeated for each of them. As a result, the client's infrastructure is in the cloud;

2. to migrate data from virtualization platforms (not compatible with the cloud operator platform) using Veeam Agent technology and Veeam Cloud Connect capability. Veeam Agent then starts the data copy process and Veeam Cloud Connect sends the data to the repository.

Reflow migration. With this type of migration, the virtualized client manages the cloud migration independently with Veeam Backup & Replication software. The migration algorithm is strange: (1) the cluster member installs Veeam Backup & Replication on their virtual machines; (2) the program allows the cluster member to access the cloud migration control panel and through it start replication (copying) their virtual machines at the capacity of the cloud provider; (3) after the migration is complete, the cluster member runs VM reprints (each of which can act as a remote workplace); (4) the cluster member organizes network connectivity; (5) the cluster member can include and exclude remote working places in its cloud.

Migration for Unix-based systems cluster member (non-managed synchronization). This process is based on file and directory synchronization using RSync. RSync is a UNIX-based application that is designed to synchronize files and directories with minimal traffic. At that, the migration algorithm is strange [1-3]: (1) a cluster member installs (on their virtual machines, server, or PC) RSync; (2) the program creates a virtual machine with the required capacity in the cloud, and on the side of the cluster member sets up RSync-system and starts data synchronization (after synchronization the machine-receiver will be the exact copy); (3) setting up the network connection, preparing the server for receiving the load.

vCloud Extender-based migratio. In the migration process of client's integration, technical support, and the service architect on the part of the cloud operator. The specific thing is that a cluster member can move both on a cold (that is, offline servers) and on a hot (that is, on a flight, without a shutdown of the working process) [1]. At that, the migration algorithm is strange:(1) preparatory work (for the installation of vCloud Extender and vCloud Replicator), which transfers the allocation of four virtual processors, 12GB RAM, and 22 GB hard disk); (2) a cluster member installs on their virtual machines, server, or PC 2 applications: VCloud Extender and vCloud Replicator. The VMware vSphere version on the side of the cluster member must be at least 5.5; (3) programs create a cloud-based virtual machine with the required capacity; and on the side of the service sphere cluster member, data synchronization is set up and started (after synchronization is complete, the target machine will be the exact copy of the source machine); (4) setting up network connectivity and preparing the server for receiving load.

The outlined ways of migration in the cloud environment of the service sphere cluster participants are basic but not exhaustive. The processes should not be attached to templates, because each infrastructure of a cluster member is individual, and all services have their specificity. However, the problems that may occur during the migration of service cluster members to the cloud environment are: 1) absence of a scheme of dependencies between the apps; 2) lack of information regarding what it services, when and in what amount will be migrated; 3) uncertainty of time for

downtime and lack of confidence that the cloud operator is suitable for the task of a particular company; 4) uncertainty of reliability and security of the data center in which the cloud operator places its equipment; 5) features of maximizing the value of the target cost function for each of the available alternatives to migration of a cluster member to a cloud. Thus, the logic of management migration in the cloud of a service sphere cluster members is shown in Figure 1.

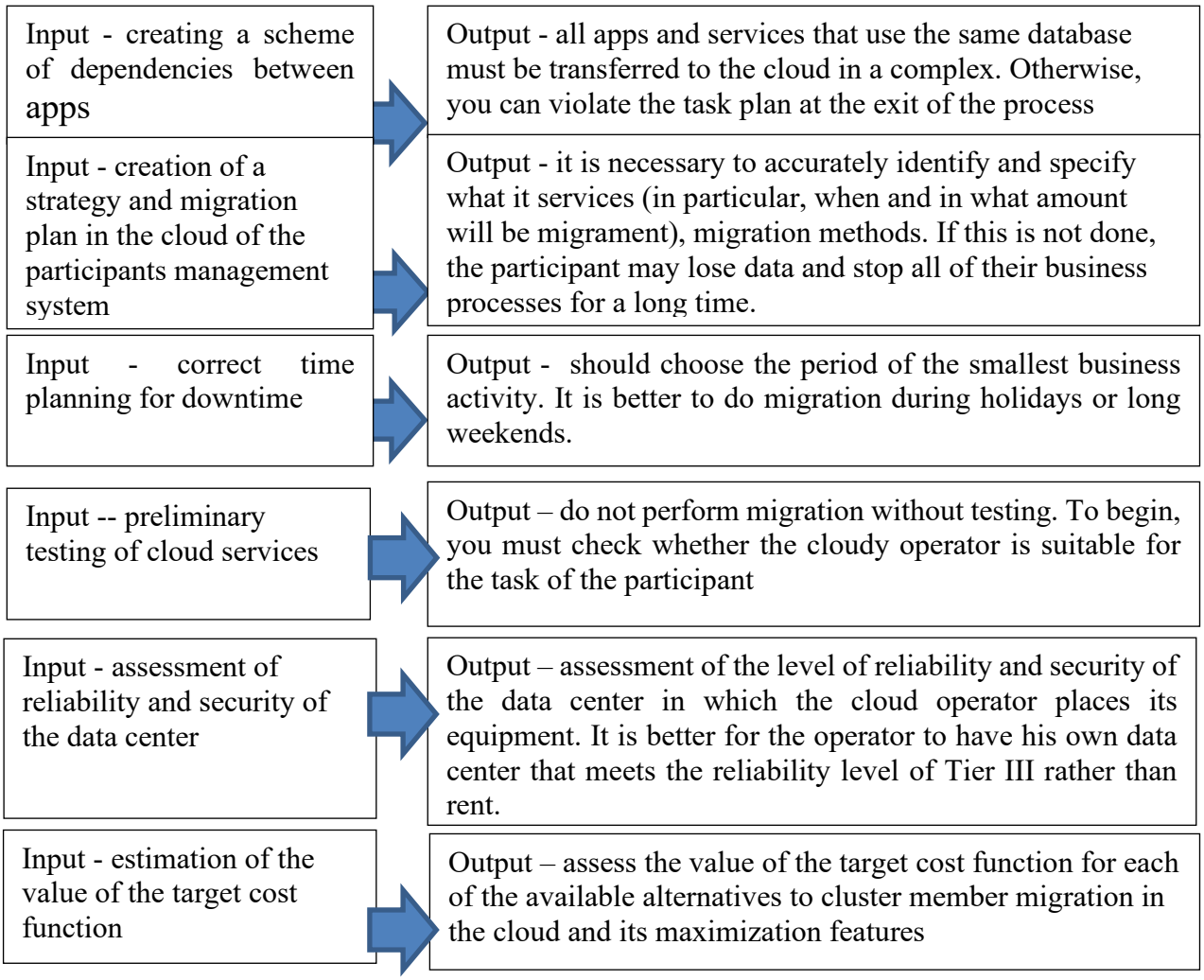


Fig. 1. The logic of management migration in the cloud of a service sphere cluster members

Source: formed based on [1;4-6]

To determine the general principles of management migration in the cloud environment, the cluster participants in the service sphere need to:

1) create a scheme of dependencies between the plugins;

2) create a strategy and plan for migration of the participant into the cloud;

3) correctly schedule time for downtime;

4) preliminary testing of cloud services;

5) assess the reliability and security of the data center;

6) assess the value of the target cost function.

To create a scheme of dependencies between apps it's necessary to specify what applications and services, use the same database.

Creation of a strategy and plan of management migration of a service sphere cluster participants in a cloud (for this purpose it is necessary to specify what actions, what IT-services and what methods of migration are planned to be used). In particular, five methods of management migration of cluster participants to clouds known as "5 R" can be defined:

1) Rehosting;

2) Refactoring;

3) Revise;

4) Rebuilding;

5) Replace**.**

The characteristics of the "5 R" methods of management migration to clouds described are presented in Table 1.

Table 1 – The characteristics of the"5 R" methods of management migration of cluster participants to clouds

migration methods	Essence of method	method advantages
1	2	3
Rehosting	Repeat hosting, or "lift and transfer" of data. Redeploying existing data and programs on the server is repeated. In the cloud the exact copy of the management system of the service sphere cluster participant is formed	Ease of implementation (the method is ideal for service sphere cluster participants, who only get acquainted with cloud environments). The variant is ideal for cases where it is difficult to change the code of interaction and management algorithm, or if the participant plans to transfer all his processes to the cloud, but without any unnecessary actions and any changes.
Refactor	"Raise, recycle, and change" is when you tune and optimize your programs and tune management processes for clouds. The cloud forms a flexible management model.	The basic architecture of processes and programs remains unchanged, but the algorithms of actions make certain changes that allow them to be corrected remotely and better to use cloud tools. It a good option for the service sphere cluster participants who

Continuation of the Table 1

1	2	3
		need to move the processes by changing their content.
Revise	The strategy is based on previous methods (Refactor, Rehosting), requiring more significant changes in the architecture and code of systems moving into clouds. This strategy requires preliminary planning and advanced knowledge.	The method is coordinated so that managers can fully use the services available in the cloud, which may require serious changes in management processes.
Rebuild	The re-development is further pushing the Reise approach, eliminating the existing code base and replacing it with a new one – more and more virtualized	This process takes a lot of time and is considered only when service sphere cluster members decide that their solutions do not meet current needs and should be more virtualized.
Replace	Replacement is another solution to the problems associated with the Rebuild approach. It is used if certain management processes need to be transformed	The participant does not recycle his own management system in the cloud from scratch, but replaces in the cloud a certain addition by a third party, which is provided by another supplier and already has necessary improvements.

Source: formed on the basis of [1-2; 7]

Regarding the migration plan in the management cloud of the cluster participants, we propose to allocate 4 key steps [1-3, 4, 7]:

step 1 - data storage assessment (we recommend selecting an expert to help assess the needs of the member, to inventory existing data and programs, to understand applications and infrastructure, to monitor dependencies, consumption levels or system requirements);

step 2 - planning of the process of development of own cloud infrastructure (consists in defining the basic components for setting up the cloud management environment, establishing certificates and assigning roles and access rights);

step 3 - planning the most migration to the cloud (approach to data transfer and dependencies before all applications are migrated to the cloud, choice of data storage option, as well as methods of data transfer between users);

step 4 - planning of process of optimization, search and implementation of improvements, namely:

(1) in areas of formation, strengthening and development of team of specialists

formation;

(2) in areas of strengthening and development of team of specialists;

(3) in areas of monitoring of services and processes;

(4) in areas of automation of processes and activity of managers and other employees;

(5) in areas of simplify code, implement automated services instead of manually managed services, optimize performance;

(6) in areas of scale of management system).

Proper planning of downtime for the migration to the cloud should be chosen based on the given business activity of the participant. We should focus on the period with the lowest profit and sales of services.

Pre-testing of cloud services. By choosing the cloud to place the management system, the cluster's participants should conduct a test drive to assess the ease of operation and resource productivity.

At the same time evaluate the performance of the classical software system at a certain working load for fixed configuration, namely*:*

(1) measurement of the speed of virtual machines in clouds;

(2) testing of data transfer rate between infrastructure nodes;

(3) check availability and scale, the elasticity of cloud service at different times of day;

(4) tests of data recovery;

(5) estimation of the response time of technical support provider);

(6) assess the ability of cloud services to adapt to changing loads in terms of process and cost efficiency.

The data center's reliability and security assessment overestimate the reliability of clouds and their services in the case of the individual nodes; the data center's security assessment.

The cost target function [1; 4-6] is the most difficult to estimate because it is implemented based on a linear programming task within which a graphical representation of the system of linear restrictions, which is typical for a particular cloud

environment, is available. For example, we will consider such an assessment of the value of the target cost function on the example of the Transcarpathian IT Cluster, which involves 2941 cluster cooperation actors. Therefore, participants of such a cluster of services at the first stage of migration in the cloud are enough to choose a service that corresponds to the system of line restrictions $x1+2500x2\leq2499$. Although the clouds allow for avoiding capital expenditures for hardware and software acquisition, configuration, and operation of local data centers, it is important that the cost function (F), even under maximum usage of x1 and x1, does not exceed 13900 UAH for the participants. per month (as this is the cost of maintaining the simplest set of own hardware and software for the cluster).

In addition to the cloud service, it is necessary to analyze the peculiarities of maximizing the value of the target function F for each of the available alternatives, taking into account whether there is a possibility to adjust the cost function for business and the specifics of charging the service usage fee to achievement:

$F = 9000x1 + 11000x2 +3000 \rightarrow \max$, under the system of restrictions $x1+2500x2\leq2499$;

restrictions:

(1) $2500x1+4000x2\leq3999$;

(2) $4000x1+6000x2\leq5999$;

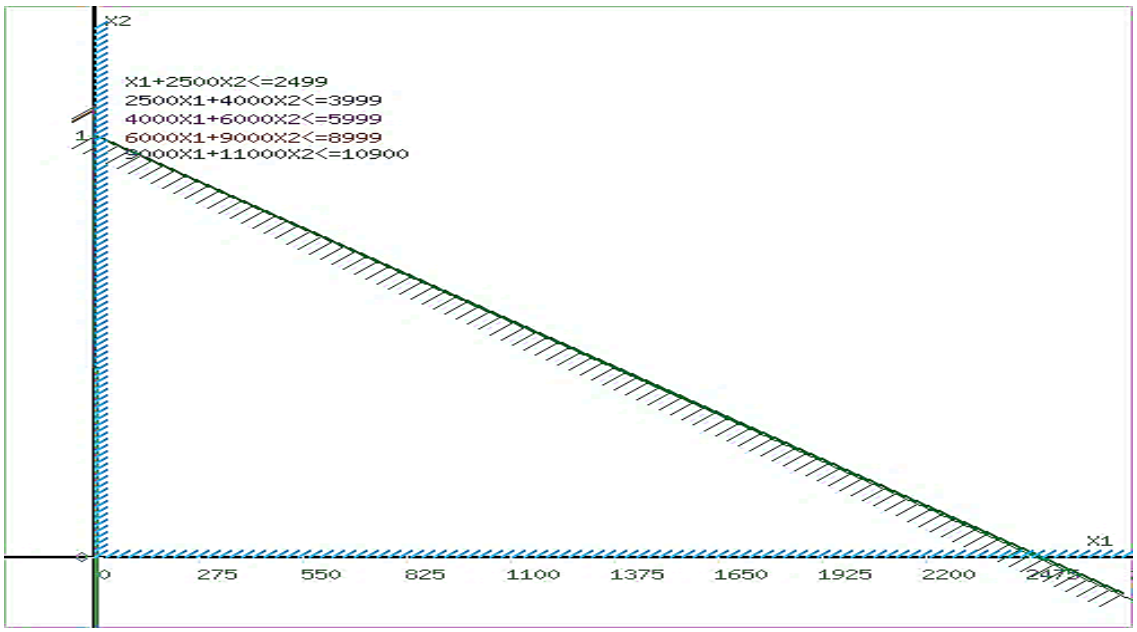
(3) $6000x1+9000x2\leq8999$;

(4) $9000x1+11000x2\leq10900$

provided that (5) $x1 \geq 0$, (6) $x2 \geq 0$, (7).

In the equations as a balance-free value, the unit of change in the amount of information is taken into account. To assess the value of the target function of expenses from the use of cloud resources, we will build an area of admissible solutions for the cluster of services sphere, that is, we will solve the graphical system of inequalities.

We will build each model at two points and determine the half-area of change of cost, given by inequalities (Fig. 2).



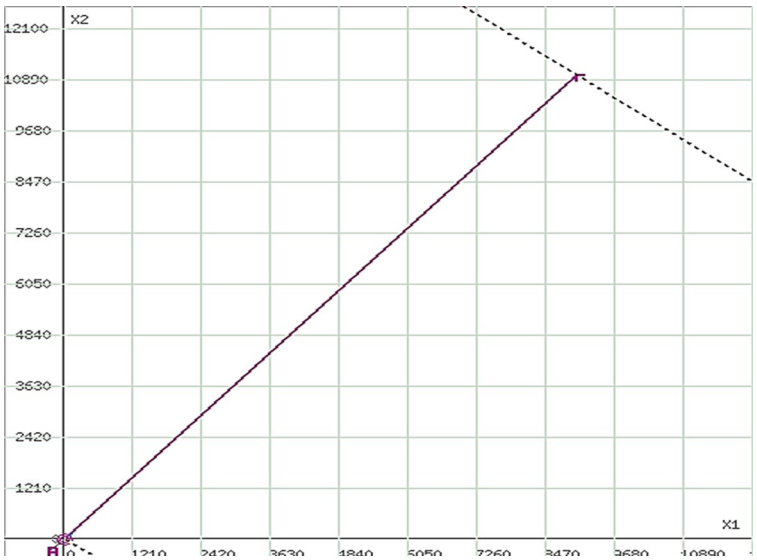
Model	A series of uniform actions on forming a problem of linear programming
x1 + 2500x2 = 2499	equate x1 = 0. Find x2 = 1, equate x2 = 0. Find x1 = 2499. Connect point (0; 1) whis (2499; 0) straight line. Choosing point (0; 0), we define the sign of inequality in half-plane: 1 • 0 +2500 • 0 - 2499 ≤ 0, тобто x1 + 2500x2 - 2499≤ 0 in half-plane low straight line.
2500x1 + 4000x2 = 3999	equate x1 = 0. Find x2 = 1, equate x2 = 0. Find x1 = 1.6. Connect point (0; 1) з (1.6, 0) straight line. Choosing point (0; 0), we define the sign of inequality in half-plane: 2500 • 0 +4000 • 0 - 3999 ≤ 0, тобто 2500x1 + 4000x2 - 3999≤ 0 в in half-plane low straight line.
4000x1 + 6000x2 = 5999	equate x1 = 0 . Find x2 = 1 equate x2 = 0 Find x1 = 1.5. Connect point (0; 1) з (1.5, 0) straight line. Choosing point (0; 0), we define the sign of inequality in half-plane 4000 • 0 +6000 • 0 - 5999 ≤ 0, тобто 4000x1 + 6000x2 - 5999≤ 0 in half-plane low straight line.
6000x1 + 9000x2 = 8999	equate x1 = 0 . Find x2 = 1, equate x2 = 0. Find x1 = 1.5. Connect point (0; 1) з (1.5, 0) straight line. Choosing point (0; 0), we define the sign of inequality in half-plane: 6000 • 0 + 9000 • 0 - 8999 ≤ 0, тобто 6000x1 + 9000x2 - 8999≤ 0 in half-plane low straight line.
9000x1 + 11000x2 = 10900	equate x1 = 0. Find x2 = 0,99, equate x2 = 0. Find x1 = 1.21. Connect point (0; 0.99) з (1.21; 0) straight line. Choosing point (0; 0), we define the sign of inequality in half-plane 9000 • 0 + 11000 • 0 - 10900 ≤ 0, тобто 9000x1 + 11000x2 - 10900≤ 0 in half-plane low straight line.

Fig. 2. The area of admissible solutions for the services sphere cluster, concerning access and balancing system x1, x2, u and F

Source: Formed for Cloud BigData

Half areas are marked with a stroke, x≥1 – use of cloud service by 100% or on top of the established standard of computing capacity or volume of storage or throughput, x=0 – use of cloud service is limited (loading will not reach 100%). The intersection of the half-squares is the coordinates of points that meet the conditions of impositions of the system of problem constraints. Let's point out the boundary of

domain polygon solutions. Let's consider the peculiarities of the increase in the cost of service usage from x1+2500x2≤2499 to 9000x1+11000x2≤10900 (fig. 3).



x1 = 1.2111, x2 = 0
maximum target function value:
F (X) = 9000 * 1.2111 + 11000 * 0 + 3000 = 13900
To define coordinates B, we decide the system of equations**:
9000x1 + 11000x2 = 10900
x1 = 0, get: x1 = 0, x2 = 0.9909
thus, the maximum value of the target function:
F (X) = 9000 * 0 + 11000 * 0.9909 + 3000 = 13900

Fig. 3. Features of increasing service costs for services sphere cluster from x1+2500x2≤2499 to 9000x1+11000x2≤10900 (target function)*

Note

* Straight F (x) = C — intersects the region at point C. Because point C receives the results as a result of the intersection of the straight (7) and (5), its coordinates meet the requirements of the equation of these straight lines: x2=0, 9000x1+11000x2=10900

** The function of the target F (x) is parallel straight (5), then on the CB segment the function accepts the same maximum value.

Source: Formed for Cloud BigData

Having decided the system of equations, we will get: X1 = 1.2111, x2 = 0. Where the maximum target function F (X) = 9000 * 1.2111 + 11000 * 0 + 3000 = 13900. Thus, the use of the service is quite profitable for clusters, illustrated according to the model.

4.2. Formation of a migration plan in the cloud of the management system of service sphere cluster members

Note that the main stages of migration of the management system of services sphere cluster member in the cloud allocated:

1) cloud management model choosing (such selection should be based on parameters: (1) desired scale; (2) desired marching; (3) possibilities of continuous

service provision; (4) business requirements concerning communications);

2) creation of management migration road map of services sphere cluster member (defines means of migration, architecture peculiarities of IT-infrastructure of management, services, the volume of data, communication channels and security);

3) creation of management infrastructure of services sphere cluster member in clouds;

4) test migration of management a services sphere cluster member (of management system structure);

5) check of the efficiency of the cloud; assessment of compliance, availability, and productivity of management resources of services sphere cluster member;

6) launch of management infrastructure of a services sphere cluster member in the cloud.

The management system cloud migration plan should be designed to help the services sphere cluster member effectively perform the migration in four key steps that summarize the evaluate data retention, planning the process of building their cloud management infrastructure, planning the cloud migration itself, planning the optimization process, searching for and implementing improvements.

Step 1: Evaluate data retention. Summarizes the needs assessment activities of a services sphere cluster member based on:

-inventory of current data and programs for management functions and processes;

- analysis of the environment of app and management infrastructure; tracking of dependence and identification of consumption's liquid;

- identification of system requirements to clouds;

- determination of resources for the first migration of the management system of the cluster member and testing.

The stage may also summarize the total cost of ownership, i.e. the total cost of infrastructure maintenance.

Actions on the inventory of existing data and programs for the realization of functions and processes of the manager, provide [1-2; 8-9]:

1) acquaintance with the current app for the realization of functions and processes of the manager, its components and relations, as well as with the environment of execution;

2) to review programs and resources for the implementation of the functions and processes of the manager, in particular, the technologies used, databases, data stores or networks, and the relationships between them;

3) compiling a list of all the workplaces used (together with their characteristics, as regards: operating systems, licenses and ways of their use by the program).

The actions on analysis of the environment of applications and management infrastructure should include a review of the elements of programs and resources of the company, and arrangement of them by categories. It is possible to create own categories, but it is necessary to take into account two factors [1; 8-9]:

1) the criticality of an element (will there be a failure of migration hurt the functioning of the management system of a cluster member ?);

2) the level of dependence (or connected element to the database influences the functions of the management system of a services sphere cluster member ?).

The tracking of dependence and identification of the consumption liquid or the system requirements to the cloud are based on experiments with cloud resources and the creation of Proof of Concept (PoC). Proof of Concept (PoC) – this is a demonstration of the practical implementation of any methods of migration into clouds, ideas, technologies, functions, and processes, to prove that the "PoC" version of the management system works. Proof of Concept version is a test version of a virtualized management system for a cluster member, verified from the point of business needs and requirements, which must be a final version of all its functions and processes. At this stage, management and IT-professionals should experiment with Cloud Platform services to identify those that best meet the requirements of the system and respond to normal usage situations. The area of Proof of Concept, which should be "investigated" to track dependencies and identify consumption levels or system requirements for clouds is shown in fig. 4.

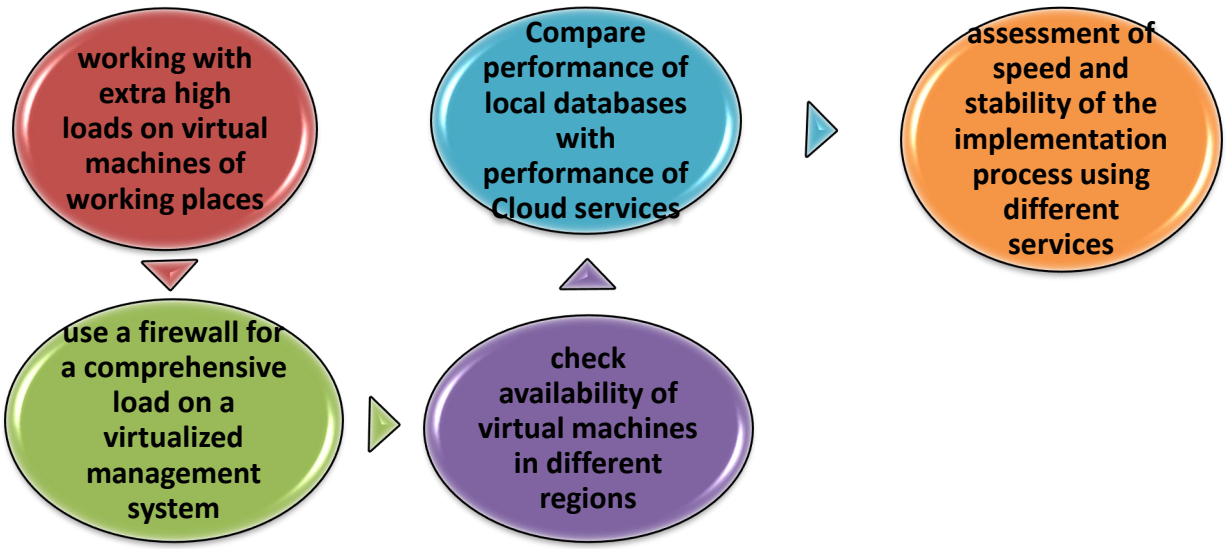


Fig. 4. The area of PoC, what should be "investigated" to track dependencies and identify consumption levels or system requirements for clouds

Source: Formed on the basis of [1-2; 10-11]

The determination of the total cost of ownership (that is, the total cost of infrastructure maintenance) should be informative and oriented both on the cost of purchased machines and on the cost of cloud services. When calculating the total cost of ownership of a local solution for the management system virtualization, the following should be taken into account: cost of power supply of machines, and networks; maintenance costs; service work cost.

It is important to calculate the total cost of ownership of Cloud Platform services, taking into account that all services used by the management system of a services sphere cluster member will be server-free. This means that the total cost of ownership will be reduced to the cost of service (usually 20-30% below primary internal costs).

Resource allocation actions for the first migration of the management system of a services sphere cluster member and testing pass the selection of resources that must be transferred to the cloud first**.** These steps are intended to familiarize the migration process of the management system of the participant of the cluster testing its processes and functions in the cloud. This should be guided by the transition from the simplest to the most complex processes and management functions. For example, the processes and functions that should be selected for the first step of the migration of the management system of a services sphere cluster member and testing are shown in Figure. 5.

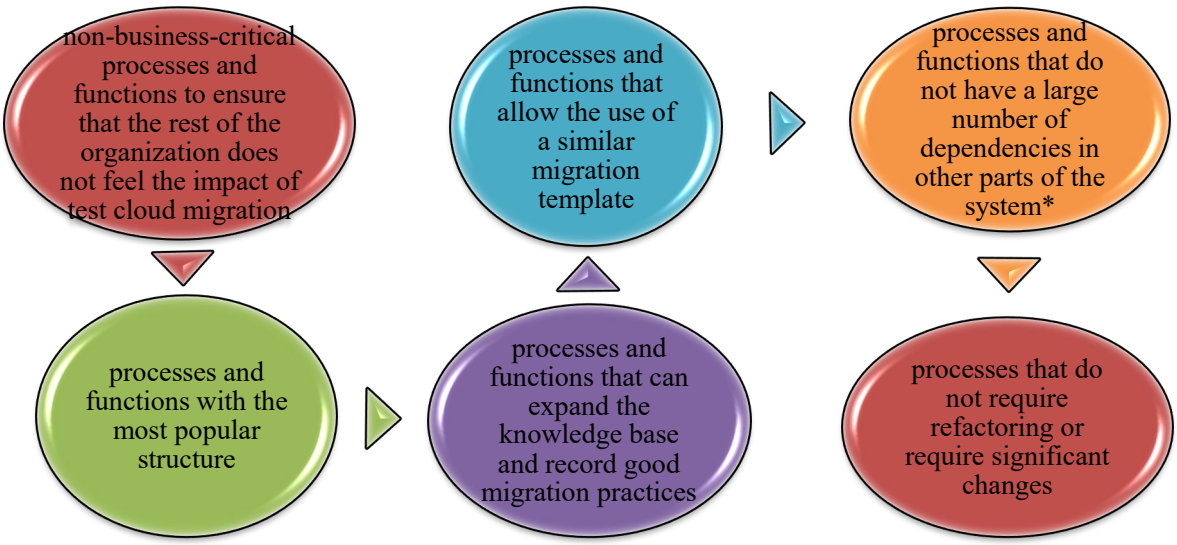


Fig. 5. The processes and functions to be selected for the first step of the migration of the management system of a services sphere cluster member and testing

Note

* in order not to have to make numerous changes to the management system at once, to make large amounts of data

Source: Formed on the basis of [1-2; 10-11]

Step 2: Planning the process of developing of own cloud management infrastructure. This step defines the foundations of the cloud infrastructure of the management of the services sphere cluster member (is being built on the establishment of organizational environment, establishment of certificates, and assignment of roles and access rights for workplaces). It is important to make sure that there is an opportunity to make changes to the infrastructure as needed. The main actions in this step are:

- confirmation of the user's identity (if the series are used from one panel); role and access provisioning;
- network design and connections for the management system**.**

User confirmation actions. These actions are carried out through the role and authorization center of the workplace. These actions are mandatory if you need to control access to all services that are used from one panel. In the Virtual Center Management Roles, you can assign roles to individual users (their work locations), services, or groups of users (their group work locations).

Types of users that can be added through the Virtual Center Management Roles

and authorization of the workplaces:

- account;
- account group;
- workspace account group;
- cloud identity domain account group;
- service account.

The characteristics of the accounts on the side of the Virtual. Center Management Roles and the authorization of workplaces are shown in Fig. 6.

After the authentication of workplaces or individual users in cloud services it's possible to start the process of creation of the resource structure of the management system using the virtualization of the structure of its organization, the project of processes and functions, allocation of segments for which access is granted and assigned to roles of individual users or groups.

This step should define the specific role and availability of the capabilities to make changes to the services and resources of the management system of a services sphere cluster member. To migrate cluster members must be assigned the following roles in a virtualized management system [1-3]:

• the management system administrator of a services sphere cluster member (manages visualized workspaces, manages access to workspaces and visualized workspaces panels, and establishes role hierarchy);

• the network administrator of the management system of a services sphere cluster member (creates and configures networks and network devices, balances cloud loads, and manages firewalls in collaboration with the security administrator);

• security administrator of the management system of a services sphere cluster member (establishes security rules and restrictions for employees involved in the management system and limits its resources, sets new roles in management systems based on adaptive organizational structures, and keeps a log of events);

• billing administrator (who sets up billing accounts in the system, and monitors resource usage and costs in the cloud).

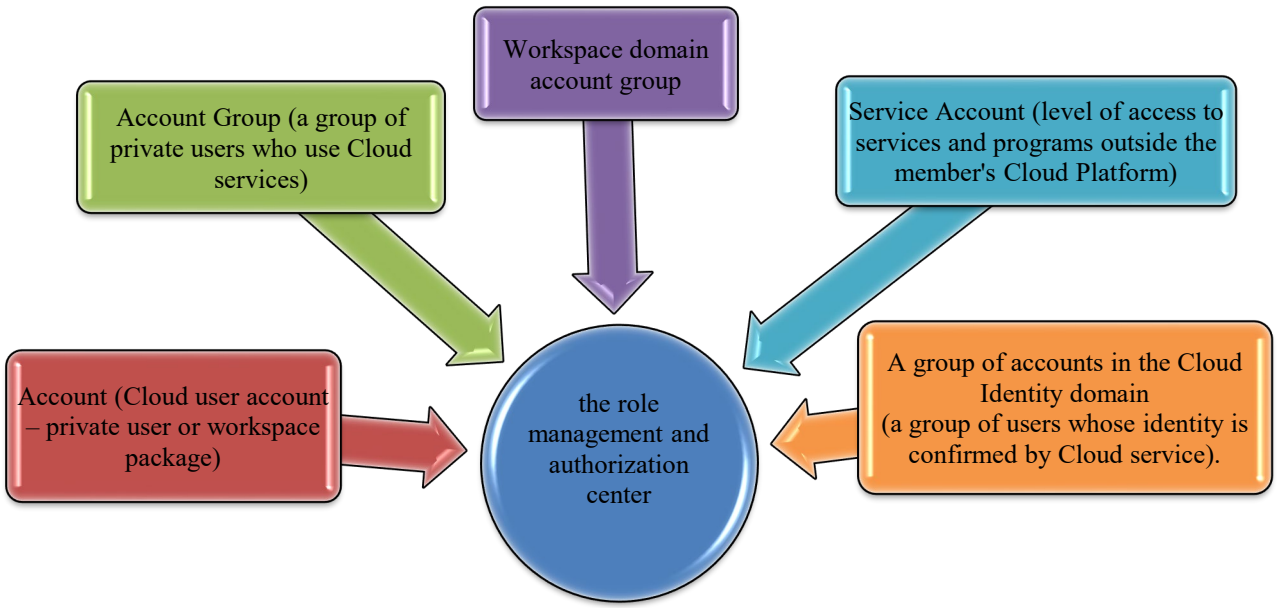


Fig. 6. The characteristics of the accounts on the side of the Virtual Center Management Roles and the authorization of workplaces

Source: Formed on the basis of [1-2; 10-11]

The design networks and connections found setting up a management system and creating a connection between an existing physical environment and Cloud**.** After setting up the management system network and creating a connection which a cloud and assigning executive roles, one needs to create at least one connection to the virtual cloud of the serves sphere cluster (for this it is necessary to install a firewall, its rules, and improve monitoring events with Cloud Logging service). Network and connection design actions allow sorting and combining individual elements of the management system that is carried by.

Step 3 - Planning the process of developing of own cloud management infrastructure. Defines the specificity of the migration process progress and application of the data transfer approach before the beginning of the migration of all programs into the cloud management infrastructure. The actions on data transfer before the beginning of the migration of all programs into the cloud management infrastructure smooth migration applications uses.

The planning of the migration itself to the cloud of a services sphere cluster member is oriented on different data storage options and data transfer methods. Basic data storage options for migration to the cluster member cloud are shown in Figure. 7.

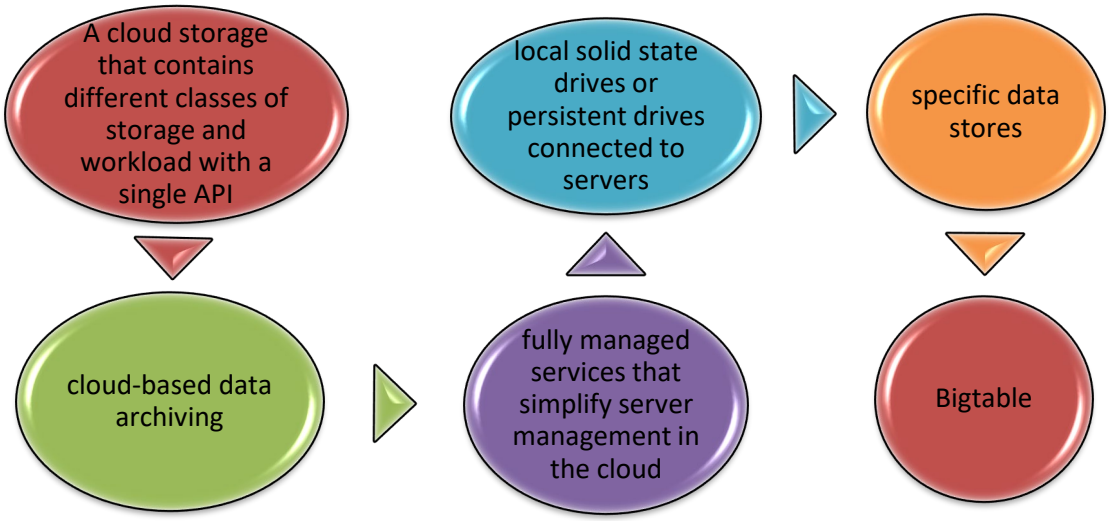


Fig. 7. Basic storage options for migration to a services sphere cluster member cloud

Note

*For example, NoSQL database is designed for processing large volumes of data and allows seamless integration with large data tools

Source: Formed on the basis of [1-2; 10-11]

For example, basic data storage options in the cloud include [1-3]:

1. a cloud repository that contains different classes of storage and workload with a single API (suitable for those participants in the cluster who plan to read or update their data every day);

2. a cloud data archiving (suitable for those participants in the cluster who plan to read or update their data about once a month);

3. local solid-state storage devices or permanent drives connected to servers (storage devices are connected to provide up to 3 TB of disk space per instance, but may limit availability, endurance, or flexibility);

4. fully managed services that simplify management of services sphere members in the cloud; specialized data stores (which automatically scales, allocates, or archives unused applications);

5. Bigtable (the database is oriented on large data with extremely low delay, intended for processing large volumes of data and seamless integration with large data tool/

Step 4: Optimization, search, and implementation process planning have been improved. Focused on processes of optimization, search, and implementation of

improvement of processes and functions of the management of a sphere cluster cluster member. The basic areas of optimization, search and implementation of improvements are:

- actions on formation, strengthening, and a team of specialists development;
- actions on round-the-clock monitoring of the participant management system; automation of processes and activities of performers;
- actions on simplification of processes and functions of management using code**;**
- actions to use automated managed services instead of manually managed services;
- actions on optimization of productivity and scale of the management system;
- actions on identifying opportunities for spending cuts on management systems.

Actions on formation, strengthening, and development of a team of specialists. All employees involved in the cluster member management system, as well as administrators and developers in the preparation and implementation of the migration, must receive valuable knowledge that is invaluable for the future use of the cloud's potential**.** This is possible based on [10-11]:

1) ensuring a high level of staff involvement and creativity;
2) studying staff competencies;
3) distributing cloud-based materials in the cluster member management system;
4) supporting approaches to the unification of automated workplaces;
5) creating a budget for further experiments or financing participation in hackathons and other events.

The more knowledgeable the team of specialists, the more likely the organization to form an effective, virtualized management system, regarding the processes of migration into the cloud.

Actions on round-the-clock monitoring of the management system of the participant. At this stage, the processes of continuous monitoring of services and processes that provide the functionality of the cluster participant management system should be planned. **T**his is because it is important to be informed about what is happening and what is the field for improving processes, implementing new practices,

and verifying the impact of changes on the management environment. Monitoring can be performed with the operations service (this service was formerly called Stackdriver).

Actions on automation of processes and activities of performers. All manual operations should be monitored, especially if they require a lot of time or affect the quality of service or management. If there are a lot of such operations, you should look for opportunities:

1) automation of key processes and updating of the configuration of operations (task setting and control, sales management, fixing indicators, and building organizational structure of activity of the member of the cluster);

2) automation of work operations and workplaces. In such processes, it is important to seek to reduce the cost of maintaining the solution and reduce the risk of error.

Actions to simplify management processes code uses. The experts of the management service should include as much information as possible about the processes in their code**.** This is possible by introducing processes such as "management infrastructure as code" (in particular: (1) infrastructure management, configuration management, or source code processes); (2) "management policy as code" (code-level policy management, such as compliance with security requirements or rules).

Using the code will allow the service sphere cluster member [1; 10-11]: (1) to achieve complete control of the management system environment of cluster member; (2) to simplify management and audit of cluster member; (3) to create the code using development through management system testing; (4) to quickly receive information about the change of the management system environment, which will be introduced by the planned modification.

Actions to use automatically managed services instead of manually managed services. Cloud Platform offers services to create automatically managed services (to unload the team and increase the flexibility of the management system environment and its scalability through upscaling and downscaling). Among such automatically managed services:

1) Sales management service (created for accounting of relations with clients);

2) Time and personnel management (in which systems where employees can leave applications for vacation, monitor working time, number of working and weekends);

3)ESP (content creation, work with prepaid, delivery of messages, etc.);

4) Provision and organization of the joint process of creation, editing, and management of content;

5) Building of organizational structure (will allow to create and apply the intelligence of the map and to build organizational structure**).**

Actions on optimization of productivity and scale of the management system. One of the advantages of management system virtualization is its access to unlimited disk space and computing capacity. They can be adjusted and adjusted according to the requirements of the management bodies, administrative units, and subdivisions of the service sphere cluster member, in particular [1; 10-11]: (1) scale horizontally of the system management (add or remove virtual machines, workstations, nodes of the cluster, or copies of the database); (2) scale vertically of the system management (change the functionality of workplaces, configuration of service); (3) create and correct routers' circulation of information in the of the system management of service sphere cluster member.

Pay attention to the fact that the management system scales a necessary property of the cluster system, its networks, and its process. This is because such property means the ability of the management system to increase the processing of volumes of information and to expand easily. In addition, to cluster cloud management, scalability may affect the ability of its subsystem to increase the overall capacity at increased load (in particular, when hardware resources are added: (1) to individual workplaces in cluster; (2) to groups of workplaces in cluster).

Actions to determine the possibilities of reducing the management system costs by monitoring consumption and related costs. This can be ensured based on [1; 10-11]:

1) use of transparent diagrams, tables, and reports (the review in the console of the amount of payment for a particular service, for project management);

2) portfolio of free services for tracking and forecasting the costs of any

combination of actions, measures and management methods;

3) use of discounts for the obligation to use the minimum level of resources.

4.3. Demonstration of practical implementation of cloud management.

The virtualized service cluster manager will be developed by us as a combination of modern technologies, principles, methods, cloud-based tools, and management forms aimed at increasing the efficiency of service sphere cluster members' work through the program and platforms running on cloud provider servers. Features of such management are the following: (1) high availability of workplaces and data by login and password; (2) cost reduction on processes and functions of management; (3) flexibility of workplaces of service sphere cluster members' (which can be used through the cloud from the computer, phone, and tablet); (4) functioning of the management system is transformed into a service, which should be administered; (5) simplification of technological management decisions; (6) functioning according to clearly defined program goals and ways of their achievement.

Management virtualization ensures the formation of a qualitatively new management model for the cluster of service sphere participants – cloud, for which practical implementation is obvious.

Demonstration of practical implementation of cloud management is a test carried out to confirm that the product or idea can be brought to the stage of a viable project. About 90% of the new models of cloud management of cluster members are affected by the fact that at their implementation technical experts do not look ahead (therefore, all problems and shortcomings of such model are determined in the process of its use). However, the Proof of Concept can determine the viability of the models of cloud management of cluster members before their implementation.

The stages of the proof of the minimum viability of the model of cloud management are [1; 10-11]:

Stage 1: Formulation of the concept (the service sphere cluster member should

clearly understand that it is in the management system that will be checked for viability: In which processes are planned changes, what shortcomings exist at present, and what changes are planned after the management system virtualization);

Stage 2: Collection of all necessary data for checking the viability of the model of cloud management;

Stage 3: Analysis of the experience of other service sphere cluster members on management virtualization;

Stage 4: Analysis of all available data on the viability of the model of cloud management;

Stage 5: Development of prototype management system model (the presence of even a partially functional prototype allows you to find shortcomings of your model and to quickly work on errors).

Thus, when the management system is virtualized, technical specialists use Proof of Concept (stages 1-4) to check certain assumptions (usually technical) and its prototype (stage 5) to check the application of the idea.

Proof of Concept (PoC) shows whether a virtualized management system or its function can be developed and a prototype shows how it can be developed.

Thus, when the management system is virtualized, technical specialists use PoC (stages 1-4) to check certain assumptions (usually technical) and its prototype (stage 5) to check the application of the idea. Proof of Concept (PoC) shows whether a virtualized management system or its function can be developed and a prototype shows how it can be developed.

The prototype is oriented on visualization of the model of cloud management (which shows how the result of management virtualization will look and how it will be felt). The prototype is a draft or the first attempt to make a working cloud management model.

The comparison of the contents and role of Proof of Concept (PoC) and prototype in the proof of the minimum viability of the model of cloud management is presented in Table 2. POC may break into a prototype or Proof of Concept (PoC) + prototype or vice versa during operation.

Table 2 - The comparison of the contents and role of Proof of Concept (PoC) and Prototype in the proof of minimal viability of the model of cloud management

Elements	POC	Prototype	complex Proof of Concept (PoC) and Prototype
The purpose of creation of an element of the proof of minimal viability of cloud management model	Test the idea or viability of the function	Check implementation, convenience and ease of use of several functions.	To create a viable product, making a minimum of effort
Element function	There may be one function of management virtualization	Multiple functions of cloud management model	Basic functions to ensure viability of cloud management model
Users of cloud management model and management virtualization result	Within the technicians team, staff of cloud management	Within the technicians team of cloud management	Service sphere cluster participants
Continued use	The implementation of the function can be used in further development management virtualization	Implementation of functions can be used in further development of cloud management model	First version of cloud management model
Value management virtualization	foundation for the future	Potential for possible modifications of cloud management model	The finished cloud management model
When designing	When it is not known whether an idea management virtualization or a separate function virtualization can be implemented	When the business case of cloud management model uses is not proven, risks are unknown	When the risks of cloud management model uses are minimal
Necessary resources for application	Need technical expertise to realize the idea management virtualization or a separate function virtualization	Almost no technical resources required of cloud management model, no development likely	Need technical expertise and resources to create of cloud management model
The result of application	effective concept of management virtualization	cloud management model of service sphere cluster	Demonstration of practical implementation of cloud management

Source: Formed on the basis of [1-3; 10-11; 12]

The demonstration of the practical realization of management virtualization is based on a Prototype, which is formed within the business of the a service sphere cluster member, and determines whether the idea is realized and which is the optimal

way for further development of cloud management.

The complex Proof of Concept (PoC) and Prototype is aimed at [1-3; 10-11; 12]: 1) confirming that management virtualization will be implemented according to the plan; 2) reducing the number of possible failures at later stages of management virtualization; 3) confidence of the party employees in the value of decisions that management virtualization; 4) saving time and money (compared to full development); 5) identifying staff needs and receiving feedback at an early stage; 6) lets you shape and look at the model, and plan how the user interacts with the apps.

The main advantage of the prototype is that a service sphere cluster member can quickly test the cloud management model for possible errors. Although the cluster member does not implement the model, it is possible to receive feedback from staff (test-makers). Then, based on the feedback of test technicians, technical specialists can quickly make changes to the existing model, release new versions of the model of cloud management or create a new prototype [1; 13].

The Prototype process uses tools such as user data flow, wireframe, or cloud management model layouts. Technical specialists draw the user's path and schematic appearance of the workplace interface within the framework of cloud management on paper, on board, or with special tools. After the development of layouts interactive prototype with a graphical interface is prepared. The prototype can look like a ready model – including the ability to scroll through images or view internal elements – but there is no line of code behind it.

Proof of Concept and prototype is the basis of the proof of minimal viability of the cloud management model of service sphere cluster. The minimal viable model of cloud management is its minimal functional version. This model contains a set of the most important functions, ready for further development and the addition of new elements. The least viable model of cloud management works as a fully operational product. It’s important to get feedback and an understanding of the direction of the move (whether to move in general or give up the idea from the beginning). That’s the prototype model of cloud management does not have many unusual functions, but includes only the main functions that provide its value. The combination of proof of

Concept and prototype provides the following functions [1; 12-13]: (1) helps minimize the cost of software development; (2) helps speed up the launch and delivery of valuable feedback in the long term; (3) helps to get early feedback (in particular, understanding what functions and processes are needed and what is not needed).

Proof of concept is an integral stage in the process of management system virtualization, transformation, and creation of a new model of cloud management. However, Proof of Concept was created to validate the concept of changing the cloud management model, for example, for significant refactoring of the program or transition to another infrastructure. The list of cases in which PoC should be developed is given in Fig. 7. In particular [1; 14; 12-13]:

1) creation of a new model of services sphere cluster cloud management (since the use of ready-made cloud tools allows to create of new models of cloud management faster);

2) implementation of new functions of the model of services sphere cloud management (machine learning and artificial intelligence for recognition of images of analysis of video content, etc.);

3) readiness to increase the level of implementation of services sphere cloud in management (the initial level of implementation of cloud in management model is rather small, and if the cluster participant wants to use cloud calculation more (for example, to transfer system elements to managed services), it should make changes in architecture and program code);

4) in cases where migration from the own server, from hosting, or from the virtual machine is carried out on a step-by-step model (i.e. transfer of the source code without making significant changes). In the case of a step-by-step migration of management to the cloud, the development of Proof of Concept will allow us to determine whether the migration is possible by recommendations, which volume of refactoring should be carried out, and whether it will be a profitable transfer of management to another cloud;

5) transition to another cloud from another infrastructure of management system.

The main elements of demonstrating the practical implementation of cluster management virtualization (complex Proof of Concept (PoC) and Prototype uses)

are [1; 13-14; 15]**:** 1) matrix of testing of cloud platform and cloud services (platforms and spheres should be tested in manual and automatic technology to prove the absence of deterioration of quality of management, to determine test case, which leads to deterioration of quality of management); 2) possibility of data management of the services sphere cluster management system (to define areas of berthing, search, and processing of data which can and cannot be automated); 3) possibility of reporting and portability of reports; 4) ease of setup and registration; 5) support for control of versions of cloud infrastructure; 6) expanded and customized interface (able to integrate with other tools); 7) permanent integration; 8) cloud communications of services sphere cluster; 9) cross-browser testing and testing of several platforms (when distributed testing environment is supported).

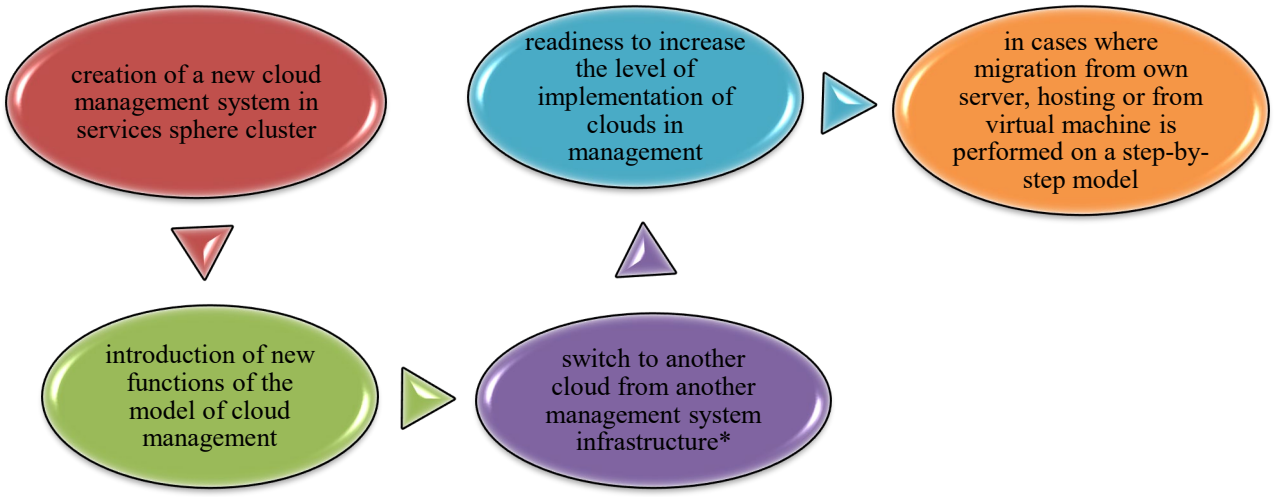


Fig. 8. List of cases when PoC is designed in the process of management system virtualization, transformation, and creation of a new cloud management model.

Note

* The need for PoC is caused by the fact that even when moving from one cloud solution to another technical specialists need to make changes, because not all generally available cloud services are closed 1:1. Often it is necessary to carry out refactoring, to adapt the architecture of the addition to cloud services.

Source: Formed based on [1; 13-16-17; 18, p. 41-46]

Demonstration of practical implementation of cluster cloud management should be primarily to define adherence to key principles of services sphere cluster management virtualization, to which we are referred [1-3; 14-15, 19, p. 338-340]: (1) reduce costs of data centers, server, and network hardware, hardware, and software of the services sphere cluster management system; (2) absence of the need to maintain

office premises of services sphere cluster members; (3) possibility of full access to a large volume of information at any time and place; (4) ensuring information security and continuous operation of the services sphere cluster management system.

Conclusions.

According to the results of the study, attention is drawn to the transformation of the environment of functioning of the services sphere cluster at the expense of gradual migration into clouds and realization of the management virtualization principles. Qualitative virtualization of the management of the services sphere cluster is determined by the possibilities: (1) reduction of expenses on the creation of data centers, purchase of server and network equipment, hardware, and software; (2) reduction of expenses on maintenance of office premises (due to formation of virtual working places); (3) reducing staff costs; of full access to a large volume of information at any time and place; (4) ensuring information security and continuous operation of the management system.

Attention is paid to the importance of modeling processes of gradual migration into the cloud of services sphere cluster participants due to the application of processes of demonstration of practical realization of management virtualization and linear forecasting of cost function by graphical method. The outlined measures, in the complex, provide information about the capabilities of metamorphosis, the volume of a storage or the throughput of clouds, the maximum number of users-participants, and the operation of the cluster management system. The outlined technique can take into account cases: replacement in the cloud; refracting; re-placement; reconstruction from scratch.

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CHAPTER V.
SYSTEMATIC APPROACH TO THE ORGANIZATION OF JOINT FUNCTIONS OF INTEGRATED ECONOMIC ACTIVITY OF E-SPORTS CLUSTERS

Introduction

Problem setting (description of the problem being analyzed in general and its connection with important academic or practical tasks). Despite Russia's war in Ukraine, the formation of e-sports clusters and it-clusters comprising e-sports clubs and their unification is taking place at an active pace within the sphere of services. The existence of such cooperation structures requires joint regulation of the activities of subordinate regulatory, regulatory, and activity of participants to ensure efficient operation of the economic and management machinery of such a cluster, economic, accounting, and analytical operations.

Analyzing the latest studies and publications which launched research in this field and to which the author refers. The classical basis of the organization of functions of economic activity and influence of administration on the functioning of cyber-sports clubs is the technique of regulation of actions of subordinates, which are identified and offered for use in research L. Nechauk, N. Telesh, M. Smirnova), as well as the labor regulation techniques of the subordinates, which identify and propose to use in researches L. Nechauk, N. Telesh, S. Sharapov. In addition to the above-mentioned techniques, there is a group of scientists (L. Nechauk, N. Telesh.) who puts the training of subordinates. However, it is specific that within the framework of the e-Sports clusters, such a method of regulation of the actions of the subordinates is necessary, aimed at regulation only, regulation, limitation of the activity of a considerable number of participants of the events and to ensure joint operation of the economic apparatus and control apparatus, provision of joint economic, accounting and analytical operations.

Formulation of goals (setting a task). According to the above-mentioned provisions, the research is aimed at forming a systematic approach to the organization of common functions of integrated business activity of e-sports clubs. The following

research tasks must be solved to achieve the goal: system description of techniques for organization common functions of eSports cluster participants; formation of the author's approach to the organization of joint functions of integrated economic activity of e-sports clusters participants.

5.1. System description of techniques for organization common functions of eSports cluster participants

The main techniques for organizing joint functions and interaction of eSports clusters participants organize are different regulations, among which are provisions about:

- club departments (e-playing fields, accounting, planning department, etc.);
- management, job instructions, standards, graphics, operating instructions, working day rules, etc. [1].

At the same time, the application technique of activities regulation of the subordinate integrated economic activity leads to interference in the activities of e-sports clubs and the bureaucracy of influence.

The techniques of eSports cluster participants' labor regulation aim at establishing norms and standards guidelines for the economic activity of eSports clubs. The main techniques of joint functions organization, unification, and arrangement of the interaction of their elements are:

- time norms formation (oriented on the determination of the size of working time expenses for the performance of a unit of work);
-production (oriented on the setting of the volume of rendering of services or work on each operation, which should be performed (provide, etc.) per unit of working time);
- service (which is content-oriented to establish requirements for club participants (units of equipment, places for gamers, etc.), which should be serviced during working time unit) [2, 3].

It’s not advisable to give up the labor norms of the subordinates. According to the subordinate's labor norms, its obvious orientation on such techniques application, within the framework of integrated economic activity, will lead to the fact that

responsibility for the quality norms and personnel norms are concentrated in a single center this problems forms [3, p. 99].

The training of subordinates focuses on [1]:

- clarification, acquaintance (with working conditions, tasks, and obligations of club employees within the limits of the functions of economic activity);

- regulatory impact on the functioning of e-sports clubs (through consulting or establishing rules for the operations performance that belong to joint functions).

The main techniques of joint functions organization, unification, and ordering of interaction of their elements are the formation of the educational support (instruction on planning and conducting of general competitions of different levels, instruction on quality control of the production of the product, total rendering instruction of services of a professional sports coach, teachers, coaches, etc.). The disadvantages are that the generalized content of the training of subordinates is within the framework of integrated economic activity.

The main feature of the integrated administration of the activities of eSports cluster participants is that it's aimed at the unification of e-sport clubs with different common functions, which within the framework of the implemented unified operations (functions elements) are the basis for building the integration process. From this, it follows that a list of functions should be defined and agreed upon by each participant (to this end, the cooperation protocol may be drawn up). However, account the shortcomings of the aforementioned, methods of organizational influence, their application in such conditions is impossible, in connection with the peculiarities outlined in Table 1.

Table 1 - Specific needs and disadvantages of organizational impact methods within the framework of integrated economic activity of eSports cluster participants

Method	The needs that arise in the application	Disadvantages that arise in application
1	2	3
Regulation of the actions of subordinates (suggested by	- the coverage of the regulation processes, regulation of all cluster members, and limitation of their activity;	- interference in economic, accounting and analytical activities of e-rsport clubs, without taking into account its specificity;

Continuation of the Table 1

1	2	3
Nechauk L., Tesh N. [1], Smirnova M. [4])	- separate approach to ensuring the operation of the economic apparatus and control apparatus for each common function; - detailed economic, accounting, and analytical actions within the framework of each common function operation for each cluster member; - need in the system of registration of organizational regulations.	- the bureaucracy of influence within which the situation of domination of the form of execution of operations over their content may arise due to the substandard criterion of achievement of the target result criteria of observance of the form of execution of work; - a significant number of organizational regulations that duplicate the functional duties and responsibilities of the executive; - difficulty of reviewing and amending organizational regulations.
Labor norms of subordinates (suggested by Nechauk L., Telesh N. [1], Sharapov P. [3])	- establishment of norms and standards which are relevant for the economic activity of all e-sport clubs; - the need to constantly review norms in connection with the dynamics of economic processes (determined by the format and requirements of the game process).	- the distance from the playgrounds of individual clubs*; - not timely respond to the needs of individual clubs (regarding specification/revision of norms and business processes)*; - average data on actual labor costs, the efficiency of its use, volumes of operations*; - the risk of overpassing the form of transactions over their contents.
Training of subordinates (suggested by Nechauk L., Telesh N. [1])	- centralized explanation, acquaintance with the conditions of work; - clarification of tasks and duties of employees of all e-club members of the cluster; - maintenance of staff of consultants (for constant consulting of all club participants employees, concerning rules of performance of operations of common functions).	- no opportunity to create instructions with detailed content for acquaintance with production conditions that affect the effectiveness of realization of common functions (due to improper handling of equipment, etc.); - generalization of training, tasks, and duties of employees can lead to disruption of operations, an extension of operational cycles; - the risk of overpassing the form of transactions over their contents.

Note

* problems arise because the responsibility for quality of norms and labor standards is concentrated in a single center that forms the following problems.

Source: formed by the author based on [1; 2; 3; 4]

Admit that within the framework of the outlined process, a qualitative approach of administrator system of joint functions activity organization of eSports cluster and participants operational aspects is necessary, which won't create a domination risk of the form of execution of operations over their content. We believe that elements of

subordinates' labor regulation are preserved for the input and output normative values of set coordination (rules, standards, and operations rules). It's because the developers and legal owners of the e-sports games set requirements for: (1) the time of operations (among which competition and training sessions); (2) the form of internal technical requirements which should correspond to a separate operational action, the number of production objects of clubs (arena, tournament operators, platforms of video hosting, companies on the organization of online broadcasting). Regulation should help to avoid mistakes in the performance of those business operations of e-sport clubs, according to which they are inevitable in case of non-compliance of some operational actions with the normative requirements [5].

5.2. Approach to joint functions organization of integrated economic activity of e-sports clusters participants

The organization approach of joint functions of integrated economic activity of e-sports clusters participants should ensure the elimination of the risk of domination of the form of carrying out operations on their content. For example, each function should be switched or logical, namely the function (y), and each of its elements (xi) can form values from a set that guarantees or does not guarantee the achievement of the target result. We believe that such an approach uses a Boolean algebra that defines each joint function (B) as multiple logical elements (XI) that form them and simultaneously provide information processing in a digital form. At the same time [6; 7]:

1. logical elements perform logical functions (communication operation) on input signals (operands, normative data);

2. function (y) and each of its elements (hi) accept values only from the set {0,1}, namely, set in which they guarantee (0) or don't guarantee (1) achievement of the target result according to their compliance with the normative requirements (i.e., two logical operations performed);

3. each joint function should be considered a separate administrative entity, which

should be effective according to the linear method and calculation algorithm (often used to evaluate employee operations or evaluate individual operations, operations, etc.).

In other words, the joint function effectiveness, in terms of impact on the e-sports cluster function, will be considered as the ratio of the actual result to the planned. The same can apply to each operation that forms this function of joint activity.

Under these conditions, each organization of joint functions provides for combining and organizing the interaction of logical elements according to their functional connection (under which we understand dependence, under which each meaning of one sign corresponds to the specified value of another [8]). At the same time, m is the number of outputs (logical elements) that can expect to be infinite, so it's expedient to organize each of the functions of the integrated economic activity of the cluster only by most essential logical elements or by the basic algorithm:

$$y=f(x1, x2, \dots, xn) \text{ in multiple only } \{0,1\}, \quad (1);$$

де: x – element (or the basis of the digital form processing system); n - the number of inputs (variation of element values).

Since to the rules of Boolean algebra, for the qualitative organization of joint functions of cluster members, unification and ordering of functional interaction of operations or actions of employees of all club participants are necessary to refuse the formation of integrated norms, regulations, and instructions.

Refusal should favor simple schemes with logical elements that use the main combinations of input and output normative values of general elements (operations xi). These elements, in aggregate use, provide the desired result of each separate joint activity function.

Logical element schemes define the main system elements (the operations themselves, depending on whether they correspond to the normative requirements) and conditional logical parts to determine the functional correlation of these operations (on the basic types of their connection: inverter operations; disjunctor operations; conditionally disjunctor operations, Pirson operations (or conditional conjuncture

operations), unconditional connection operations, two operations eliminating link, reserve operations of unconditional conjunctions, Shepherd operations or denial of conjunctions).

The above relationship type distribution is conditional on the content of a Boolean variable joint function supplemented by other types of functional association (if it separates in the formation of logical elements of the cluster members' integrated activity function) [8].

The Boolean variable operations of joint functions with normative requirements are available if operations depend on the sequence or duration [9]. Since the highlighted content of functional transactions (as logical elements) of the joint function of integrated activity is the main, we propose to standardize them according to the format of the IEC allows to mark and draw the above types of operations communication (X1…Xn), according to the scheme shown in fig. 1.

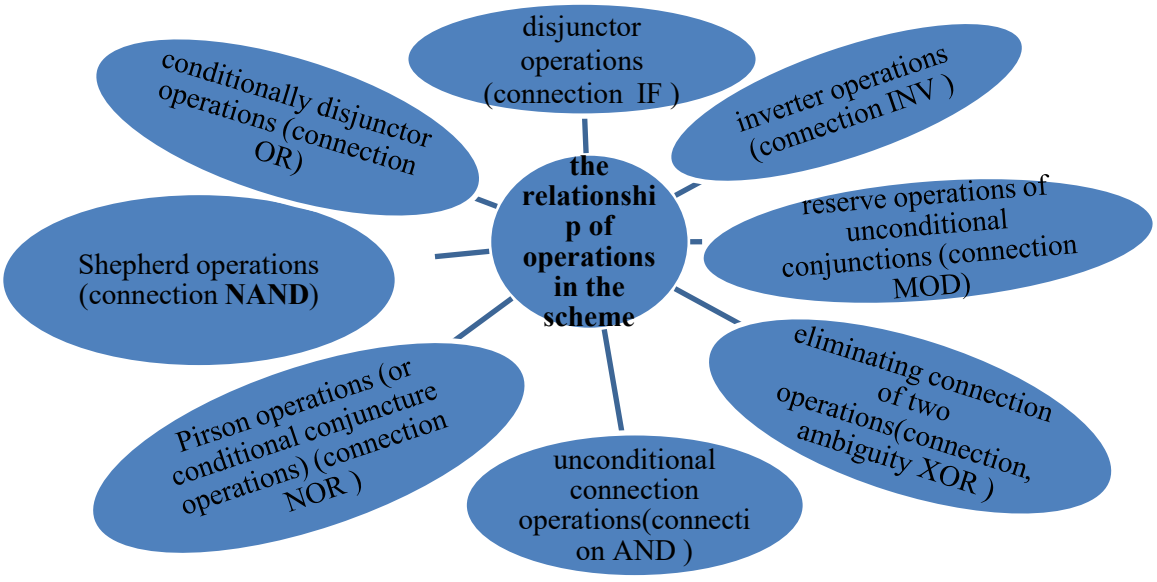

Fig. 1. Operators of operations communication in the logical elements scheme of the joint function of integrated economic activity in IEC format

Note

* disjunctor operation, conditionally disjunctor operation, and Shepherd operations can lead to the occurrence of race states (which are the wrong situation during the operation due to its non-compliance or partial compliance with the regulatory requirements).

Source: Formed based on [8; 6; 9]

Let us consider more detailed information (highlighted in Fig) about the contents of the conditional logical elements proposed to be standardized according to the format of the IEC, having introduced the following types of operators of operations (X1…Xn) and their characteristic marks on their functional connection types with the result of each separate joint function of integrated economic activity (B):

- connection operations INV (or logic element «NOT» indicates a logical denial of the functional impact of the operation on У). Marks inverter operations or such can ignore because even if they comply with regulatory requirements, they do not directly affect the effectiveness of the joint function of integrated business activity [8-9];

- connection operations IF (or logic element «or») indicates disjunctor operations, or which that do not provide (or reduce) the effectiveness of the joint function of integrated economic activity if at least one of them does not meet the regulatory requirements;

- connection operations OR (or logic element «or», «2or» with a possible expansion to «n»). Indicates conditionally disjunctor operations, or those that ensure the effectiveness of the joint function of integrated business activity, then and only when at least one of them meets the regulatory requirements [9, p. 155];

- connection operations NAN*D* (or logic element «2 and-not» with a possible expansion to «n»). Indicates Shepherd operations or denial of conjunctions (or joint operations of 2 and more subjects), which, according to the partial compliance with the normative requirements, do not ensure the effectiveness of the joint function of integrated economic activity;

- connection operations NOR (or logic element «2or-not» with a possible expansion to «n»). Indicates Pirson operations (or conditional conjuncture operations) (спільні операції 2-х і більше суб'єктів), which, even if partially compliant with regulatory requirements, provide an inversion (transformation) of the effectiveness of the joint function of integrated economic activity;

- connection operations AND (or logic element «and», «2and» т.о. with a possible expansion to «n»). Indicates undoubtedly conjunctions operations (or joint operations of 2 and more subjects), which, in any case, provide an inversion (transformation) of

the effectiveness of the joint function of integrated business activity (applied for related operations, for which resource providers and other services required and which aren't performing, until all related operations of suppliers are performing);

- connection operations XOR (or logic element exclusion «or»). Specifies the excluding connection of two operations for which the regulatory requirements are hard to obtain, the result of which is available then and only when only one of them is involved in the joint function;

- element with three outputs MOD (or logic element which indicates reserve operations of unconditional conjunctions, which can't include in the joint function of integrated economic activity, but if it combined to influence the efficiency, under certain conditions).

Each operation of the common function of integrated business activity of e-sports clusters can be defined as a set of operational actions (which can also consider as Boolean variables and can be described, as conditional logical elements of communication [11; 8]).

According to the above, a systematic organization approach of integrated economic activity functions should use function schemes in which the operations with logical elements of their connection with the result are allocated. In addition, to logical parts of integrated economic activity joint function uses, the Karnagh map can form. It is possible because of the contents of Boolean variables (from the truth table or regulatory requirements) and their ordering according to the Gray Code principles (coding of information in which two consecutive codes differ by the value of only one number). Characteristics of Karnagh map types and peculiarities of the arrangement of contents of Boolean variables are shown in Table 2. Accordingly, the contents of the Karnagh map are similar to the:

- contents of the truth table (which is an element of the table interpreted as a variable);

- formatted in a special way (in the form of the expanded n-dimensional Boolean cube);

- suitable for the point-to-point manual minimization of joint function contents.

Table 2 - Characteristics of Karnagh map types and peculiarities of arrangement of contents of Boolean variables are given in Table 2.

Types	Semantic content	The arrangement of data features	Formalization features
Card operations (variable of which there are separate operations)	The matrix consists of cells, the number of which is equal to the number of sets of normalized operational actions, which are variable operations. Each cell corresponds to a certain set of instructions.	Extreme matrix cells always match combinations 00 and 10. If the cells are neighboring, they are different from the same. Zero in the matrices unfixed, only units, reducing their size	If the operation is a function of n variable (operational actions) described by m types of regulatory requirements, the matrix m×m.
Card functions	The matrix consists of cells, the number of which is equal to the number of sets of operations with a certain connection, which are variables of the joint function. Each cell corresponds to a certain set of operations.		If a common function is formed by n variables (operations) executed by m participants, formed the matrix m×m

Source: Formed based on [11; 8]

At the same time, on the edges of the Karnagh map, we offer to place columns and lines (operations of functions, actions) at their intersection to specify joint variables are presented in direct form.

To minimize the content of the matrices that form the content of the Karnagh map, the principle of minimization of Boolean variables based on the Quayn method, In particular, searches for the most effective, from the point of view of influence on the functioning of e-sports clubs, joint operations of 2 and more subjects, based on equal logic of replacement of individual operations [11; 8]:

1. identity acquisition (formed by finding the format of the joint operation of e-sport clubs, which absorbs most of the homogeneous operations but does not cover them by efficiency).

2. identity bonding (formed by combining the single operations of e-sport clubs into one joint operation that completely covers them in performance. Bonding is only subject to operations that differ by inversion (opposite) only one variable (or action);

3. distribution law association (formed by combining the individual operations of e-sport clubs into one common one, which will benefit from the results).

Distribution law unification is subject only to those operations that do not differ in version (or by contraindication of changes or actions) and do not contain operations of the switch connection. At the same time, Quine's method should give an advantage to the perfectly divided normal form of joint operation or to the perfect conjunctive operation form, the properties of which form when combined operations. After obtaining the minimum form of joint function of integrated economic activity, possible to build the most effective logical scheme, provided that not characterized by critical tension.

It is obvious that in this form, it's possible to form the most simplified kind of such function through the following advantages:

1. forming templates to identify the types of operations to be combined with links to obtain a simple expression of the effective joint function of integrated business activity;

2. identify and remove potential inverter operations and operations of exceptional connection (such as those that create difficulties while performing a joint function);

3. determination of the state rush (a situation in which a separate operation of the joint function of integrated economic activity has disjunction, conditional, disjunction type of connection or is related to Shepherd operations), inevitable in connection with the risk of non-compliance of certain operations with the normative requirements. If the operation doesn't meet the regulatory requirements, the performance of the function and the result of the operation depends on the sequence or the duration of its operations;

4. content simplification is the joint function of integrated business activity to six types of transactions, with a significant variable number of requirements defined by the types of regulatory requirements. The advantage is given to joint operations of 2 and more subjects. It makes simplify to find the optimal transaction templates.

Thus, the Karnagh map will achieve:

- effective distribution of operations by individual workers and groups of e-sport club employees;
- coordination of the contents of the operation within the framework of joint functions of integrated economic activity.

Such features of the organization of functions of integrated economic activity are caused by the fact that their most important sign is that it always produces a joint result on the incoming value. The input value is often called the function argument, and the output value is called the function value.

Conclusions.

The development of a systematic organization approach of common functions of integrated economic activity accounts for their influence on e-sports clusters functioning based on the new administrator system will not create a risk of domination of execution of operations over their contents. Although, it's important: 1) to keep separate elements of labor regulation of subordinates (because they are necessary for planning, control, and coordination of input and output values of common elements); 2) to eliminate the domination risk of the form of operations over their contents each function should be switched, or logical. It can assume that the whole function and its elements can form values from a set that guarantees or does not guarantee the achievement of the target result. Thus, a systematic organization approach of joint functions of integrated economic activity of cluster members should be oriented on a Boolean algebra to identify each function as multiple logical elements forming them and simultaneously provide conversion of information in a digital form.

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CHAPTER VI.
TYPOLOGY OF THE SAAS-BASED MANAGEMENT SYSTEMS VIRTUALIZED ON THE TOURIST CLUSTERS EXAMPLE

Introduction.

Problem setting (description of the problem being analyzed in general and its connection with important academic or practical tasks). At present, each member of the service sphere cluster is committed to integrating the management system and set of computing resources for their logical integration into a new system, characterized by the isolation of internal management and computing processes performed on a single physical resource. According to provided studies (chapters 1-3) it's stated that all available virtual management systems of service sphere clusters can be detailed on types of supported services. Namely, possible to divide it into three types: management systems IAAS; management systems PAAS; management systems SAAS. The specific for virtualized management systems of service sphere clusters is that each of them is specific, formed, and functioning according to the subscription model (i.e. each of the services, whose element is used only when necessary). Taking into account the new features and processes of the virtual management system the existing types are unconsidered in scientific literature enough. In particular, there is unspecific information regarding possible sub-types of the most comprehensive SaaS model, peculiarities of its service provision, and support functions for the client (which in this case is a cluster member). This is most clearly can be seen using the tourism clusters example, which focuses mainly on such models (because of the dominance in their structure of small business entities participants).

Analysis of recent researches and publications, in which a solution to this problem has been started and to which the author refers. The general provisions regarding the details of the virtualized management systems of the service sphere cluster are little explored. Some aspects of this issue are discussed only at the level of accounting, taxation, or reporting. In particular, Mykhailylovina S., Matros O., and Polishchuk O. learn the peculiarities of the accounting and taxation system virtualization. Lyubov M. and Kulik V. study the possibilities, threats, and prospects

of using cloud technologies in accounting. Mazina O., Oliynyk V., and Rogozny C. learn the specifics of the development of SAAS-based accounting and reporting systems. Therefore, the provisions concerning the details of the virtualized management systems require systematic detailing and study.

A similar problem concerns the peculiarities of service provision of management virtualization. These issues are surface mentioned in the works of Kulik V. and Lyubimov M. on the possibilities of using "cloud" technologies of SAAS-based accounting. The virtualized management specifics of SAAS-based aren't considered, including service sphere clusters in general.

Formulation of goals (setting a task). Since the above provisions, the research purpose provides peculiarities of service provision describe, virtualized management systems typology study on the example of tourism clusters. For this purpose the following research tasks need to decide:

- Systematization and description of modern features of service provision of the SAAS-based management system of tourist clusters;

- Concretization of the typology of support of functionality of the virtualized SAAS-based management systems for tourism cluster participants.

6.1. Modern features of service provision of the SAAS-based management system of tourist clusters

The management systems of tourism clusters are virtualized SAAS-based mainly. This is because such system use does not require any special calcification (the system is simpler than the PAAS-based and IAAS-based). The SAAS-based management system of tourist clusters provides a ready-to-use solution for a client with minimal configuration requirements. In particular, cloud service providers offer:

- computing resources on-demand;

- network resources on-demand;

- accumulation of resources on-demand;

- responsible for the protection of basic computing services.

The specific is that the SaaS-based management system is quite effective with minimal involvement of the system administrator or without it. The peculiarity of such a system is the variety of modifications of network services, which allow information tools of the virtual environment to expand the program and technical resources of the management system of the tourism cluster participants.

It is obvious that at present, several basic SaaS services can be allocated, which are widely used for management system virtualization, in particular [1-2]:

- Management of relations with clients of the tourism cluster participants (CRM);
- Planning of resources of tourism cluster and its participants (ERP);
- Marketing of tourism cluster and full participants by e-mail (email-marketing);
- Accounting and tax accounting for small business owners;
- Management of operations of the personnel department of the cluster members;
- Management of security of tourism cluster members.

So, the service of the management of relations with clients of the tourism cluster (CRM) efficient for virtualizing client-to-client strategies of cluster members. In particular, the following areas are involved in tourism:

(1) to increase the level of service sales;

(2) optimize marketing and improve customer service of the cluster based on the accumulation, processing and customer information use;

(3) storing the historyof relations with tourism cluster clients;

(4) establishing and improving business processes and results analysis.

CRM-services can be detailed by types:

- customer service at service points (in particular, support of autonomous, distributed or centralized processing of information);
- customer service through authorization of operations and operational reporting;
- distributed sales support service (services contain data reprints at the points of sale or smart card);
- servicing clients through analytical system or data storage.

The system can perform the following virtualized functions:

- automated sales management;

- marketing management, client servicing management and call centers (in particular, for this function we offer to allocate systems for processing customer calls, fixing and further work with customer appeals).

Service of planning resources on tourism cluster and this participant (ERP). This service is good for virtualizing key business processes and managing these processes to achieve optimal performance. In particular, the following areas are involved the sphere of:

(1) Correction of data flows between corporate business processes;

(2) Providing reliable data for business process optimization;

(3) Business process optimization in the cluster (namely, area of finance, logistics, product sales, reporting, production, and personnel management).

The system can perform the following virtualized functions:

- automated exchange of data with other systems (in order to increase visibility and flexibility of data for employees and help in the accelerated development of measures for achieving large results);

- automated analysis formation, which ensures decision making and defines directions of operational efficiency improvement;

- change of production planning (which are adapted and scaled according to business needs).

Service of marketing of tourism cluster and cluster participants by e-mail. Such service is based on the use of e-mail for promotion of cluster services. In particular, the following areas are involved in the service sector [1]:

1) automated informing of clients (from newsletter database) about new products, discounts and other services;

2) automated attraction of potential clients;

3) automated increase of brand recognition;

(4) automated construction of relations;

5) remote support of attraction of clients between purchases (different types of marketing e-mails using).

The system can perform the following virtualized functions:

(1) distribution of advertising letters;

(2) distribution of information letters;

(3) a message that provides a resumption of communication with clients and subscribers who have not recently detected activity.

A service of accounting and tax accounting for small business. This service is used for the virtualization of accounting and tax accounting systems. In particular, the following areas are involved in the service sector:

1) automated financial reporting that helps business owners make informed business decisions;

2) automation of processes related to analysis, tracking and recording of all financial operations of cluster participants;

3) converting numbers into clear and understandable statements that identify and show the losses and profits of cluster members.

The system can perform the following virtualized functions:

- automatically generate accounting data (allows to enter operations with keyboard and mouse);

- create a system of accounting and tax accounting;

- to provide tracking of the account from the account of business owners;

- provide hiring professionals online to help you complete accounting work.

Service of operations management department of personnel of the tourism cluster members. Such service is used for the virtualization of accounting and tax accounting systems of enterprise personnel. In particular, for tourism sphere, the services cover the complex of tasks performed by the personnel department, and allows to automate its work, including to store in the program external documents of any formats (with connection to a specific worker), to maintain a time record of spent (with the possibility of transfer to the program of salary calculation).

In particular, for tourism sphere, the services cover the complex of tasks performed by the personnel department, and allows to automate its work, including to store in the program external documents of any formats (with specific worker

connection), allow timekeeping of hours worked (with the possibility of transfer to the program of salary calculation).

Security management service, which is aimed at protecting cloud management systems and data (from internal and external threats)**.** For the services sphere following directions used:

– prevention of unauthorized access and data leakage;

- physical networks protection, including routers, electrical systems, data, storage devices, servers, apps, operating systems, software and hardware.

The system can perform the following functions:

- tracking and deleting of the affected accounts;

- monitoring of the software and hardware cloud software vulnerabilities in management virtualization;

- determination and elimination of internal threats.

At the same time, clients are required to protect their own programs, data, execution environments and intermediate software. In addition, existing collaboration services such as Amazon Chime, document editing (such as Amazon WorkDocs), Communication and contact centers (e.g. Amazon Conne).

The SaaS-based virtualized management systems of tourism clusters is a "system" of design, which is supplied. Thus, its functioning is connected with a number of drawbacks, which complicate internal processes. These disadvantages include:

1. Insufficient security of data functioning in the management system of a cluster member. A cluster member must resolve identity management and job access management issues on their own before starting SaaS-based management virtualization. This problem is becoming more acute in the case of:

-availability of the need to workplaces access of employees from a mobile device;

- availability of the need protect against counterfeit or harmful programs that collect personal information from users.

This problem is aggravated by the large scale of network virtualization and data transmission systems.

2. Problems with compliance with GDPR rules in the management system of a

cluster member (which includes all data collection, shared access and data destruction). For a virtualized management system, the rules of operation of processes and software are necessary. In particular, the following should be specified:

– correct requirements for the service provider (regarding the elimination or disposal of digital content, the form of data processing and its encryption in the cloud);

- orders to solve any discrepancies in this process;

- to implement the decisions in advance;

- respond adequately to privacy violations or data breaches.

Lack of proper control over data in the management system of a cluster member (as external solutions). The main difficulty is that control over the data of the virtualized management system of a cluster member owned by a third party.

3. Specificity of contractual obligations of the service provider and cluster members. In particular, the obligations to share contacts in the virtualized management systems of cluster member of and SaaS provider will be different. In this connection, third-party contracts may prevent customers from sharing data with suppliers because confidentiality may be broken.

4. Lightning-quick data mobility in platform change situations needs a process of managing the virtualization of a cluster member. In particular, critical data transfer from the management system is always a problem, and the standards of the new service provider often limit the data transfer. Therefore, the cloud services providers' change requires the temporary suspension of all management processes. Lightning-fast data mobility depends on the data type, location, and ability to organize alternative storage. Important to avoid situations of long-term blocking of management processes.

Limited virtualization of the cluster member’s management through the browser-based program featuresthat located outside. This program is unblocked through the Internet, which often imposes restrictions on the productivity of processes of the cloudy management of the tourist enterprise. This is due to the following features of SaaS:

1) works slower than local client programs;

2) works slower than server programs;

3) functionality depends on the speed of the internet, which is quite problematic

in the conditions of energy infrastructure damage.

In addition, travel cluster members who use multiple SaaS applications or want to connect SaaS to existing local management virtualization appls have problems with software integration.

6.2. Concretization of the typology of support of functionality of the virtualized SAAS-based management systems for tourism cluster participants

Each SaaS for clients of the tourism cluster uses free basic services and additional paid services. They are needed to support the functionality of virtualized management systems by:

- virtualization of the management system platform (separation of system operating processes from its resources takes place);

- data storage virtualization (there is an abstraction of the logical data storage of the management system from its physical storage);

- network management virtualization (creation of a virtualized address space within a network or through existing subnetworks of the system).

At the same time, typology is not only in the difference in basic and paid services, but also in the orientation to specific cluster members and the general usage of such services. According to this, the typology of the SAAS-based management system of tourism clusters is as follows:

- Taxer – it's a cloud-based solution for the management system virtualization of all cluster participants, regardless of the direction of its activity.

The main functionality of paid services is fairly wide. The basic version is specialized on:

1) remote generation and submission of tax reports;

2) instant payment of taxes or receipt of requisites;

3) accounting for small business entities;

4) automatic creation of acts, bills, etc.;

- Serpstat is a cloud-based solution for the management system virtualization of cluster members, which requires the active use of information and advertising services. Basic services replace the services of the search marketing agency. These services are useful for intermediaries between travel agencies and companies in the tourism industry. At the same time, paid services provide the widest possible opportunities for remote management of SEO services and based on full analysis and keeping of SERP`a, open possibilities for:

- storage of full history for all objects;

- market share tracking;

- distribution of traffic between domains;

analysis of the dynamics of the market share change;

- local search with accuracy to the city;

- analysis of zones for possible references etc.;

- WORKABOX (Silver Cloud Partner; Golden Cloud Partner) and bpm'online sales it's a "cloud" solution for the management system virtualization of the cluster members, which belongs to the sphere of travel-carrying of the Union, can be carried by intermediaries between travel agencies and enterprises of the tourism industry, tourist organizations which offer their clients own complex of services. Робота з віртуалізованою систмою проходить через веб – браузер [3]. This virtualization is only done on a fee-based basis, but is based on a limited time (in particular during 14 days). During this period, cluster members are able to use the same service functionality as in the paid version. After the end of this period access to the service will be terminated. The main functional capabilities of the management system of the tourism cluster based on WORKABOX and bpm'online sales are shown in Fig. 1.

- GitLab - it's a a cloud-based solution for the management system virtualization of any member of the tourism cluster. The system works on open source code, , which is a code repository management system for Git, bug tracking, CI/CD unit and other functions. Cloud services were first created for the virtualization of management systems of companies on software development. Later, GitLab turned into an integrated solution that covers the entire life cycle of services for joint management of

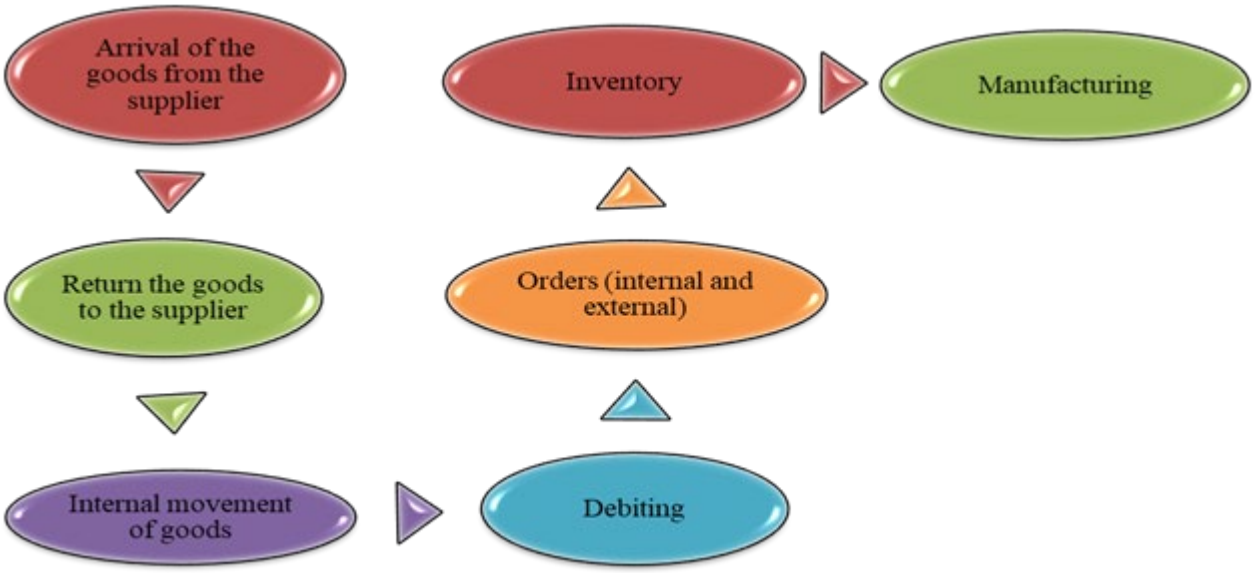

Fig. 1. Main functional capabilities of the WORKABOX-based and bpm'online sales-based management system of the tourism cluster

Source: constructed by the author based on: [3]

service production, which is jointly produced by several cluster members. Paid tours integrate into a single environment of options on the choice and use of vehicles, accommodation and service, travel insurance, excursion services (including services of a guide, personal assistant, interpreter, etc.);

- iFin it's a "cloudy" solution for the management system of the tourism cluster members created for any of its participants. Free services provide wide opportunities for internal interaction of participants, accounting and tax accounting of participants, inventory accounting, inventory, etc. For paid versions, the main features are [5]:

- automation of digitization, the output of data and related errors, acceleration of goods acceptance;

- possibility to get rid of confusion with the initial documentation and the report nomenclature;

- optimization of personnel labor (by way of their release from mechanical paperwork);

- saving up to 90% of the budget for consumables and mail services (printing and storing of paper versions of documents);

- timely closing of the issue of obtaining tax credit survey;

- the opportunity to become a convenient partner provides all necessary documents in time.

The main functionality of the management system of the iFin-based document management cluster is shown in Fig. 2.

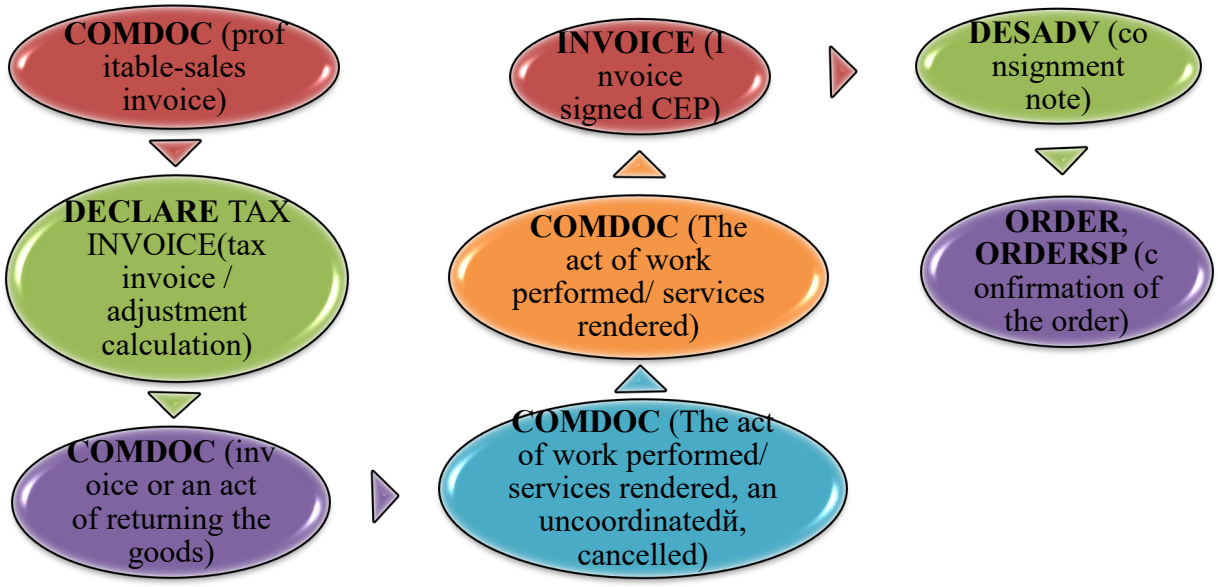

Fig. 2. The main functionality of the management system of the iFin-based document management cluster

Source: constructed by the author based on: [5-6]

The paid version of the services in the cloud creates opportunities for constant, contact-free interaction on the scheme – a member of the cluster – a supplier – a state fiscal service. At the same time there is an opportunity to develop an individual type of document for the network, integration with any accounting systems (free and paid solutions; compliance with the law of Ukraine, time marks on the formed documents);

- Worksection it's a "cloud" solution for the management system of the tourism cluster participants, which belongs to any direction – tourist operator, tourist agent (ideal for growing companies need to systematize their tasks on the complete tourist services according to wishes of customers). The main advantages of the free services of Worksection are:

- possibility to remotely plan projects and monitor progress, control the terms of completing tourist services and business tasks (among them coordination of routes,

reservation of places in vehicles, means of accommodation, reservation of services of excursion tours, hydroships, interpreters, etc.);

- possibility of setting up three-sided visa-free mode with client and freelancers;
- time accounting (use of clock rates);
- opportunities for project budgeting (depending on whether the package of tourist services is mass or individual) – plan/fact of the report;
- accounting and joint control of project and team development;
- possible visualizations of work with the interactive task docks uses.

Fee-based services provide opportunities for the use of integrated service schedules and Gantt chart to optimize business tasks; access to travel tracking systems on mobile devices for both groups of tourists and individual tourists..

In addition to the specified types, we offer the latest cloud solutions to support the functionality of the virtualized management systems for the tourism cluster clients, including:

- YouScan (which offers free services in brand management, and crisis management of tourist enterprises);
- Yaware and PromoRepublic (with limited function provides free analysis to managers and employees, which helps to use working time effectively);
- Botel (which offers only paid services for management virtualization in the hotel-restaurant business with services for fast order processing - mobile cash desk, warehouse, marketing, menu services, account service, and analytics);
- Zadarma and Reply.IO (management virtualization system includes free services for creating a cluster PBX, including voice menu, call translation/forwarding, call recording and conversation statistics, language analytics, auto answer).

Conclusions.

At present, every participant of tourism clusters strives for quick and easy integration of management system and set of computing resources. In this case, in the tourism there is carried out an accpetic logical association of physical management system and various services of computing SAAS-based resources (among them WORKABOX, GitLab, iFin, Worksectio, Yaware and PromoRepublic, Binotel, Zadarma and Reply.io), in a new virtual system, which is characterized by isolation of internal management and computing processes, performed on one physical resource. According to the basic set of services, within the management systems of a member of a cluster should be subjected to virtualization of a data transmission network, a data storage network, platform and application software (emulation).

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