CONCEPTUAL KNOWLEDGE MODELING AND SYSTEMATIZATION ON THE BASIS OF NATURAL CLASSIFICATION

Mikhail Bondarenko, Nikolay Slipchenko, Kateryna Solovyova, Andrey Danilov, Ruslan Kovalchuk, Irina Shcurenko

Abstract: Knowledge management is aimed at the sustainable development and competitiveness increasing of an organization, a state, a human. The appropriateness of knowledge application for solving a new class of complete ill-structured qualitative problems in weak-structured domains is noted, for example, of many problems in the social (organizational) systems, ecological systems; for the information society creation; creating and implementing new informational technologies; for improving the management and many others. To solve such problems is also needed a preliminary information-analytical phase, of taking into account the semantics of information and the application of new effective system methodology - systemology, which corresponds to the new noospheric stage of science development. The sections of this work are meaningfully combined, in the first place, by using the new method of systemological classification analysis for the knowledge systematization and conceptual models creation, taking into account the criteria of natural classification. The method of systemological classification analysis, for example, allows obtaining new deep knowledge and systematizing the knowledge in any domain the most adequately and objectively, taking into account the essential properties and relations. Using the systemological classification analysis allows evaluating any knowledge classification, to take into account the objects essential properties and relations; to predict the new objects on the base on their properties. New constructive criteria of natural classification allow creating "correct" classifications, which in all spheres of application ensure the effectiveness of solving problems. The examples of systemology and systemological classification analysis application are proposed for creating the domain ontological models - social networks, change management, human needs, directly related to knowledge management, as well as during the development the online store products and services catalog. When using systemology in change management, the organizations can obtain weighty benefits. The application of systemological classification analysis in social networks allows increasing the effectiveness of their functioning based on the use of knowledge systematization (through the development of an effective system of functions and menus). All this will help the company to increase significantly its intellectual capital without using large investments.

Keywords: knowledge systematization, natural classification, ontology, systemological classification analysis, conceptual knowledge, conceptual modeling, deep knowledge, knowledge management, social network in Internet, change management, hierarchy, systemology, artificial intelligence, Protégé, context diagram.

ACM Classification Keywords: 1.2 Artificial Intelligence – 1.2.6 Learning: Knowledge Acquisition

Introduction

One of the most effective instruments of the society sustainable development, of the governance effectiveness and the organizations competitiveness increasing is knowledge management (KM). Using of the knowledge management methods and models opens many new solutions of improving competitiveness, developing

intellectual, social and personal capital. Modern successful companies have long understood that it is knowledge - the main competitive advantage, that is why their intellectual capital at a cost is tens or hundreds of times greater than the material one. Knowledge is needed to solve a new class of complex non-formalized qualitative problems in weak-structured domains, for example, many problems in the social (organizational), environmental systems, for the information society creating; for the human survival; for innovative information technologies development and implementation and many others.

Solving such tasks requires the mandatory pre-information-analytical phase, which role is constantly growing, taking into account the semantics of information and the application of the new system methodology - systemology [Бондаренко и др., 1988], which corresponds to the new noospheric stage of science development, has a high efficiency and capacity in solving complex modern scientific and practical problems on the basis of knowledge.

The work of the analyst (knowledge engineer) is appropriate and necessary for the successful implementation of the processes of informatization, automation and complex software products development. Without the prior analysis these processes can become a "disorder" automation, the software will not meet the customer's requirements, and the number of unnecessary documents during workflow automation will increase. Some ideas, similar to systemological ones, are intuitively used (for example, in the requirements engineering), but the systemological methods [Бондаренко и др., 2004], [Соловьева, 1999, Bondarenko et al., 2006] are more reasonable, constructive and effective.

The method of the systemological classification analysis (SCA) [Соловьева, 1999, Solovyova, 1991, Solovyova, 2000], for example, for the first time allows to obtain new deep knowledge and to systematize knowledge in any domains the most adequately and objectively, taking into account the essential properties and relations. Using of SCA allows evaluating the validity of any knowledge classification, the reflection in it of the objects essential properties; predicting new objects based on their properties. New constructive systemological criteria of natural classification (NC) [Соловьева, 1999, Solovyova, 1991, Solovyova, 2000] allow creating the most "correct" classifications, which provide successful theoretical and practical results in all spheres of their application: the effectiveness of solving problems, further development of domains, openness, extensibility of models; further automation, convenience of users. For example: the definition of emergency measures applied in emergency situations, quick and efficient search of products and services in online stores; business modeling [Bondarenko et al., 2006], the definition of mission and strategy of the organization, the intellectual capital analysis and evaluation; the effective menus in the software system interfaces, the powerful ontologies and the knowledge systematization in KM systems. Thus, the application of the functional requirements of to the software systemological classification allows getting full, sufficient and mutually agreed requirements, that may significantly reduce the project time and budget in case of using a specially designed systemological language of modeling requirements in the form of UML-profile [Vanhoof et al., 2009]. The SCA application in social networks (SN) helps to develop an effective functions system, to improve their functioning [Данилов, 2010].

In this paper are briefly considered some examples of Systemology application, primarily, of the systemological classification analysis application, in the domains - social networks, change management, directly related to KM, as well as during the online store products catalog development.

Systemological Method of Conceptual Modeling of an Arbitrary Problem Domain on the Basis of the Natural Classification

The Natural Classification importance, peculiarities and criteria [Соловьева, 1999, Solovyova, 1991, Solovyova, 2000] have been considered earlier, including - briefly - in [Bondarenko et al., 2010].

Let us consider the unique innovative method with the help of which conceptual modeling of a domain on the basis of the natural classification may be realized.

Nowadays the need to solve complex low-formalized problems in different areas of human activity has considerably increased. To such areas refer, for example, sustainable development of the society which becomes more and more problematic in connection with the strengthening of the man's influence on the environment, caused by the increase of the scale and intensity of the economic activity in current conditions. This circumstance makes it necessary to develop methods of analysis and modeling of complex systems of an arbitrary, including natural (first) nature, for which, as a rule, are not known their role in the higher order system (supersystem), functional purpose (objective function), and consequently, their essential properties.

To solve such problems the new systemological cognitive method of conceptual classification modeling of arbitrary, including weak-structured, domains is designed and is developing. From a practical viewpoint, this has ensured the creation of the systemological classification analysis which uses the method of conceptual modeling of low-structured domains on the basis of the natural classification.

The CM on the basis of the NC became possible not only resulting from the determination of the basic NC regularities and criteria, but also resulting from the creation of a new scientific direction – systems-classes systemology. From the viewpoint of systemology a great importance for the CM has the definition of the researched system supersystem and of the functional query to the system, that is the causes of the system appearance and objective function [Мельников, 1986, Маторин, 1998, Бондаренко и др., 1998].

In the terms listed in Supplement A systemology application to CM involves the system analysis from the viewpoint of the definition:

- of the supersystem query on the given system with the defined function (of the external determinant);
- of the process of transformation from potentially suitable for the formation of this system initial material to the system as an element (substance) of the corresponding supersystem, that is of the process of the given system establishment and its adaptation to the supersystem query;
- of the given system function in the supersystem corresponding to the supersystem query (of the internal determinant).

The results of such an analysis provide the knowledge acquisition, respectively about the cause and about the conditions of the system appearance with certain properties, about the dynamics of this system establishment process, as well as about the consequence of its appearance and functioning. If the system appearance cause in some domain can be determined by its own specific means, it facilitates the determinant analysis.

The obtained results and many years of experience in classifications creation allowed developing and improving the well-known KM methods, above all on the basis of the EC regularities and of the CM methods application of the systemological analysis accounting. Nowadays it is proposed the following method of systemic classification analysis [NC] for the constructing of the conceptual classification model (CCM) of an arbitrary domain based on the NC taking into account the NC operational criteria of and the determinant approach to the domain analysis

which complements the existing CM methods with the ways of determining the objects essential properties and taking into account the deep knowledge about the domain. Let's consider the iterative structure of this method (Figure 1).

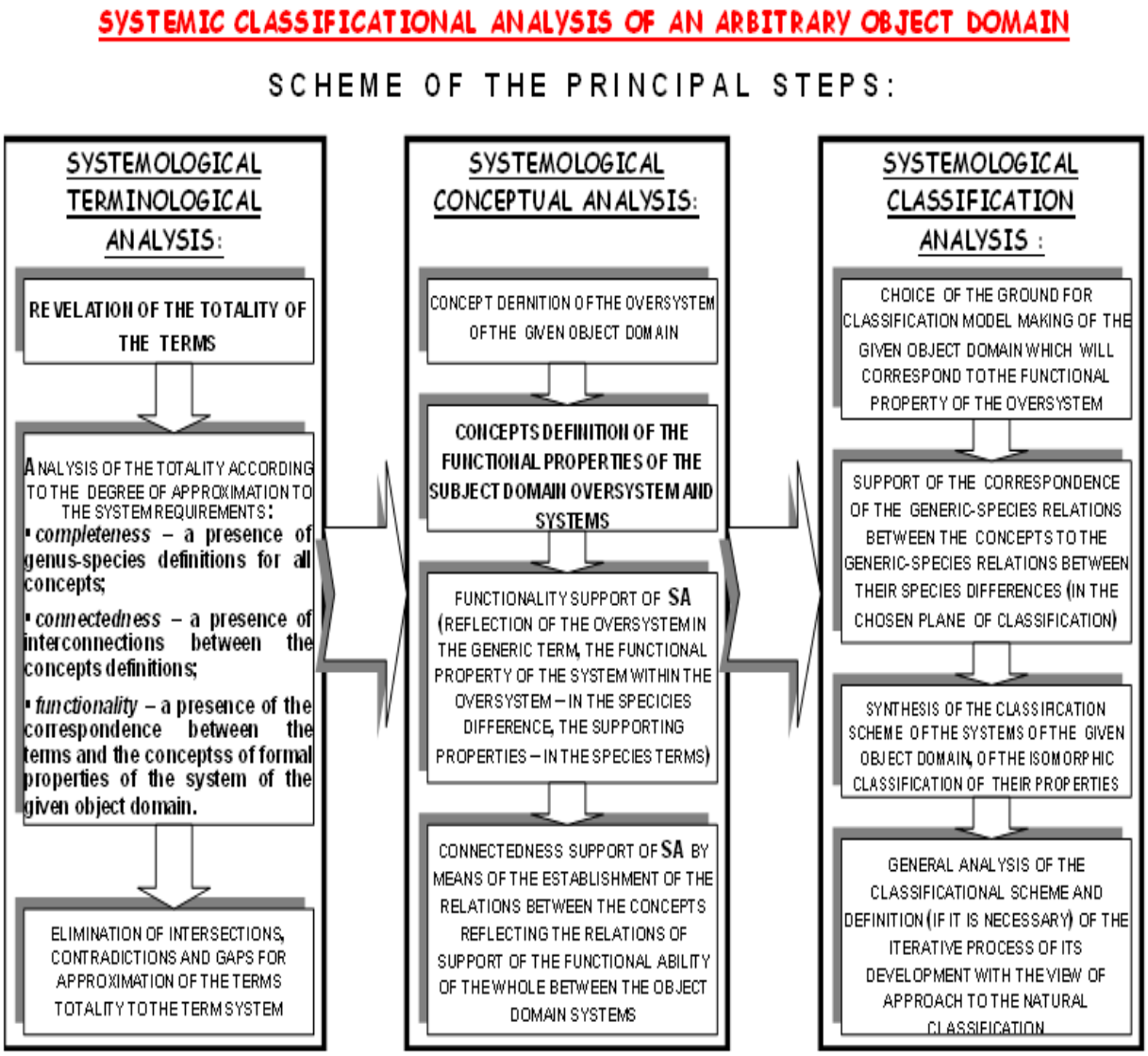

Figure 1. Systemological Classificational Analysis of an arbitrary object domain

1. Domain systemological terminological analysis.

Detection of the set of terms denoting objects and processes of the given domain that is of the terms for the concepts describing the given domain (categorical, general and single).

Analysis of the identified initial set of terms in order to determine the degree of its approximation to the system of terms by the indicators of completeness, connectivity and functionality of ST, corresponding to the initial set of the terms:

- analysis of the genus-species definitions availability for all concepts, corresponding to the selected set of terms (species, genus and species differences concepts);

- analysis of the interrelatedness degree of the considered concepts;

- revelation in the original set of terms such terms which correspond to the concepts reflecting the functional properties of the given domain systems (from the viewpoint of the revealed categorical concepts).

Removal of intersections, contradictions and gaps in the considered set of terms, that is its maximum possible optimization (approximation to the system of terms).

2. Domain systemological conceptual analysis.

The given domain place (role) determination in the broader domain, that is the determination of the supersystem (or the supersystems) of the given domain and of the corresponded to it undeterminable concept (or concepts) (of the singular category or several categories taking into account several aspects of the given domain consideration).

Determination of the given domain functional properties, essential from the viewpoint of each selected supersystem (category).

Functionality of the given domain ensuring, that is reflection of the given domain systems revelated functional properties (in a genus concept – of the given system supersystem, in a species difference – of the functional property of the given system in the supersystem, in species concepts – of the system supporting properties) in all the concepts definitions.

The concepts system connectivity ensuring by hierarchical genus-species relationships establishing between the given domain concepts reflecting the relationship of the whole functional ability support between the given domain systems.

3. Domain systemological classification analysis.

The grounds of the given domain classification model (scheme) constructing choice (corresponding to the revealed functional sign of the given domain systems from the viewpoint of the determined supersystem for the given domain).

Ensuring of the genus – species relationships correspondence between the given domain concepts and their species differences in the chosen classification plane. The given domain systems hierarchical classification construction, their properties isomorphic classification construction (in the given classification plane).

During this method implementation in the first stage the initial material satisfying the naturalness operational criteria of systemic and properties for the classification model construction is being prepared (p. 6.5). At the second stage the monism and hierarchy criteria execution on the selected initial material is provided (p. 6.5). At the third stage the classification scheme parametricity is provided that with the hierarchy condition observance provides its naturalness (p. 8.5). It is obviously that for ill-structured and low-formalized domains this method application will represent an iterative process. However, its (the method) usage arms the human analyzing and modeling the domain with a more profound understanding of the given domain structure because it facilitates the process of its definition. To some extent, the process stays heuristic, but within a formalized (but not formal) procedure.

The considered method use allows, in particular, to evaluate each classification from the viewpoint of its validity (parametricity), reflection of the objects essential properties in it, the possibility of the objects properties detection and prediction according to their place in the classification, that is from the viewpoint of the possibility of the classification application as a tool for theoretical (and practical) analysis in the correspondent domain.

Creation of the Classification Fragment of Organizational Change

To analyze the domain of organizational change suggest using systemological approach and method systemological classification analysis. Systemology considers objects around us, events, etc., as a system, supersystem and subsystems. Moreover, we can understand that the system has a supporting property that allows the supersystem functioning. It is assumed that "system is a functional object or a function, i.e. has the ability to perceive the impact of certain environmental or supersystem and in response to issue necessary for the supersystem results of their actions, that is, in fact, be the cause of the transformation of certain actions in certain desired results" [Bondarenko et al, 1998]. Therefore, we can draw an analogy with the process of doing business. The organization is a system that has a function to meet the needs of a supersystem (needs of customers). But there are times when the functional query can be changed and the system cannot perform supporting function.

There are three types of properties that the system has [Bondarenko et al, 1998]: shown, hidden and potential (deep) [Bondarenko et al, 1998]. When the organization meets the customer's needs - it has some shown properties. But in case of change of the functional request, the system is not able to accomplish supporting functions. In this case, the organization must adapt or evolve during the development of its hidden and potential properties.

This problem can be solved by using a change management. Change management process provides an opportunity to properly assess the current situation in the organization, to identify its weaknesses, to predict what the company can achieve in the future, in case of change of any conditions of work in the organization. Managing change is a very complex process that requires some training of the person responsible for it. The choice of approach to the management changes may impact on the fortunes of the company. There are many methods, strategies, models describing the phased plan for change. Each of these methods has its advantages and disadvantages. But before examine these methods; it is useful to know what the organizational changes there.

Analysis of the domain showed that there was no built structured parametric classification before. No classification, which would be built with a view of the essential properties. Such a classification would help the user to understand the areas in which changes can be made and what objects in the organization, they may affect.

In constructing the classification was chosen supersystem - Changes. The basis of division of domain concepts is the object changes. The fragment of the classification of organizational change was built (Figure 2, Figure 3).

*During the classification creation were used the materials of such electronic resources: http://courseware.finntrack.eu/learners/organisation_dev_change.html - Organisation Development and Change; http://www.e-college.ru/xbooks/xbook031/book/index/index.html?go=part-016*page.htm - Organizational dynamics: dysfunctions and organizational changes; http://www.westbrookstevens.com/ Types_of_Change.htm – Types of Change.*

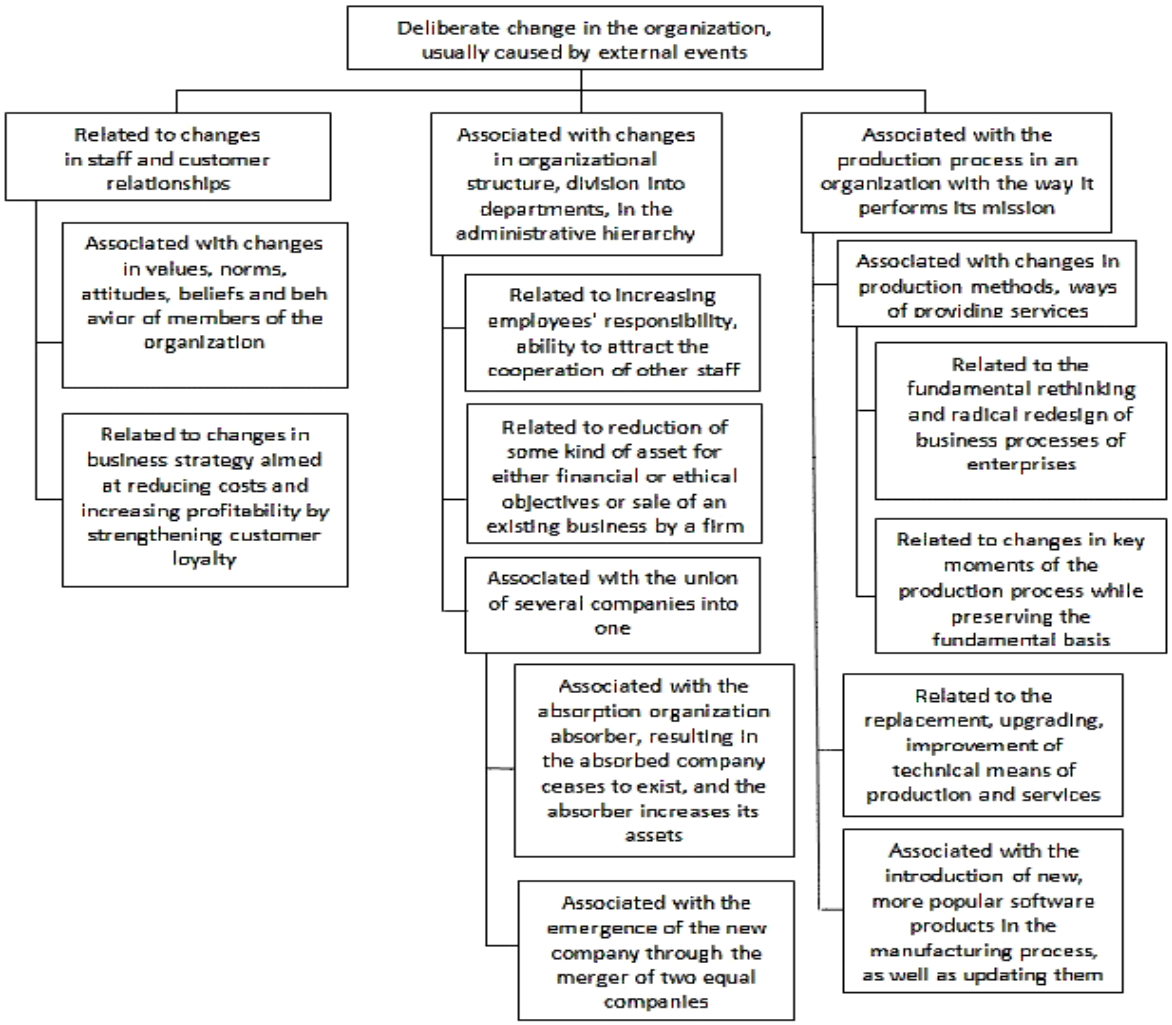

Figure 2. Classification fragment of properties of organizational change

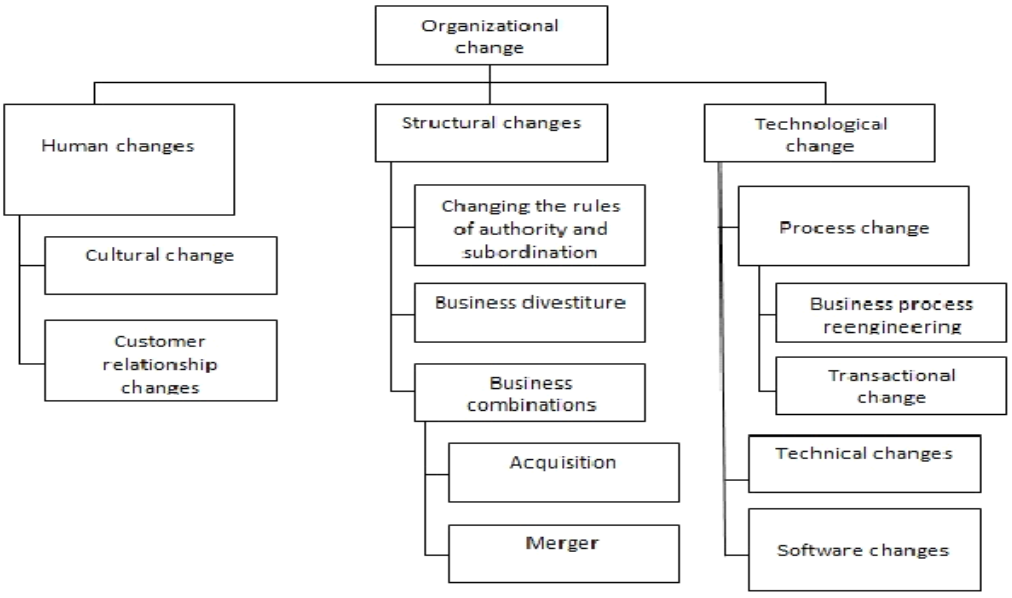

Figure 3. Classification fragment of organizational change

The Fragment Creation and Realization of Classification of "Human Needs"

Work is devoted to the subject area "human needs" research and modeling. To study this subject area was used systemological classification analysis method which allows determining the nature of the subject area, as well as its basic concepts and their properties, and relations between them.

Any subject area should be viewed not as a simple sum of the components, as well as a set of nonlinear and multi-interacting objects, as the whole system. The system has the support properties, which helps operate the supersystem.

Needs – a system that performs some functions that can satisfy the demands of supersystem. Supersystem for system of the needs is people. During his lifetime he has needs in conditions of life, in items and things, without which it is impossible to exist and develop. All the conscious and unconscious human activity aimed at meeting the needs that is to receive something which necessary for a fulfilling life. It is this "something" lends purposefulness to human promptings, and for their motivation lends sense. Meet the needs helps the system (a person) to functionate. Then the basis of division for the construction of classification we must select functionality.

The process of constructing the classification consists of several stages. In this case, all stages are carried out not sequentially, but depending on the completeness and accuracy of accumulated data.

The difficulties arise already at the first attempt to classify, as the needs of diverse and highly variable. They depend on the particular individual. Therefore, in this classification are only the most common needs that are inherent in every person. All human needs can be divided into those that provide its material existence (material) and those without that a person could exist, but it will not feel happy, satisfied. This is non-material needs. They are related to emotional state. Both material and immaterial needs are closely related, but nevertheless, their properties are different. To ensure the people's material existence is necessary, first of all, such things as food, water, air, clothing, shelter, etc. These concepts were divided into those requirements, which are due to human physiology, that is, without them his body can not functionate (they are innate), and those which are necessary to maintain the body in a healthy condition.

Non-material needs have been divided into those whose satisfaction is necessary for a person's internal development, and those that arise from the need to live in society.

Constructed a classification of properties displayed in Figure 4.

Objects in this classification has been systematized according to the classification of their properties (Figure 5), that is, for each component of the classification has generic features and also a concept that is specific difference in the content of the concept, which is classified. This allows to determinate accurately of all concepts in the classification of the recorded elements and connections through a generic term and concept of the specific difference.

The proposed classification can be refined depending on the specific problem to be solved and changes in our knowledge of the subject area.

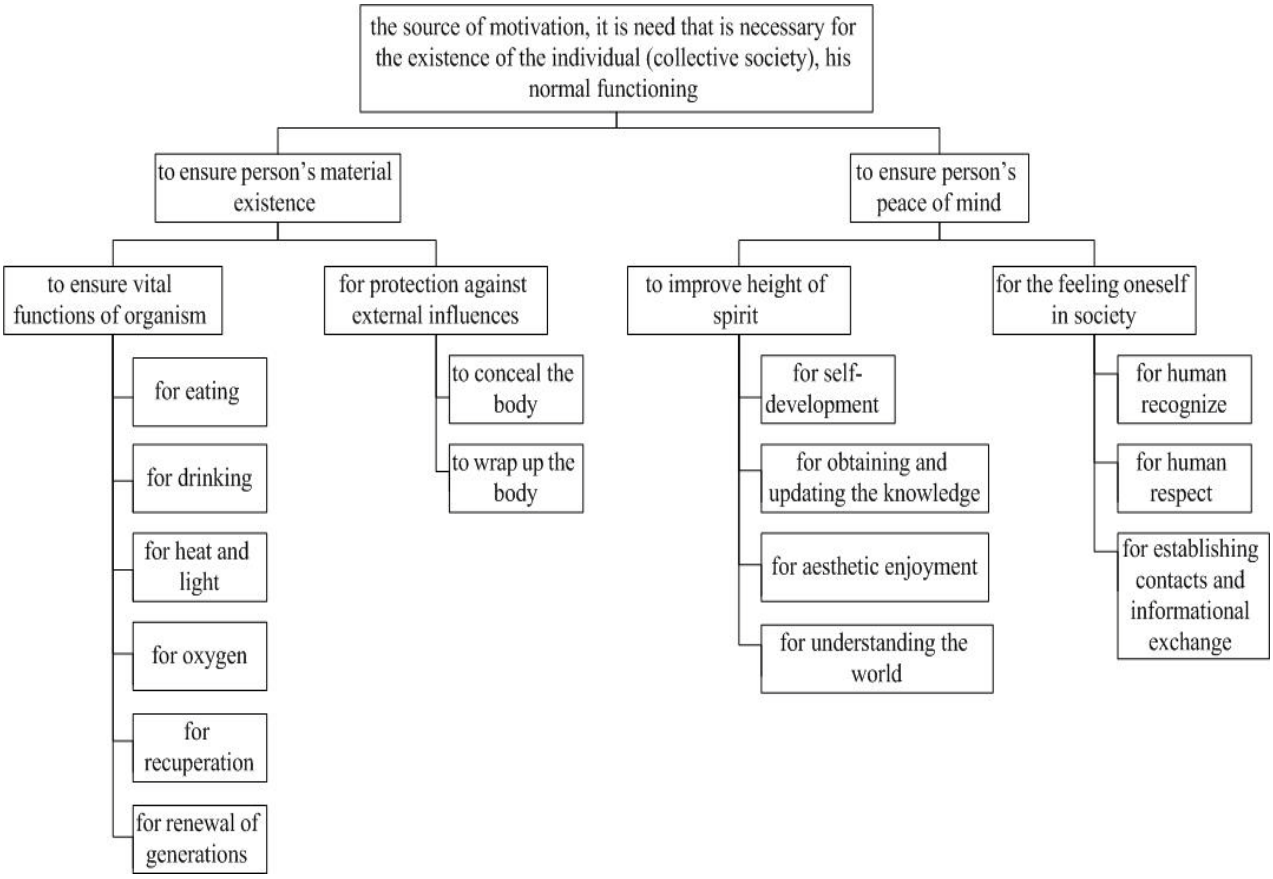

Figure 4. Classification of the properties of human needs by functionality

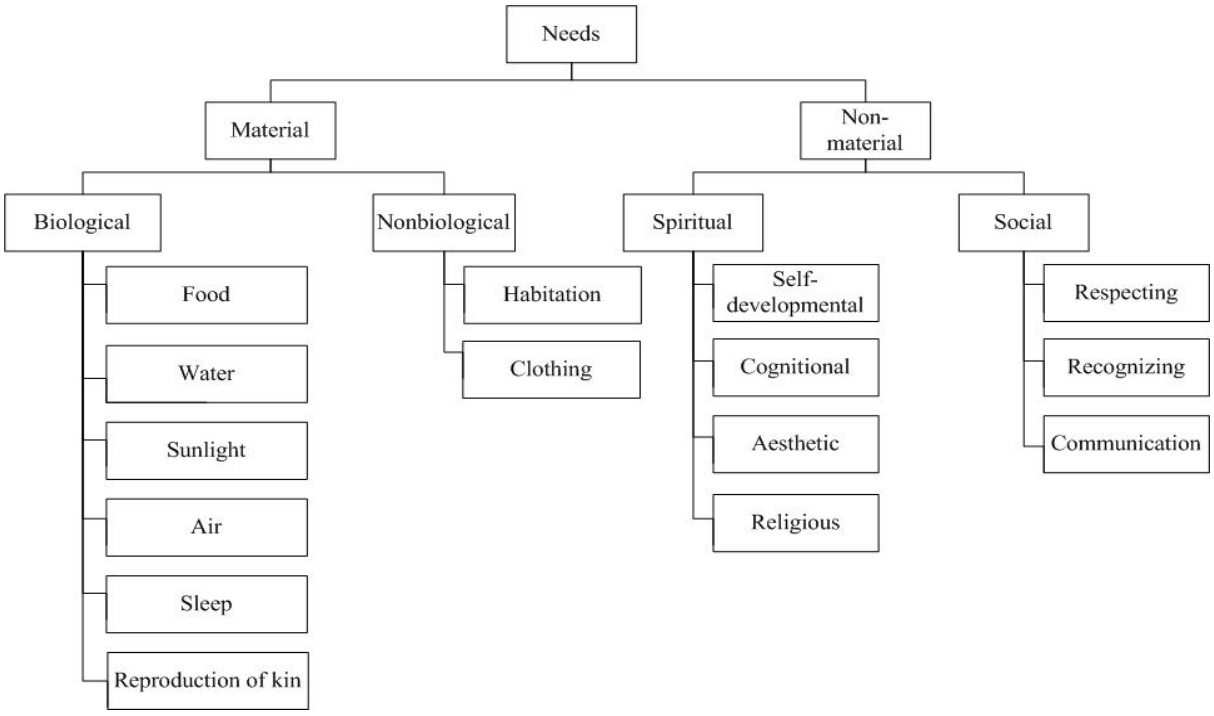

Figure 5. Classification of human needs by functionality

To construct this classification none of the existing has not been taken as a basis, location of each domain concepts was determined in terms of its basic properties. In the course of this work was an attempt to develop a classification domain model for "human needs". Supersystem - the person, the foundation of the division - the functionality.

It was compiled and analyzed a list of domain concepts. Terminology has been clarified, were built subsumtion definitions of basic concepts and defined the relationship between them. In addition to the classification of the concepts was build a classification of properties.

Constructed classification is not complete and final, since human needs are unlimited and depend on the particular individual.

Catalog Online Store as an Example of Practical Application

Today, in the era of global dissemination of information technologies and Internet services popularization, it is difficult to imagine our life without a computer, a phone and the possibilities which these devices provide to the users. One such possibilities can be a purchase of various goods and services via the Internet through online stores.

The main interface and means of getting the information about the proposed product is a catalog of an Internet store. That's why the reasonableness and the correctness of the products catalog composition, its adequacy to the domain are very important. The success of the store itself depends on the quality of the catalog. That's why the catalog has to be maximally (to what extend it is possible), convenient, informative and has to provide a quick search.

To solve this problem can Systemology and proposed by this science methods and tools of the weak-structured domains analysis and research.

In fact, the catalog - is a well-structured products classification. Therefore, during the catalog development it is appropriate to use the method of systemological classification analysis allowing to reveal the system essential property (in the given case, of the products system (and of their species-subsystems), sold in an online store), to determine the researched systems supersystems, to identify the functional queries and, based on them, to systematize the products. It will make the catalog use more convenient, will increase the speed and the efficiency of the search through the catalog. As an example, one can consider the proposed for the research the auto parts catalog fragment, already used by the search system in the online store (Table 1).

Table 1 – Auto parts catalog fragment

Auto parts
Auto chemicals
Storage batteries
Exhaust System
Engine
Isolation
Injector
Car Body
Washer
Plastic

Suspension
Shock absorbers
Alloy wheels
Forged
Alloy (cast)
Steel (stamped)
Others
Springs
Others
Drive

Steering
Salon
Glass
Fuel system
Braking system
Transmission
Headlights
Filters
Navigation
Others

An average user of this classification (catalog) will have difficulties to find the product interesting for him, since it can not know in what section this product may be located, what for these *auto parts* can be used, etc. (not all customers may know what for these or those auto parts are used).

In case of selecting a certain species of *auto parts*, the user may not find the detail necessary for him among the variety of the proposed items of the selected product species (of single concepts). For example, the user selects such an item of the catalog as *filters*, as a result, a variety of concrete *filters* species will be proposed to him (perhaps, hundreds). A user simply can not find the product necessary for him among the proposed variants.

To solve this problem it is necessary to make the further deeper concepts systematization - concepts distribution by the species taking into account their properties, i.e. the parametric classification creation by the functional destination, taking into account the naturalness criteria. The proposed operation will allow reducing in dozens of times the number of displayed items, which will be issued on the user's request. This will reduce the probability that the user will not be able to find the product necessary for him. It can also improve the usability and the speed of products search.

In the *auto parts* classification one can also trace the division concepts rules violation, a wrong division bases change, which is not allowed even by the formal logic criteria and which violates the main systemological relation of the whole functional capability support.

Due to the non-parametric character of the old catalog (the objects-classes properties absence in it), it is difficult to determine by which division base the division is made, and whether the chosen location of the concepts in the classification (whether they correspond to the domain) is right, without knowing the correspondent to them objects (divisible concepts) properties.

As the practice shows, the correct classification should be:

-convenient for the user, consequently – to correspond maximally to the domain structure and semantics;

- to ensure the successful search of the product (of the service), i.e. the user should easily find a product if it is in the catalog, to maximally increase and facilitate the product search;

- to be expandable (adding new products and services) and convenient to support.

Besides, a good classification can be the basis for automating many additional functions that are useful both for the user and for the online store owner.

From the scientific viewpoint, the correct classification (systematics) should adequately reflect the simulated domain, correspond to the formal-logical requirements (for example, the division base should not be changed) and to the systemological criteria.

Tables 2 and 3 show the *auto parts* catalog fragment, taking into account the concepts (products) properties which form the basis of the parametric classification. During creating this classification were used the materials of the site: http://expert.autocom.kiev.ua/kbase/c36 – Knowledge base for auto mechanists.

Tables 2 – Fragment of the developed auto parts catalog.

Auto parts			
	Power unit parts		
	Power system parts		
	Chassis parts		
		Bearing system auto parts	
			Car body
			Frame
		Wheel parts	
			Discs
			Buses
		Suspension	
			Dependent
			Independent
		Steering	
			Automotive
			Combine
			Tractor
		Braking system	
			Auxiliary
			Spare
			Working
			Marking
	Electrical Parts		

Table 3 – Properties of the concepts included to the auto parts catalog.

Auto parts			
	Designed to transfer engine torque to the wheels (working bodies) changes in traction, speed and direction of movement		
	Designed for storage, cleaning and fuel supply, air cleaning, cooking fuel mixture and feed it into the engine cylinders		
	Designed to move the car along the road linking the wheel to the body, damping the car.		
		Which are used for setting and fixing of all car parts	
			Designed to accommodate passengers and cargo
			For fixing the body and aggregates
		Allowing to put on their body roll and not slide	

			Serving to connect to a car tire with hub
			Designed to absorb minor fluctuations caused by imperfections in the road surface, error compensation paths wheels, implementation, and the perception of forces generated in the contact area and provide a high coefficient of friction
		Which connect the wheel to the car and allow them to move in a given direction, rotate, repeat the profile of the road	
			Designed for mounting the wheels on one axle, which is rigidly linked
			Designed for mounting wheels on one axle, without hard link
		Which are designed to provide the vehicle driver in a given direction	
			Designed to propel the vehicle driver in a given direction
			Designed for the movement of the combine in a given direction of a driver
			Designed or the propulsion of the tractor driver in a given direction
		Which are designed to reduce speed and / or stop the vehicle. They also help keep the vehicle from the spontaneous movements during a stop	
			Serving for long maintain a constant speed (downhill) at the expense of engine braking
			Serving to stop the vehicle at a failure of braking system
			Serving to regulate the speed of the vehicle and stop it
			Serving to keep the vehicle stationary on the road (parked), and also to prevent the vehicle rolling backward when starting on the rise
	Designed for the generation, transmission and consumption of electricity in a car		

The developed domain ontology, realized in Protégé 3.2, is not included to the given work due to its large size.

The systemological method of classification developing application, based on the natural classification, allows eliminating defects and ensuring the classification development and its operation in the automated system, increasing the search speed of the needed product by the user and the catalog usability.

The obtained classification is the solid basis of the online store catalog, for the users' convenience to this catalog can also be added other semantic relations, including – associations, resulting from the marketing and analytical research, Data Mining methods application. Such a classification will also be a useful base of various support automation systems and of the catalog functioning development and the online store competitiveness increasing.

Let us consider one more classification fragment – the domain "Business", the agriculture classification. The existing classification is represented in Figure 6.

164	43	Agriculture
165	44	Animal husbandry
166	45	Grain
167	46	Feed
168	47	Equipment
169	48	Vegetables
170	49	Seedlings and seeds
171	50	Garden equipment
172	51	Fertilizers
173	52	Fruits and berries
174	53	Others

Figure 6. Agriculture species catalog fragment

The proposed agriculture classification fragment contains 10 concepts: animal husbandry (44), corn (45), feed (46), equipment (47), vegetables (48), seedling and seeds (49), garden equipment (50), fertilizers (51), fruits and berries (52), others (53). The given concepts distribution contradicts to the division rules: the concepts are related to the inappropriate hierarchy levels (for example, vegetables, fruits and berries can not be on the same level with the animal husbandry; it is necessary to distinguish a class of plant breeding, to which to relate the listed concepts), the division base changes (by the definition, the agriculture is one of the industries engaged in the cultivation of crops and rearing of farm animals; that is, if one construct the classification by the functional destination, the equipment can not be part of the considered class in any case). Also, it is not needed to distinguish the class "others" as this will only complicate the search of the needed product species in the catalog by the user. The proposed classification fragment does not disclose fully the domain particularities because of the insufficient number of concepts listed in it.

Let's try to build our classification fragment taking into account the formal-logical and systemological classifying criteria..

The classification should provide the objects systematization by the defined chosen attribute which is the main for solving the stated task. In this case, the business is best divided by the destination, as namely the destination is that distinguishing attribute of the products and services, on which the catalog user primarily draws the attention. To create the correct classification will shall keep the same division base.

The place of each domain concept was determined on the basis of its essential property. The concepts properties are presented in Fig. 7. The concepts taken from the proposed classification are shown in italics (Fig. 8). The classification "Agriculture" was realized in the software tool Protégé 3.2 is shown in Figure 9.

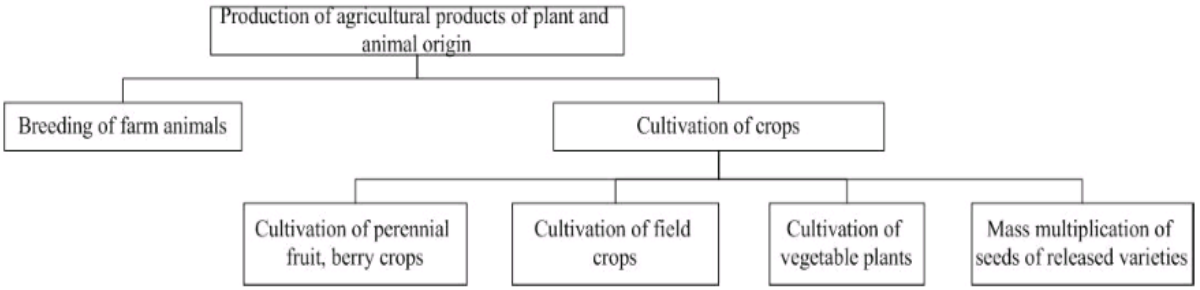

Figure 7. Properties classification

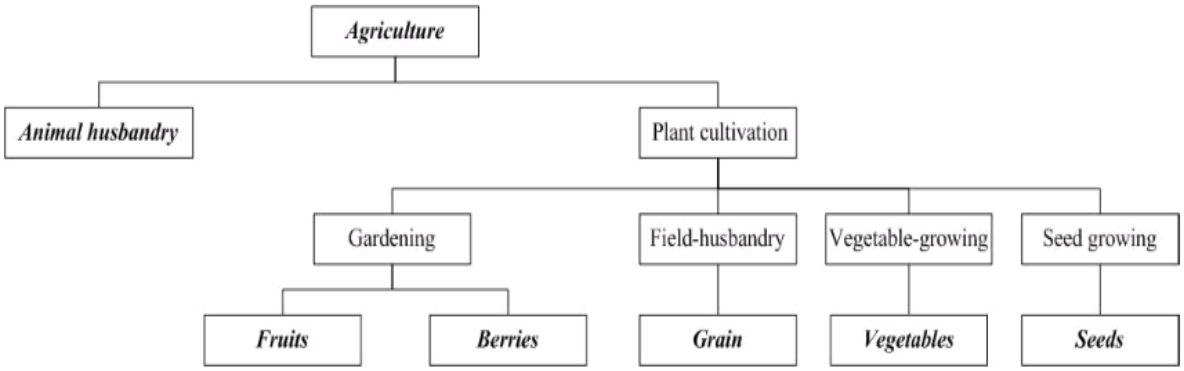

Figure 8. Concepts classification

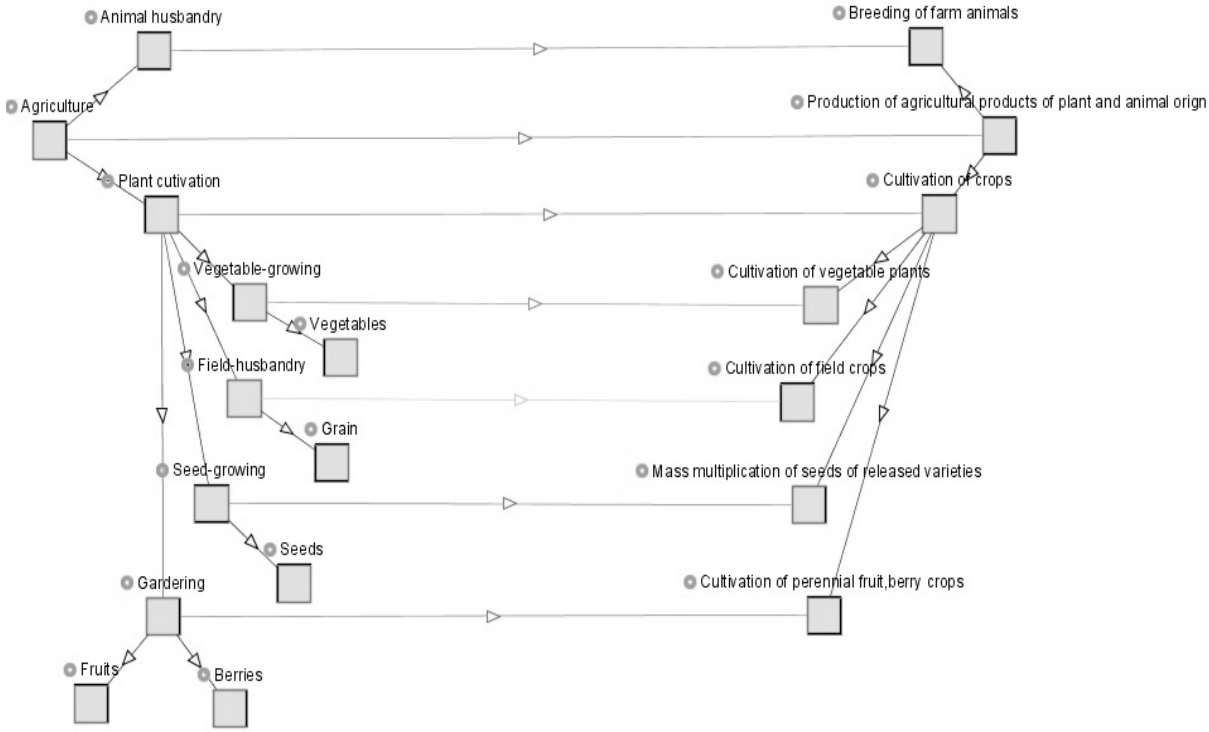

Figure 9. Classification "Agriculture"

During creating the agriculture species classification of the domain - "Business" have been used the materials of such electronic sources: http://ru.wikipedia.org/wiki/Сельское хозяйство - Сельское хозяйство; http://bse.sci-lib.com – Большая Советская Энциклопедия.

SCA Application in Social Networks as an Element of Knowledge Management

1. Analysis of Social Networks Use in Knowledge Management.

Despite the widespread of social networks in Internet, the models of knowledge dissemination in an organization by means of social networks sites have not been found. There is a number of articles describing the use of social networks for the social capital creating and using but there are no models of social networks implementation in an organization for knowledge dissemination and the employees' intellectual capital enhancing.

The model creation of knowledge implementation and dissemination in an organization will allow solving such important practical tasks as the social networks implementation process acceleration, improving their functioning effectiveness and facilitating the process of knowledge acquisition and dissemination in the social network space by the employees.

Recent publications and research in social networks domain reflect a widespread of social networks among Internet users. Increasing the role of social networks in the society life has led to the need of social networks implementation in the organizations life for supporting and increasing their competitiveness.

For more effective use of social networks it is necessary to understand which functions provide the social networks. In the previous publications the analysis of the concept "social network" has been accomplished, the existing functions of the most popular social networks have been analyzed and, based on the obtained analysis results, the recommendations for improving the functioning of the considered networks have been developed, the social networks functions classification has been created [Данилов, 2010].

The recommended informative placement of the functions of the first level of the hierarchy, taking into account the systemological classification analysis use and the natural classification criteria, is shown in Figure 10. The functions placement is understood as their placement in the networks workspace. The informative placement is understood as the functions structure their hierarchy in the social network menu. Our informative placement displays the functions relationship taking into account the knowledge systematization and the relations semantics between them in the best possible way.

Resulting from the analysis it was proposed to divide all the functions of the first level of the hierarchy on such groups: user information, my data, my messages, search and the function of input/output from the network workspace. Such functions placement will allow reducing the load on the user and speeding up the process of the needed function search, as it reflects the functioning of the whole support ability relation.

The substantial functions placement in the social networks proposed, as the result of the conducted functions system analysis, will facilitate the functions search for the social network new users, will reduce the sense loading on the user when working with the network, by reducing the number of functions on the same level of the hierarchy.

To facilitate the work with social networks and for the further study of the social networks domain the social networks functions classification with the division base by functional purpose has been created.

The conducted research shows the necessity of the further study and knowledge systematization in the social networks domain.

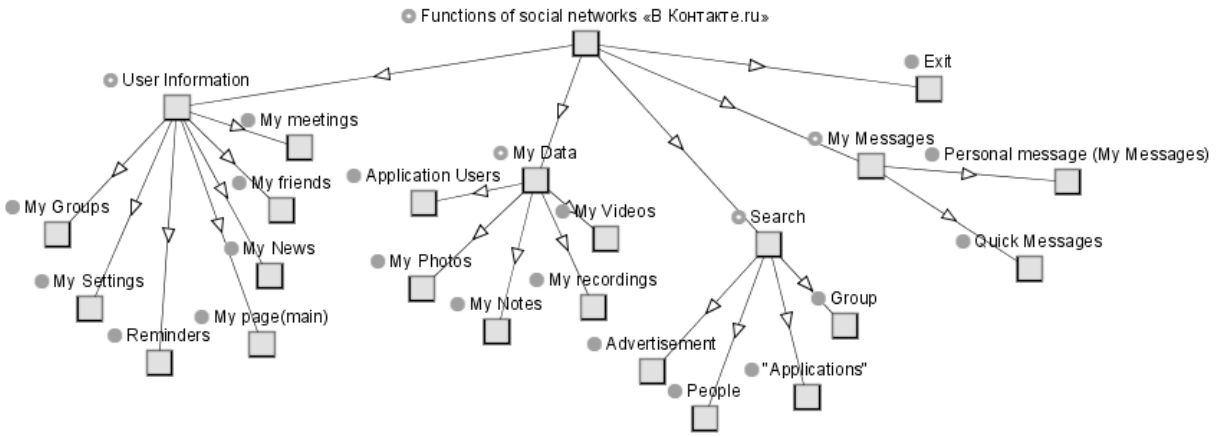

Figure 10. The social network "В Контакте.ru" systemological informative functions placement.

2. Analysis of the Use Possibilities of the Existing Methods of Tacit Knowledge Exchange.

One of the most important functions of the social network creation in the organization is tacit knowledge exchange and its formalization. To better understand the tacit knowledge exchange methods it is necessary to know the definition of the term "tacit knowledge". Resulting from the Internet resources analysis the following definition of "tacit knowledge" has been chosen:

Tacit knowledge is intuition, experience, feelings, secrets of mastery, impressions, associations, skills [Maricheva, 2007].

The following tacit knowledge exchange methods have been considered and analyzed and the ways of their implementation by means of the social network have been briefly described, including:

- "Mentoring." The method consists in knowledge transfer from the domain experts to less experienced colleagues by means of their learning. When implementing this method there should not be technical problems in the social networks sites. Interacting in the Internet space and discussing the problems and the questions arising in the process of carrying out their functional duties, the employees exchange their experiences in solving various problems. The "Mentoring Circles" implementation by means of group discussing of different questions with the employees participation is also possible.
- «Storytelling» is a story about how it was. With the help of open messages and notes the company employees describe their trips, tours, talks. The employee tells all his impressions about the trip and answers various questions of colleagues, thus transferring his experience gained during the trip.
- "The portfolio of knowledge." It involves tracking the employees' hobbies and contacts. According to the received information, the slices of the employees' interests, communications and interactions are accomplished. This method implementation was originally founded in social networks. After reviewing the user personal page, as well as his activity at sending public messages, one can learn about his interests, hobbies, friends, relationships with other users. This allows the employees' knowledge and relations use with the greatest benefit for the organization.

After analyzing the methods described above, one can conclude that social networks in the Internet are able to practically implement the tacit knowledge exchange methods the company which will allow increasing the employees' intellectual level and the company competitiveness.

3. Knowledge Dissemination in an Organization Model Creation.

When choosing a social network it is necessary to take into account several factors, such as the creation goals, the project budget, the tasks which will be solved by means of the social network, the expected users' range. The informational business model of a social network choice, aimed at the concrete organization problems solving, will help to facilitate the process of choosing a social network.

Systemology application in social networks will allow increasing the functioning effectiveness of social networks, the networks implementation, facilitating the new functions implementation. Systemological research of social networks will allow systematizing knowledge in the social networks in the Internet domain and defining the appropriateness of various functions use in this or that social network, in a concrete organization.

Using the knowledge obtained during the social networks functions classification fragment creation, the informational business model of (Figure 11) describing the process of a social network in the Internet choice and creation for increasing the organization competitiveness. This model describes the main processes in the organization when choosing a social network (the definition of the goals and tasks solved by the social network; the means and the software tool for creating the social network choice; a brief description of the processes associated with the immediate introduction of a social network in operation, of the ways of promoting the social network use by the employees).

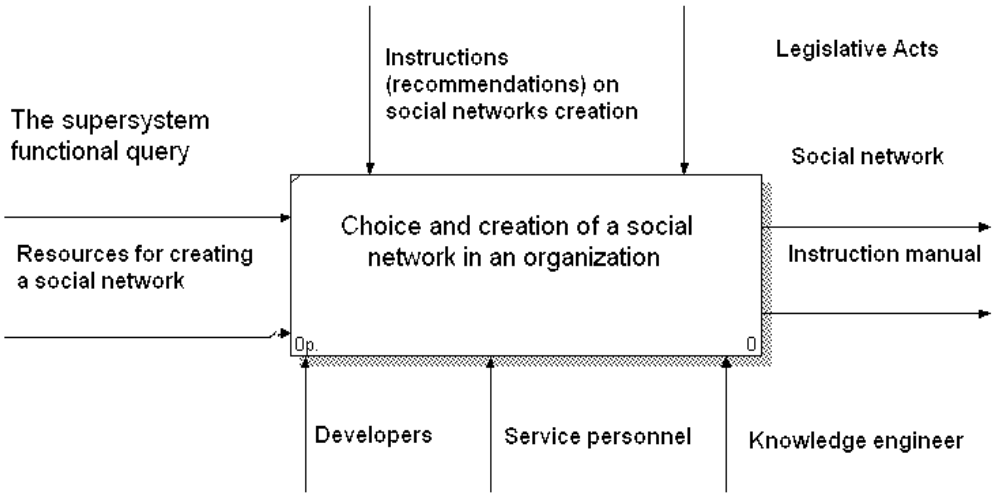

Figure 11. Context diagram of the informational model of the social network selection and creation in the organization.

In the future it is planned to develop the business model of social networks application in the Internet for knowledge management. The model will include the methods of exchanging both explicit and tacit knowledge of knowledge that will allow increasing the effectiveness of the social networks sites application in the organization for knowledge management.

The use of the created informational business model will allow facilitating and accelerating the Internet social networks choice and implementation process in the company and minimizing changes necessary for the effective functioning of the social network in the Internet; will allow reducing costs during the social network in the Internet creation and use.

The results of the work can be used as recommendations for the construction or choice of a social network by the organization for increasing its competitiveness, strengthening the relationships between the employees

(increasing the social capital), increasing the intellectual capital of the employees and of the company on the whole.

The use of social networks in the Internet by Ukrainian and foreign organizations will give them the opportunity not only to increase their competitiveness in the labor market, but also to create a strong foundation for further development.

Conclusions

The SCA innovative method application based on the NC criteria will allow obtaining the high-qualified parametric knowledge classifications in any, including - weak-structured domains, taking into account the objects essential properties and relations, acquiring and applying new deep knowledge. This allows solving effectively complete non-formalized theoretical and practical problems.

For example, the application of SCA and the NC criteria in SN allows to increase the effectiveness of their functioning (through the development of an effective system of functions and menus, optimizing the number of objects on one level of the hierarchy); to determine the appropriateness of using various functions in the SN, depending on the solving tasks. The use of knowledge systematization allows elaborating the rules for creating SN for organizations working in different spheres of activity. This will help the companies to increase significantly their intellectual capital without using large investments. The social networks use will allow to bring together the company employees forces for experiences exchange and solving problems, to create a favorable climate in the collective; to carry out continuous training with minimal financial costs, to accelerate the information exchange within the company. Widespread of SN among the users of the Internet makes them an effective tool for disseminating information. Creation and use of scientific and other social networks in the Internet will allow to assist effectively to the scientific community and the society in the whole development; to the development of the communities of practice as an innovative tool for solving concrete problems based on combining the potential of talented scientists, specialists and experts; to change management as a means of innovations and organizational development supporting.

Change management is very actual for the organization development and competitiveness increasing. That is why the change management subject domain research on the base of systemology and SCA (the fragment of which you can see in this work) is very important.

During the online store products catalog development, can be obtained the right classifications which reflect adequately the simulated domains, correspond maximally to their structure and semantics; to the formal-logical requirements (for example, the division base should not be changed) and to the systemological criteria; and that is why they are convenient for the user, ensure the successful search of a product (i.e. the user should easily find the product if it is in the catalog); maximally accelerate and facilitate the search. Such catalogs are easily expandable (adding new products and services), are convenient to maintain, can become the basis for automating many additional functions that are useful both for the user and for the online store owner.

The application of knowledge systematization in the organizations work will allow increasing the competitiveness level and the organization intellectual capital that will allow the organization to reach a higher level of development in relation to its competitors which do not use the knowledge management methods and technologies.

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COGNITIVE MODELLING AS THE INSTRUMENT IN THE COURSE OF KNOWLEDGE OF LARGE SYSTEM

Galina Gorelova

Abstract: In this report we observe the possibilities offered by cognitive methodology of modeling of complex systems (social and economic, sociotechnical) and the developed software from positions of process of knowledge of complex object, and also extraction of different aspects of knowledge from the data about an object. The maintenance and program of researching of complex systems are set in the form of model of a metaset of the researching system, which distinctive feature is the description not only of big system and its interaction with environment, but also introduction in a metaset of "observer" that allows to build methodology of research and decision-making taking into account development of process of knowledge of object in consciousness of the researcher. Generally the model of the complex system is under construction in the form of hierarchical dynamical cognitive model. The mathematical model is exposed to formal researches. Connectivity, complexity, controllability, stability, sensitivity, adaptability and other properties of model on which the conclusion about presence (absence) of similar properties at studied big system becomes are analyzed. In the course of research self-training of the analyst ("observer") takes place by using developed toolkit for extraction of knowledge of object and decision-making.

Keywords: The expert, extraction of knowledge, cognitive, complex system, model, behavior, structure, decision-making, information technology.

ACM Classification Keywords: I.2.0 General - Cognitive simulation

Introduction

The certain experience of the work which have been saved up during a number of years in sphere of cognitive modeling of large ("big") systems (Gorelova, etc. (2002), (2005), (2006), (2007), (2009), (2010)) allows to understand both the developed and being developed formal models and methods of research of difficult systems as one of very effective tools of their knowledge and usage of results of this knowledge in practice. Application of cognitive approach is understood in this case in a context of continuous "interaction" of results of knowledge by the subject of difficult object and the object itself, it is important to consider application, at least, in a view of three positions: first - the "utility" ("harm") of consequences of accepted decisions for object, then from theoretical positions of reception of new knowledge and from positions of "utility" of this knowledge for the subject.

In the first case it is especially important to understand "the risk of the human factor". Considering the weakly structurance of problems of the big systems, difficultness of "correct" gathering and processing of the information about them, "correctness" of the aim of research (an explanation of the mechanism of the phenomena of forecasting, management, generating of administrative decisions, etc.), it is necessary to take in a view the necessity to have the convenient tool for research and decision-making support.

By this time, many tool means of support of decision-making, including, various intellectual systems are developed. But thus it is not given special attention to a question how to consider process of knowledge during