# Insafing – new intellectual technology of group work

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ABSTRACT

The article explores a new form of intellectual communication called „insafing“, which is a type of communication that utilizes the elements of Activity Organizing Games, built in accordance with an in-advance-prepared sense scheme. The scientific and methodological fundamentals of insafing based on the Theory of Dynamic Information Systems (TDIS) and the methods of cognitive engineering are discussed in the article. The article also provides an example of insafing on the realization of the project „The country of adventures and travels along Siberian Route“.

**Keywords**

Insafing – intellectual communication – Theory of Dynamic Information Systems (TDIS) – Activity Organizing Game (AOG) – Categorical Systematic Methodology (CSM)

## 1 Introduction

Modern civilization faces the growth of the level of inner variety and complexity of projects. The intellectual saturation of inventions and their exploitation are increasing. The transition to intensive development and to the implementation of innovations requires formation of new technology of intellectual activity where the main factor of development is knowledge.

From the antiquity, where mathematics and axiomatics-deductive approach to organizing the arguments appeared, the logic is being formed with forms of organizing the thinking and the patterns for knowledge management, first of all, terms, views, definitions and conclusions, the significant progress in techniques of working with knowledge has not been achieved. The mentioned constructions determine resolving power of intellectual culture, where the key limitation is the adjustment of the listed forms of thought, speech and writing, introduced, firstly, in a linearized form, secondly, for working individually.

The introduction of forms for specialists team work on different issues, tasks and projects should be relevant to the significant changes in intellectual activity in XX century. The methods of solving the problems by working in team include the following: „serious games“ and their form „command post exercises“, „Workshop of the future“, „quality control group“, „foresight“, „brainstorming“. The methodology and methods of Activity Organizing Games (AOG) have been in progress in the USSR and nowadays in modern Russia since 1980s (Shchedrovitskiy, 2004). Activity Organizing Games vary in developing of a script (it should ideally be original for every particular case), in presence of expert playing technicians and people motivated to work in a team. The „immersion“ of participants into the game is desirable, when it is held beyond the work environment avoiding distractive office and personal factors. It is important for AOG to schematize the activities needed for solving a problem. Due to the development of the Internet technology and mobile communications online communities, distance learning and interacting systems (teleconferences, webinars, etc.) are being formed. Quite positive environment for advancement of teamwork methods is set up. Whereinto, serious intellectual potential might be engaged.

In line with elaboration of new intellectual technologies that provide formation of innovative ways of reasoning and creation of new forms of knowledge management, and that are implemented in the framework of Categorical Systematic Methodology (CSM) (Razumov, 2004), Theory of Dynamic Information Systems (DIS, TDIS) (Razumov & Sizikov, 2013), we will give consideration to the new AOG – insafing (Dus et al., 2014). Insafing was designed for organization of group work to solve the problems in different fields of knowledge, education, engineering and management.

## 2 TDIS

TDIS began to form in the late 1990s accumulating results gained in homeo-statics, which is a branch of cybernetics (Gorskiy, 1998), in concept of intellectual systems and intellects (Ladenko, 1994), CSM.

In making an assessment of the results it develops that the common ground for the mentioned directions is searching for cognitive tools suitable for describing the processes of all kinds in the research area with the help of universal language. Special attention is given to the work with visual schemes transmitting original sense content-rich characteristics of the objects. In the course of searching for universal cognitive tools, working with constructions developed on the basis of organization knowledge elaboration of inartificial and artificial objects, the limitations were discovered. The limitations touched upon the universalism on almost every type of schemes, for example, the schemes based on symbols of Chinese philosophy. Afterwards, the accents are shifted to the development of a mathematical framework for conceptual (qualitative) modeling. The task to design an analytic object in terms of the system of axioms was determined and solved. This object is a multiuse cognitive shell for the models of objects of any type. Thus, the class of information objects, called DIS, was identified.

DIS is an analytically identified object that can be presented in a form of oriented graph with vertices and two types of edges (principal, dominant) whereon the process of information functioning is given.

Definition 1. DIS D is a pair $(G, PIF_G)$, where G – orgraph with two types of edges, and $PIF_G=\{A(k)|\ k\in Z\}$ – PIF on it is a sequence of three types of acts of IF redistribution among the vertices of orgraph:

$G=(V, R_d, R_c)$, where $V\subset\Re$, $|V|<\infty$, $(R_d\cup R_c)\subseteq(V^2\setminus I)$,
$A(k): FS(k)\to FS(k+1)$, $FS(k)=(S(k), \lambda_k, f_{kd}, f_{kc})$,
$S(k)=(r_k, q_k)$,
$r_k: V\to R^+$, $q_k: V\to R^+$, $\lambda_k: V\to R^+$, $f_{kd}: R_d\to[0;1]$,
$f_{kc}: R_c\to[0;1]$,
$(\forall k\in Z)(\forall v\in V)((f_{kd}^-(v)\le 1)\&(f_{kc}^-(v)\le 1))$ and
or 1) $r_{k+1}(v)=(1-f_{kc}^-(v))r_k(v)$, $q_{k+1}(v)=q_k(v)+q_k^*(v)$,
or 2) $r_{k+1}(v)=r_k(v)$ for $q_k(v)<\lambda_k(v)$ and $=r_k(v)+q_k(v)$ for $q_k(v)\ge\lambda_k(v)$, $q_{k+1}(v)=q_k(v)$ for $q_k(v)<\lambda_k(v)$ and $=0$ for $q_k(v)\ge\lambda_k(v)$,
or 3) $r_{k+1}(v)=(1-f_{kd}^-(v))r_k(v)+r_k^*(v)$, $q_{k+1}(v)=q_k(v)$,
where $f_{kd}^-(v)=\Sigma\{f_{kd}(v,v_1)|(v_1\in V)\&((v,v_1)\in R_d)\}$,
$f_{kc}^-(v)=\Sigma\{f_{kc}(v_1,v)|(v_1\in V)\&((v_1,v)\in R_c)\}$,
$r_k^*(v)=\Sigma\{f_{kd}(v,v_1)r_k(v_1)|(v_1\in V)\&((v,v_1)\in R_d)\}$,
$q_k^*(v)=\Sigma\{f_{kc}(v_1,v)r_k(v_1)|(v_1\in V)\&((v_1,v)\in R_c)\}$.

Herein denoted: Z – set of integers; $\Re$ – set of all knowledge clusters as philosophical categories; V, $R_d$, $R_c$ – set of vertices, principal and dominant edges of the orgraph G; |V| – potency of set V; $V^2=V\times V$; I – identity mapping (on V); $R^+=[0;\infty)$; A(k) – act PIF; S(k), FS(k) – state and total state of DIS at the beginning A(k); $r_k(v)$, $q_k(v)$, $\lambda_k(v)$ – value of the quantities of active and passive IF and the level of transformation of type-two IF into type-one in $v\in V$; $f_{kd}(w_d)$, $f_{kc}(w_c)$ – value of relative conductivity of principal $w_d$ and dominant $w_c$ edges.

Structural parameters, value of transformation levels and relative conductivity – functional parameters – are orgraph G characteristics. And the sequence $\{S(k)|k\in Z\}$ – graph PIF DIS D.

In a practical aspect, diversity of DIS may be interpreted as a shell, in which a model object under study of any object region is inserted homomorphically. For this purpose DIS is showed in categorical scheme (CS) in a format of orgraph with vertices relevant to categories, and edges (principal, dominate), that helps to present the structure of research object. Mathematical properties of DIS are elucidated in TDIS. It is implemented: at structural level in orgraph DIS morphology analysis; at functional level, where three acts of information functioning process and typical regimes for DIS were determined; at imitation level leading to objects models construction in DIS formats with performing numerical computer experiments using them. Packaging knowledge in DIS forms makes it possible to document sense content-rich characteristic of any object in order to transfer the results of mathematical analysis of DIS formal construction on it, whereon the knowledge about the object under the study is projected. It emerged that working with the help of class DIS models is a convenient instrument for discussion organization of scientific, academic and project problems in a group. In this regard, insafing is being developed.

Insafing as an intellectual communication of AOG participants uses the following operations of TDIS: decoding, folding, and mutation. Decoding – detalization of a category (term) into three new terms. Mutation – replacing the categories achieved in every stage of decoding according to the formed in TDIS algorithm. Folding – for each new triplet of categories received from mutation at the relevant level of decoding a new category or a new name for the triplet is found. The main topic of that particular insafing is focused on one category. The indices are not entered in the scheme for it. This category is being decoded when the three categories for its specification are present (first level decoding, for each category (orgraph vertex) a special index is entered – 0, 1, 2), each of which undergoes further decoding (second level decoding, where the following indices are entered for the categories – 00, 01, …, 22, – 9 in whole). Discussion topic may be detailed further on. Triadic principle is justified in TDIS as optimum for representation of information processes at structural, functional and imitative levels. It provides means for building convincing CS for modeling objects discussed in insafing.

TDIS was initially formed in the framework of ideas of Pythagoreans and Plato`s Academy of importance to coordinate mathematics and ontology, which is related to the views of Penrose (Penrose, 2007). In TDIS the ideas mentioned above are complemented by a suggestion about necessity of synthesis of mathematics, physics and philosophy. Methodology of organization of insafing is formed on the base of TDIS, but taking into account that the object model in a form of DIS is formed by the group. What is essential is that the participants of insafing are focused on working with the scheme as if with hypertext. Continuing with presentation of knowledge in orgraph, we have opportunities to show scenarios for discussion of the topic we are interested in as the way to avoid its vertices and revealing different groups of categories. TDIS provides algorithms of connection between vertices taking all the revealed for DIS mathematical properties into account, foreseeing efficient transitions to functional and imitative levels of research in prospect. This is implemented through the operations named „mutations". Mutations are the rearrangements of categories in triads by the rules, specified in the setting of indices at vertices – categories. As a result of mutations at the second level decoding, six new triads appear, which don't have names yet. Thus, the technology of TDIS produces a heuristic effect, but for its development the operation of folding is needed, when the new names are given to all of the six triads formed by mutation.

The sequence of decodings from level 0 to level 3 without regard to mutation and folding can be seen in Figure 1.

The DIS schemes in Figure 1 are called DIS-computers (DIS-*C) aiming to show that the DIS structures allow to implement particular computational technology at the level of numerical simulating models. The next scheme presents working with DIS scheme of level 2 with the application of decoding, mutation and folding. The cognitive model of completing the processes described above is presented in Figure 2.

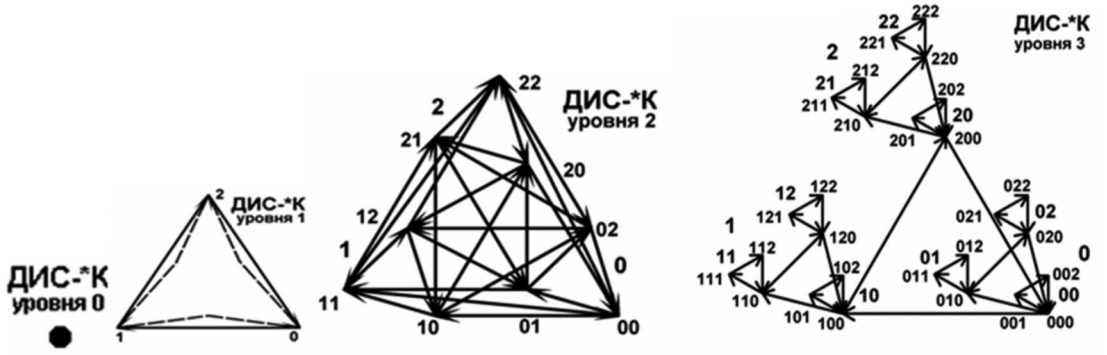


*Figure 1: ДИС-*К (DIS-*C) of 0-3 levels as cognitive patterns for knowledge packaging.*

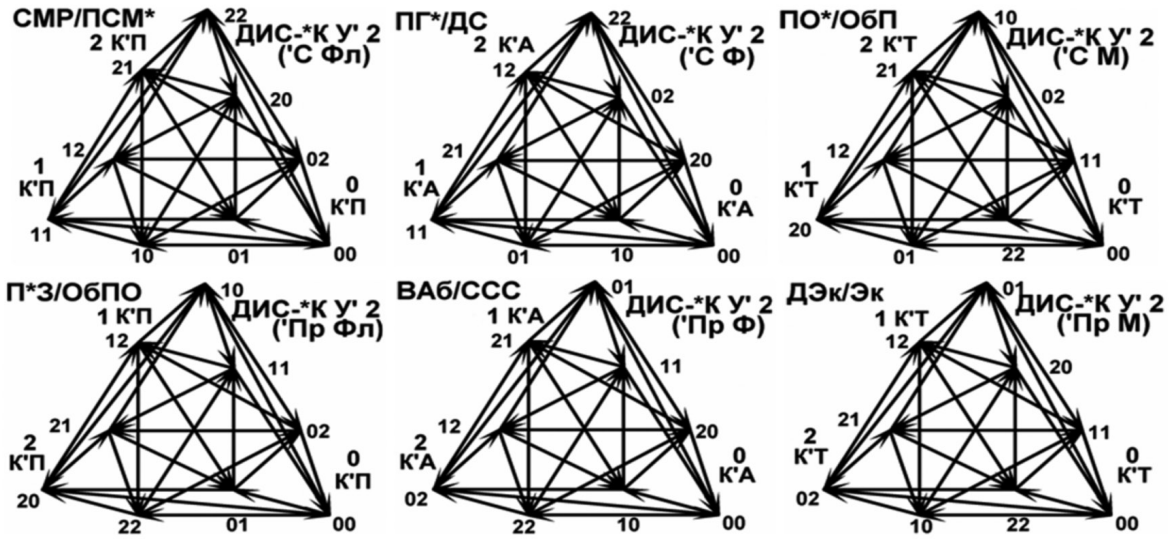


*Figure 2: Basic mutations of a DIS computer at the second level in the language of canonical numbering of its vertices (DIS-*C L'2).*

The scheme in Figure 2 demonstrates an example with knowledge analysis characterizing the research with regard to perception, learning and projecting in general terms. Keys: basic mutations of triads: ВАб – realization of the abstract, ДЭк – access to experiment, ПГ* – testing of hypothesis, П*З – comprehension of legitimacy, ПО* – comprehension of experience, СМР – self-development; basic types of mental organization: ДС – pressure of fear, ОбП – training through imitation, ОбПО – training through practical learning, ПСМ* – connection to self-development of the Universe, ССС – creation of the means of insurance, Эк – experiment; basic aspects of study management: ‘Пр – application, ‘С – establishment, correspondingly, М – of mathematics, Ф – of physics, Фл – of philosophy; the rest: К’А, К’П, К’Т – information criterion, correspondingly, active, passive, transforming; M-A-mathematical apparatus as a mean of analysis and support, П – notion, СРП – mean of working with a notion.

The symbols, additional to indices, may also be taken into account. They provide an opportunity to bring any special question to the level of generalization and abstraction (Razumov & Sizikov, 2013, pp. 16-22). Insafing as an application area of TDIS makes it possible to relate any of the topics discussed to your accumulated base of developments. The development of TDIS, DIS technology and DIS computers goes along with formation of fully connected system of general scientific categories which is open to renewals. This system is called nomological base. It includes about one hundred categories and a formal alphabet[1] was created just for it (Razumov & Sizikov, 2014). Communication technology – insafing provides for possibility of serious interdisciplinary studies of the topic. It functions in the following manner. The group of categories (key words) on the topic is relevant to the categories of nomological base. If no matches were found, decoding of the categories and also mutations take place until the categories of nomological base appear. When this is accomplished, resources that are already present are involved for further research of the topic, including some mechanisms of cognitive mapping.

## 3 Methodology for insafing

Insafing began to form in 2012 (Dus et al., 2014, pp. 25-42). It is applied and expands as a new technology of communication in the areas of project planning in business, management, scientific researches and education. Let`s touch on methodology of insafing in project planning as this line of work theoretically provides combination of research and didactic processes for purposes of solving a specific task. The internet resource called „The First Sense Net“ (2015) was elaborated by the authors of the article on the basis of TDIS in order to support and promote insafing. And also two versions of software application were elaborated: AWS of researcher – Cognitive assistant (Lunacharskiy, 2011), the program implementing mutations of DIS computer of the second level (Razumov & Sizikov, 2013, pp. 16-22).

As the TDIS apparatus is being used in insafing, it is necessary to point out that initially the subject-organizer of insafing is specified with the level of abstraction used on a case by case basis. High level requires us to start the work as a serious scientific research in an interdisciplinary format and with a focus on innovation. At that rate, as it was described above, the categories of a subject correlate to nomological base. The results and instruments of TDIS are actively involved in the process. The disciplinary socialization of obtained theoretical results, accompanied by their specifications and interpretations as a matter of actual practice is primarily performed in the phase of interactive communication. The medium level refers to work with categories characterizing the subject, with orientation at the level of training and the needs of the group in which insafing is planned. The low level, as a general rule, is accepted upon condition that the group is ill-prepared (training session, brief one-time consultation exercise). The CS, upon which the interactive phase of work starts, is formed in cooperation with the group. The procedure of insafing is the following (Figure 3).

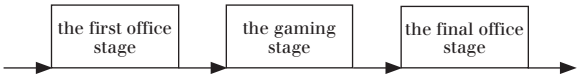


*Figure 3: Schematic diagram represents the stages of insafing.*

Three stages of work are allocated: the first office stage, the gaming stage and the final office stage. The office stage is performed by a general subject, the organizer of insafing. Taking interests and proficiency of the customer into account, the level of abstraction is assessed and the scenario is formed, the event´s duration is planned, the way the future result should look like is fixed and the way of its presentation is determined at this point. Whether the sense scheme is to be developed together with the group, or would be suggested by the organizer cut-and-dried, is also specified. Creative potential of organizers proves out at this phase, as well as their ability to walk a fine line between their own research interest and the training and needs of the customer. The capabilities of visualization of discussion in a form of CS or so called „sense“ schemes

[1] To be consulted with the content of nomological base on the website: http://thoughtring.com/ViewForm.aspx?id=421.

(Ryzhenko, 2012) are usually used in the office stage. The use of software application „Cognitive assistant“ (Lunacharskiy, 2011) is approved. Experience has shown the practicability of discussing the products of the first office stage with a group. On this basis, the transition to the gaming stage commences.

The communication on scenario given to the group is evolved at the gaming stage of insafing. The presenter begins his work with demonstration of the CS, which is the basis for the further discussion. If the group accepts the CS, the roles breakdown takes place. When operated at the second level of CS (as shown in Figure 2), each of nine categories marked by double digit indices corresponds to the expert`s attitude. The experts are divided into nine subgroups. In accordance with the CS in Figure 1, these are the triads: 00, 01, 02; 10, 11, 12; 20, 21, 22. The subgroups in every act of communication are united in three groups. Insafing, on the one hand, has capacities for combining a good number of triads, and, on the other hand, under the conditions of limited time they confine to combinations suitable to the purposes of certain insafing. The goal of the experts is the generation of knowledge concentrated by a particular category to the benefit of development of universal (systematic) concept of the entire triad as the category of the first level decoding (0, 1, 2). Working on these categories is assigned to moderators in each group. They organize communication in a group, accumulation of the results and presentation of the group`s report. Thus, the minimum of thirteen people is necessary for the construction of insafing (nine experts, three moderators and a presenter).

The logic of insafing is built in such a way that in the office stage of the work the process initially goes on the way of specification of the topic. The gaming stage is the process of movement for the details to their integration into the big picture, in other words, the system with emerging effects has to be derived. The discussion of the topics marked by categories as 0, 1, 2, begins in groups, each consisting of three experts and a moderator. It lasts from 15 to 30 minutes. The affinity of discussions is achieved with the help of questions associated, in accordance, with the indices – 0, 1, 2; and on the triads repeatedly – 00, 01, 02; 10, 11, 12; 20, 21, 22. The so called „sense schemes“ are sometimes used in the research. For instance, the scheme is stated as a triad of questions: What? How? Why? The „What“ question refers to the subject`s characteristics and the compilation of definitions. The „How“ question points out the instrumental part, in other words, what methods and technologies might be implemented in it. The „Why“ question implies stating the goal for the system and also highlighting in which larger scale system, also developed in insafing, the system is inlined. After the discussion they switch over towards the presentation of the material by moderators. The speech lasts no longer than five minutes and after that within the ten minutes period some questions may be asked, and the discussion takes place. After the last (third) moderator has finished his speech, moderators organize a group for discussion of a topic given for insafing. Their goal is to form a system of representations, in which all the participants were interested originally. Their discussion lasts up to fifteen minutes and then one of the moderators speaks (up to five minutes). After that it is a time for questions and discussion (up to ten minutes). In case, if observers are required, they are involved as opponents for evaluation of ideas and propositions presented.

The collected materials become a basis for the final office stage of the work, which includes: preparation of conclusions offering a concept, a programme, technical requirements and other documentation necessary for the further realization of the project that was discussed in insafing.

## 4 Example of insafing

The technology of insafing was implemented by the authors of the present article for the development of the tourist project „The country of adventures and travels along Siberian Route“ (O proekte, 2015). This project is designed to form high-demand tourist products on the territory of Siberia. The word „routes“ was used in Russia to name the roads, where the coachmen connection was established until the end of the XIX century. Coachmen connection is the horse-drawn connections for state, commercial and postal purposes, in which trios of horses were usually used. Siberian Route is the longest road in the world that traveled north of „The Silk Road“ and led from the European part of Russia across the Urals to China (via Lake Baikal and Nerchinsk), and also in the direction of Alaska (via Yakutsk and Kamchatka). Nowadays, the tourist zone is being formed along the route, where a great number of historical artifacts, museums and legends stood the test of time, and, where there still are unique natural complexes. The project involves establishing of a common player tourist area managed by a community of indifferent people and organizations.

The series of insafings was organized that included different participants. The final one is reputed to be the insafing of December, 10, 2015 in Omsk through the request of association of intermunicipal collaboration „Siberian Route“ with the assistance of the Ministry of Culture of Omsk Oblast (Shkarupa, 2015).

The experts in tourism, culture, municipal administration, environmental protection, finance, economics, computing technologies, and also the students of Omsk universities took part in insafing (each subgroup out of nine working simultaneously included 3

to 5 people with one student or one postgraduate being present). The sense scheme presented in Figure 4 was used as the basis of the first stage of communication.

The sense scheme Realization of the project „The country of adventures and travels along Siberian Route“ (Figure 4) is performed in office. The questions were prepared for each of nine subgroups, marked by double-digit indices, for the participants of insafing to answer (Table 1).

*Table 1: Questions for the groups of initial communication.*

| ***Source group 0. What is the „Country“ like?*** | |
|---|---|
| **Topics** | **Questions that should be disclosed in topic** |
| Topic 00. The components of the „Country“ | - characters<br>- characters` activity<br>- relationship between characters<br>- space for activity<br>- etc. |
| Topic 01. What is happening in the „Country“ *(during the final communication this topic will be moved to another group)* | - legislation and the rules of conduct function<br>- events happen (quests, special offers, traveling…)<br>- topics (trails) are formed<br>- bonuses and statuses are assigned<br>- etc. |
| Topic 02. Why is the „Country“ organized in that way | - design creates visions<br>- visions present interests<br>- characters create events<br>- events are formed into topics<br>- bonuses and statuses generate action<br>- common player area emerges<br>- etc. |
| ***Source group 1. Who needs this project and why?*** | |
| Topic 10. Who is interested in the project *(during the final communication this topic will be moved to another group)* | - clients<br>- authorities for culture and cultural institutions<br>- business entities<br>- local authorities and other levels of government<br>- etc. |
| Topic 11. Motivation for participating in the project | - acquisition of resources<br>- self-sustained growth<br>- attainment of senses<br>- etc. |
| Topic 12. Project results | - financial sufficiency<br>- steadiness, reliability<br>- interesting life<br>- patriotism<br>- etc. |
| ***Source group 2. How to implement the project*** | |
| Topic 20. Resources and forces at work of the project „Countries…“ | - actors<br>- artefacts and mythology<br>- investments<br>- etc. |
| Topic 21. Means of project management | - strategic guidelines<br>- management entities<br>- managing impact on participants<br>- patterns and instructions for action<br>- etc. |
| Topic 22. Mechanisms for realization of the project *(during the final communication this topic will be moved to another group)* | - mobilization of resources<br>- coordinating<br>- consolidating progress<br>- operational maneuver<br>- etc. |

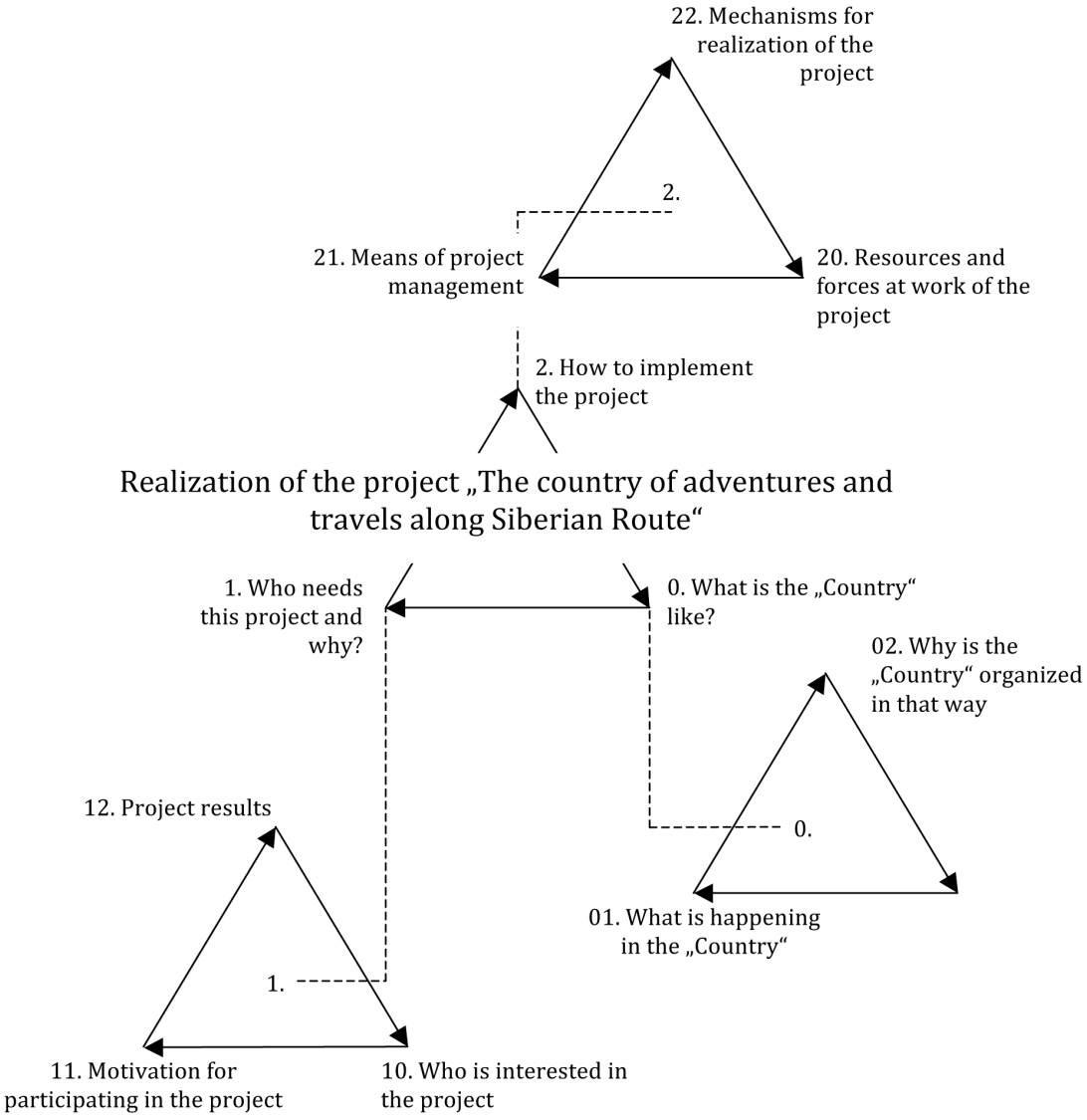


*Figure 4: Initial Sense scheme: Realization of the project „The country of adventures and travels along Siberian Route“.*

The first step of insafing was organized on the basis of this sense scheme. It was responsible for arranging communication in three groups with further public discussion of the groups' reports.

The second, final step of insafing, was based on new sense scheme Means of obtaining success in the project „The country of adventures and travels along Siberian Route“, obtained in the office stage through one of mutation processes of the initial scheme.

The final scheme acquired the form presented in Figure 5.

The questions for communication introduced in Table 1 were composed into triads in Figure 5 according to combinations of the categories and were based upon this sense scheme.

The final office stage of elaboration of technical requirements for social networking service, depiction of which is beyond the scope of the article, has become the result of the first office stage of insafing (construction of the sense scheme) and the gaming stage (communication in a form of AOG).

The overall result of insafing is the final office stage of sketch project development with the further development of technical enquiry of partner rewards program, realized in 2016 and in the beginning of 2017 on the website http://sibtract.ru.

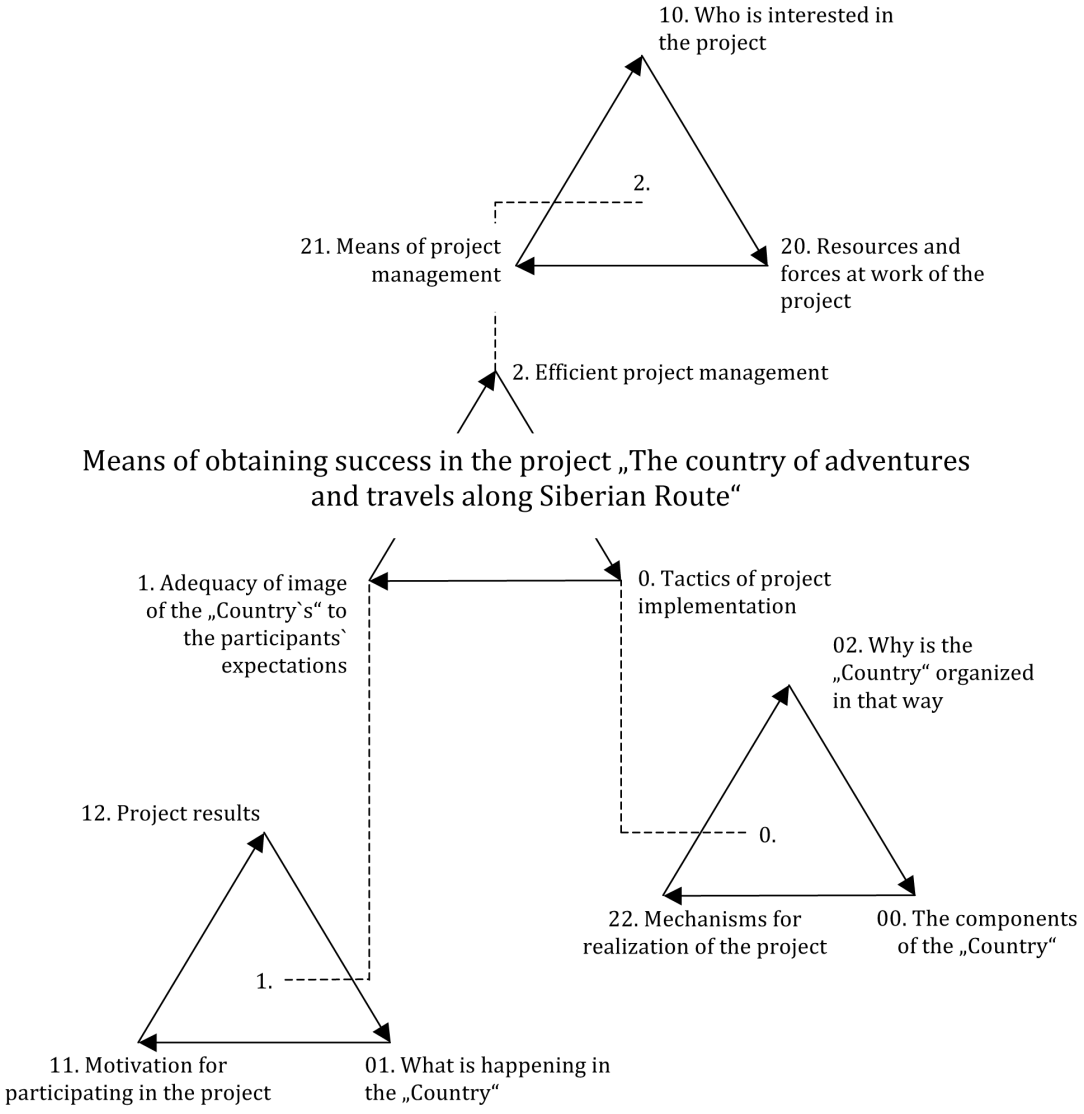


*Figure 5: Final Sense scheme: Means of obtaining success in the project „The country of adventures and travels along Siberian Route“.*

## 5 Conclusion

Formation of the sense schemes of communication (Figures 4, 5) appears to be an important aspect of group work technology. It saves time significantly hewing off unnecessary digressions and allows to go through the issues more in detail which are important to tasks at hand. Moreover, it deepens the elaboration of the product of communication – attained results reported by groups. The cognitive approach to the work is provided with the fact that the scientific base of TDIS is taken as a basis of knowledge management. The architecture of knowledge on the topic for discussion is built on it. Insafing provides an opportunity to combine (in interactive form) logical clearness and strictness of reasoning with abundance of alternatives and justification of heuristics. Every specific question is discussed in such a way that the operations of decoding, folding and mutation included in insafing technologies enable to achieve simultaneously heuristically valuable and reasonable results.

The provided case study of implementation of insafing in realization of the project „The country of adventures and travels along Siberian Route“ represents the way of working with this instrument.

The stated in the article methodology of insafing organizing, including preparation specifics and arranging both office and gaming stages, has the generic character in different subject areas. However, it should be noted that insafing implementation in order to solve

problems in other subject areas requires formation of other sense schemes. For automatization of such formations at office stage the program „Cognitive assistant“ (Lunacharskiy, 2011, pp.142-145) might be used.

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