# Principles of systems approach in Kazakhstan geoinformation mapping

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**Abstract**

The article geoinformation mapping Kazakhstan is considered as the development of a large complex dynamic system maps.

**Keywords:** GIS, GIS mapping, geosystems, GIS technology.

GIS mapping (GM) - modeling of natural and socio-economic Geosystems GIS-based [1]. Model geo-system should be considered as a system of cards, tied together and complement each other. Moreover, in virtue of the integral, the dimensions and dynamics of geosystems the objects of their design and simulation are the highest category of complexity [2]. One of the main goals of GIS mapping as a science - is to support decision-making in the management of geosystems in the broadest sense, including assessment, planning, forecasting, optimization, etc.

The increasing complexity of the model systems studied by deepening the structuring of its constituent objects, the highest possible display their properties and behavior in order to better modeling dramatically increases the amount and complexity of work at all stages of development.

To represent objects and phenomena of the real world in all geographic GIS data is converted to digital form and stored in a database. And about two-thirds of the development cost of the project accounts for costs associated with the creation of its database, which depends on the efficiency and effectiveness of the entire project of GM [3].

Analysis of the built and developed projects GIS mapping shows that it is more private purpose projects and only a small fraction of the total amount challenged to system designs cards. But the creation and implementation of projects of individual tasks do not solve the problem.

Use for optimum system design methodology maps object-oriented systems approach, modern mathematical methods and computer technology opens up new possibilities for managing the complexity of the statement and a comprehensive approach to the Civil Code, under which geosystem regarded as a complex dynamic natural and technological system, which is an integral unity of many interconnected objects.

In addition to the complexity of the geosystems as the object modeling, complexity arises because of the difference of views on the nature of the problem consumers, the producers of the problem and the developers [3-6], when the demands of directors of the problem presented in the form of documents that are difficult to understand, or ambiguously interpreted by different parties, may lead to poor quality of the product uncompetitive.

The special problem of discrete modeling of complex systems. When the system is described by a continuous function, then by definition, small changes in input variables are displayed in small changes in the output. In digital systems, a small change in the input parameters can lead to a transition of the system in a completely new quality. "As yet there is no mathematical methods or intellectual capacity for full simulation of large discrete systems

we have to be satisfied with a reasonable level of confidence in their correctness". [4] Coordination theory developed so far only for simple and continuous systems [6, 7], or the coordination of subsystems occurs through shared information fields such as "blackboard". The use of object-oriented analysis and design (OOA, OOP) allows you to date other approaches adequately simulate all kinds of hierarchies of the general theory of hierarchical multilevel systems.

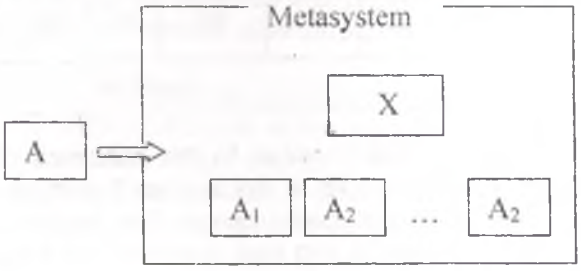
Of the many possible areas of classification maps should be considered the most important grouping of map data on the subject and content, as it is based on the reflection of species diversity Coverage natural socio-economic territorial systems, helps to identify the main characteristics of their structure, hierarchical level, and the relationship of subordination. In this classification are taken into account and integrated sector-wide approaches to socio-economic mapping, define a general shift of the community cards to industry and Industry specific.

In accordance with the provisions of the first and higher level of thematic classification form a general geographic maps that display the objects of nature at the same time, the population and economy. Due to increased economic development in the geographical envelope of the Earth and the growth of anthropogenic change in the content of the natural complexes geographic maps occupy an increasingly prominent place of socio-economic characteristics, which makes it possible to trace their relation to maps of socio-economic issues.

The second stage of the system maps form the so-called basic card - special topographic maps (mainly large scale), specifically designed to meet the needs of the economy. They have the greatest wealth characteristics of the population and the economy. It can also be related to the maps of socio-economic valuation of natural resources and the environment, many environmental maps showing the effect of economic sectors to natural systems, and other cards, the complementary characteristics of nature and society.

The transition to the system mapping also explains the theory of intersystem transitions [7]. At each step of the new level control system has a subsystem which formed only later evolution (in our case - a multilayer dynamic thematic map) and, which can be considered as the current upper level of management. Metasystem transition occurs by making multiple copies of this top-level subsystems and integration of copies of copies of the subsystem by subsystem of education through the formation of the next level of management (Figure 1).

**Figure 1: Overview of the metasystem transition. A - the system of the prior, X - a new top level in the control system, A2 - duplicated subsystem A in the formation of meta**

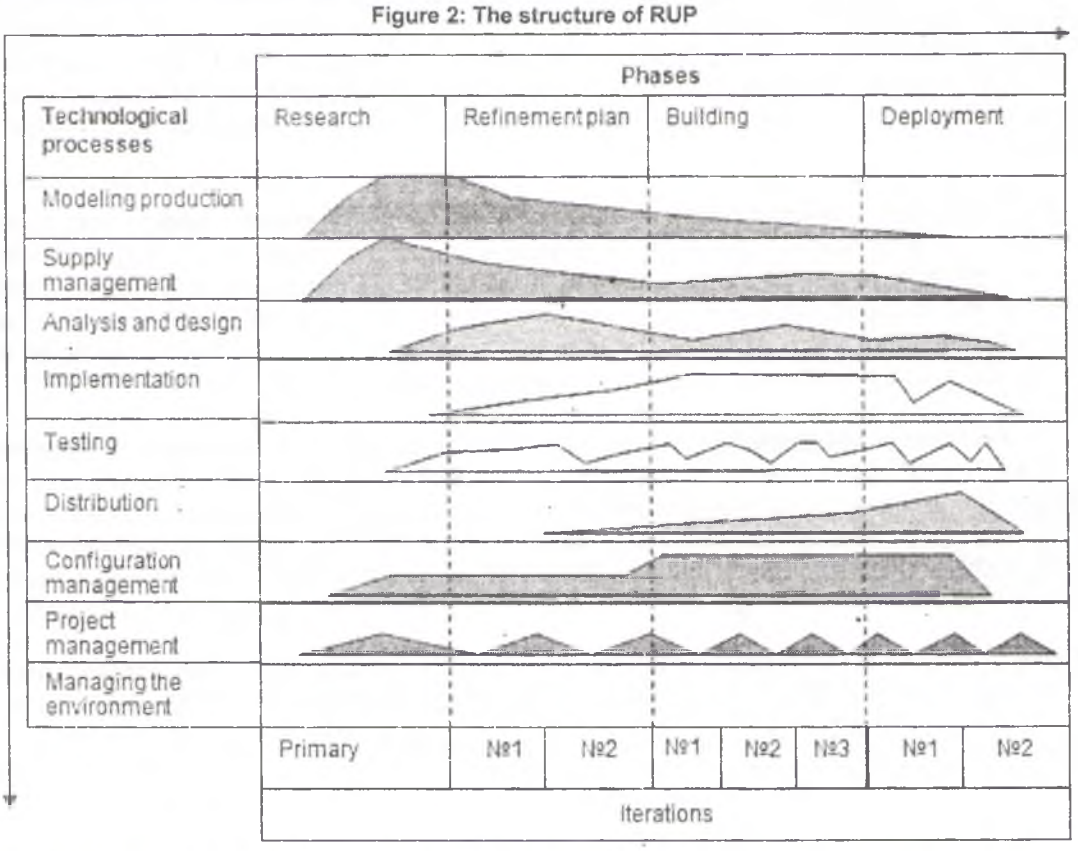



Increase in the power of information technology technical support, reducing the value of its units, the development of methods and programming languages and software systems allows for more detailed projects of GK. But there is a problem of optimal control of a team of developers and the development process itself [3-6].

To cope with the increasing complexity of the work in modeling without loss of quality is only possible using the latest advances the theory and practice of object-oriented GIS technologies to create complex information systems, such as RUP (Rational Unified process of creating software-intensive products), such CALS (information technology maintenance and support stages of the life cycle of the product) and other international standards (ISO 9001:2000). The development of a method of modeling large complex systems from a general description of subsystem functions to the processes of quality management technology, established standards, phases, milestones, performers, activities and artifacts - the path to competitive products.

RUP - is the process of development of complex information products corporation Rational Software, one of the many tools available on the market information of object-oriented technologies. A process based on the architecture and managed precedents (case - in English - use case, - mode). Process, follow these guidelines: develop iteratively, manage requirements, use a modular architecture to use visual modeling, do not forget about the quality control and monitor changes (Figure 2).

**Figure 2: The structure of RUP**




Architecture - it is part of a project related to the principles of the system, fixing the attention on the most important elements of the system that have a strong impact on the quality, the possibility of evolution and performance. The system architecture defines the interfaces of the main structural objects and their behavior, the basic control flows. This will subsequently develop a model of the system, its constituent objects, their properties and behavior without compromising the integrity of the system. The construction of the system architecture and its representations is important in terms of methodology.

When building the model and define the requirements for the system being developed different approaches to the use of vocabulary domain, CRC-cards, conceptual clustering, etc. But if the model of the problem created by the customer, is far from the model of the

developers, there is a high probability of an incorrect address, or work with several models that will increase the risks and lack of coordination in the work. Therefore, a model built on the precedents technology that allows to express the problem clearly and customers and developers.

Iterative development allows you to identify risks at an earlier stage and in a timely manner to respond to them. At each iteration, the developers continuously test and deepen the implementation of the project, set the feedback to the user, find and eliminate the risk and get a real idea about the state of the project. Requirements Management involves people from the early stages of the project to harmonize the requirements and opportunities created by the development.

The modular architecture allows re-use of their own or setting available commercial components (maps, layers), divide responsibilities between system elements. At the heart of the modeling process is a system architecture that is created on the first iterations and then evolves iteration for iteration.

Visual modeling with a standard language UML, allows members of the development team, talking the same language, using precedents as to analyze and design a model of the system to make it clear to both users and developers and customers.

In addition, the current state of mining science and practice of the country, when the inflow of young specialists is insufficient, actually the fullest possible knowledge retention of the older generation of cartographers, documented in the form of a standard language for use in the following without loss.

Correction of errors that are cheaper than they used to be discovered. Checking the capacity of the system includes the creation of tests for all key precedents and tests for each iteration.

The long-term development of the science and practice in the design of modern information systems led to the development of processes such as RUP, providing standardized management tasks and responsibilities of developers. The modeling process is represented with four basic elements: the performers, artifacts, activities and processes. The elements of the show: who does what, how and when.

Examples of artists: a systems integrator, architect, specifier precedents. Examples of the types of performers: the search for precedents and actors reviewing. Artifacts activities - used or generated by them, objects, parameters: case model, class, subsystem, object. Technological process - a sequence of activities that provide meaningful results (Figure 1): simulation of production, analysis and design, plan iterations.

The life cycle of RUP is an iterative process and its phases (Figure 1) and the milestones. Phase of the study completed a milestone goal of the life cycle, the phase refinement plan - architectural landmark, the phase of building - a landmark initial phase of the deployment and performance - a milestone release. These milestones are the times at which on the basis of clear criteria for decisions to continue or change certain processes and iterations.

Each iteration passes (Figure 1) all of the major types of activities: requirements management, analysis and design, implementation, testing, but the transition from iteration to iteration, there is a shift in emphasis in the activities.

Need to improve the quality of the design through the use of GIS. Existing Western ArcGIS, etc. decide on a high level, the necessary tasks of design and planning. Although there is work that these GIS have not automated. It is a pity that many Republican members

mapping work while using manual methods without the use of modern GIS technology. We need to promote quality management systems projects, such as RUP, CALS, etc. Experience and knowledge of the older generation of scientists of the republic is not lower than the world and aliows you to make of the above, and to improve the quality of projects CC.

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