International Journal of Applied Engineering Research ISSN 0973-4562 Volume 10, Number 23 (2015) pp 43456-43460

Management Systems of Urban Planning

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Abstract
Common problems of urban planning development programs management are considered. Methodology of automated planning and urban planning development program management in megalopolis is given.
Principle approaches used in solving problems of preparation and management of large-scale construction programs are summarized.

Keywords: urban planning development program; monitoring of construction programs; functional management methods; planning and management; network planning and management methods; project management; project briefcase management

Introduction

In Moscow 3,1 million square-meters of housing will be built using funds from the city's budget combined investors contributions. City coffers are expected to fund an estimated 737,8 square-miles. Plans are also underway to construct significant social objects.
The city task programs-events which are approved by Moscow State authorities with the goal of addressing the city's social, cultural and ecological problems, as well as branches and centers for city services within Moscow's administrative zones.
Here are some of the programs concerning city construction:

- The construction of city order housing programs;
- The complete overhaul, modernization, and reconstruction of buildings and facilities as well as whole areas located within the city;
- Complex city program of condominium formation and creating favourable conditions for establishment of housing owner companies and their activity;
- Moscow program "Housing for a young family";
- The construction of new buildings that will attract small businesses;
- Moscow program "Housing" for 2012-2018 years;
- Moscow program "The development of municipal engineering infrastructure and energy efficiency" for 2012-2018 years;
- The promotion of the Moscow Underground and other means of high-speed transit;
- A task program to reorganize Moscow's industrial zones;
- The construction of new parking facilities in the city of Moscow;
- Moscow program "Urban planning policy" for the years 2012-2018.

Elements of the management system

Thus, on the basis of use of similar information models of elements of technological cards process of formation of organizational and technological documentation considerably becomes simpler [1].
One of the highest priorities for improving urban planning, program development and management is to introduce modern models and systems which allow reconstruction management and facilitation of making rational, circumspect decisions on that based on unbiased, reliable, and complete information about controlled objects.
With increasing building density in urban areas the construction technologies of the exploited roofing with vegetative system become particular important [2].
The complex task of planning and overseeing Moscow construction programs has complicated structure being formed by vertical hierarchical levels (which are interconnected with functioning and subordination of participants in planning and realization process) as well as by actual composition and every participant's activity in a certain time limits of functioning system. At the same time all these activities are done with regards to concrete material elements-buildings, edifices, infrastructure objects.
The main element of the management system being created (fig.1) is a single object of construction. It is this term that is used by all participants of all types and subordination levels within the system. Determination of the object as the supporting element can be illustrated by examples of separate and obvious system components:

- urban planning development program-lists of objects to be constructed (being constructed) at a certain period of time;
- region construction program-list of objects to be constructed (being constructed) at a certain period of time;
- address lists of all types-list of construction objects;

- engineering infrastructure-list of construction objects;
- etc.

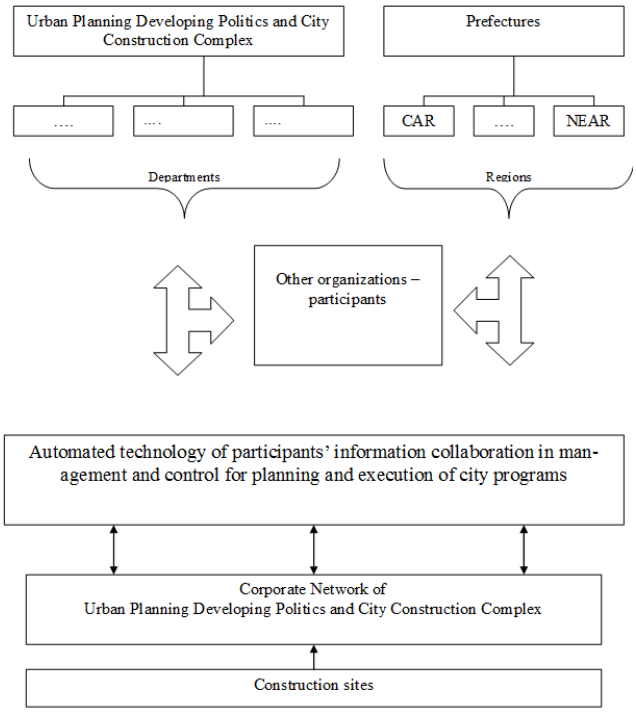

Fig. 1. General structure of management system

At any moment of system function the term "object" must be employed in the form of independent element of common object list.

The process of creating a single construction object from its initial proposal to finished project can be considered as a totality of consistent stages of its inner properties changes. (fig. 2). These properties are of complex origin but in the context of management systems they are all evaluated by some characteristics of abstract mnemonic nature (name, figure or scheme, table, design, reference, expert conclusion, estimate etc.) making it possible to judge present object state under the limits of its lifecycle. Thus a single stage in an object's lifecycle is considered as a set of properties indicating significant changes of its properties. Composition of stages and their filling with concrete characteristics are determined by a system of organizational structures which provide realization of the object's progress from the management point of view.

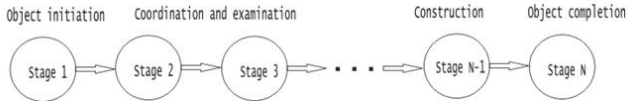

Fig. 2. The city's construction program object lifecycle

Organizational structures hierarchy predetermines potential possibility to determine the second independent informational system element-list of objects. This list is the basis for functioning of the upper controlling structure which organizes, controls and coordinates work of a whole system. At this level information on a certain object is enlarged and packed in mnemonic perception in a particular way in order to serve procedures of total management and control.

Changes of an object's state through its lifecycle can be described as a set of consistent parallel works with different content. Variety of objects with their set and work chain in the context of management system can be classified and led to the ultimate number of classes in the form of finished models.

Information elements of management system

Object information

There are two kinds of information regarding the object:

- data directly formed, modified and saved in management system, and;
- information which can't be processed in the system (designs, projects, estimates etc.) but generalized data which are used in the object data and management system overall.

Every object gets its own model as account card when it appears in the system. "Card-model" is the lowest level of object conception and being relatively independent it should be available to upper level structures for review and for receiving indices. At the same time tools being used should provide date connection and mark work completion in management system.

The advantage of presentation of construction objects as single models is the potential to create a data bank of management system works executives and trace their workload.

The list of objects when being presented in management system should be formed from objects names with a set of appropriate indices showing workflow on erecting an object in the form of particular system model. At the same time the combination of indices in the list may vary, enlarge and re-order during execution of urban planning development program stages. The creation of documents involved may accompany the list at certain stages.

The principle function of lists is to provide fast collection of summary indices of urban planning development programs completion in every organizational department and on the whole work execution control at the intermediate stages.

In the upper level of the management system hierarchy is the Head of upper level or his organizational structure which controls and coordinates all the participants involved in the planning and construction program.

Activity within the upper hierarchical level is not regulated by information system and is instead determined only as a chain of one-stage events-landmarks determining significant for coordination with the system moments connected with direct participation of the upper hierarchy (meetings, agreements, approvals, control, etc.) (fig. 3). Such events are affixed to calendar (occur according to schedule?) and they determine consistent stages in the realization of the urban planning development program in the context of the management system.

The main information element, which the upper hierarchical level oversees at various moments, is a list of objects with their target indices of actual state for a single object.

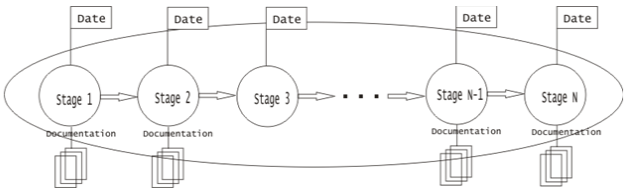

Fig. 3. The presentation of a city construction program is seen as project stages occurring according to schedule and documentation.

Such indices can be a set or summarized in the form an index with two qualitative states: "Yes" or "No". "Yes" means normal execution, "No" indicates a slippage or lack of some kind of work on a certain object.

Indices of "No" type are supporting concept moments in the work of the upper hierarchy. The system doesn't consider and can't predetermine concrete decision maker's actions aimed at situational improvement, but it should provide decoding of the index "No" according to the following types of information:

- organizational structure which is responsible for index formation;
- work or a series of works connected with index formation;
- planned and actual status of work;
- appointed supervisors, and;
- possible consequences (for non-completion of work).

Along with potential to handle "No" type indices in one-stage actions of decision maker within fixed schedule terms, the upper level of the hierarchical structure should have access to indices of certain objects in order to analyze the status of works at any stage in individual departments at the lower level at any moment. This analysis is carried out by appointed supervisors representing the upper level of the hierarchy and may be conducted in the form of meeting arrangements or current control.

For information about building processes, materials are diagrams, drawings, sets of numbers, symbols, and text description. The system should describe all this information to present different character in a single alphanumeric form [3].

The majority of formal languages (created structures) are constructed as follows: first, select the alphabet, or a combination of the original characters that will build all the expressions of the language, and then describes the syntax of the language, that is, the rules for constructing meaningful expressions. The letters in the alphabet of a formal language may be letters of the alphabets of natural languages, and the brackets, and special characters, etc. [4].

Of the letters, according to certain rules can make words and expressions. Meaningful expressions are obtained in a formal language, only if certain rules in the language of education. For each set of formal language of these rules should be strictly defined and the modification of any of them usually leads to the emergence of new varieties (dialect) of the language. On the issue of formalizing the description of technological information are two fundamental methodological approach: the development of a set of coding sheets and the use of a special formal language.

In the design based on standard processes, you must first find an appropriate standard process. In systems engineering unit processes to describe the background using formal problem-oriented languages that are more invariance and therefore more versatile. For example, in mechanical processes described using the grammars and language [5].

Subordinate structure

Subordinate levels of the system's hierarchy are actual organizational establishments (departments, prefectures, expert and licence committees and offices, design and construction organizations) directly involved in official activity within the Moscow construction complex.

A subordinate level of the system's hierarchy operates within a specific framework describing their duties, one that creates certain independence and uniqueness with respect to composition, yet operate with consideration to and cooperation with shared tasks and roles within the overall project. But the presence of construction objects, shared descriptions within their information indices and lifecycle stages provides cohesion with stages of city construction programs realization at any hierarchical level and from any independent structural establishment work.

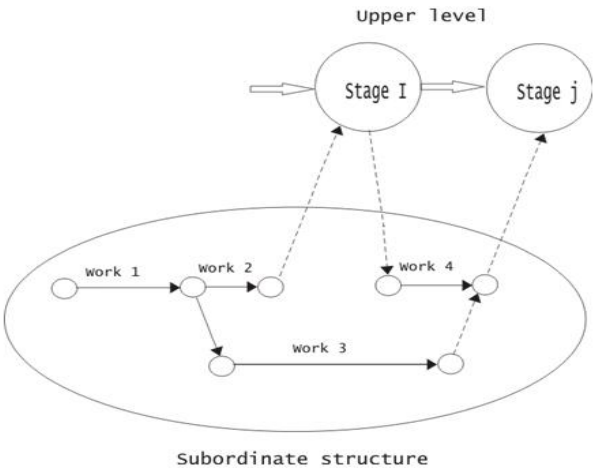

Fig. 4. Ties of isolated subordinate structure with general program.

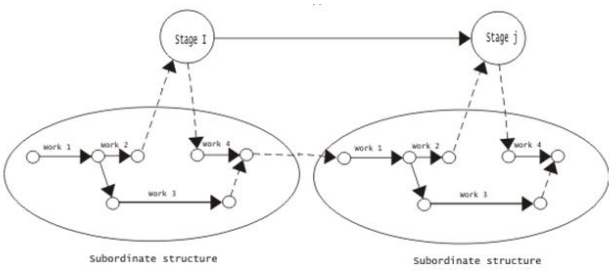

Fig 5. Ties of subordinate structures between them and general program.

If the work of upper hierarchical level structures as a procedure of urban planning development program realization was considered above in the form of a set consistently arranged large stages of object's lifecycle changes in the general list, work of organizational establishments of lower level should be regarded as a set of works and stages having more complex structure of ties and chains.

At this level it is also possible to deal not with a single object but with their set (list), in this case given hierarchical structure level becomes similar to upper one but functional properties of this structure inevitably lead to appearance of some work composition reflecting structure activities chain as well as objects indices composition which the structure is responsible for before structure of higher level.

Organizational establishments' work can flow relatively independent and correlate with urban planning development program realization stages determined by upper hierarchy (fig.4) or can be connected with work of other hierarchies at the same level or with subordinate ones.

In general view subordinate organizational structures may act independently, jointly, accept different levels of subordination etc. The basis of system's work at this stage is decomposition of the structures and their hierarchies as well as ties between them and with upper structure.

Somehow subordinate structures address to the lower information element-object, determing his new properties at any stage of his lifecycle (fig 6). This element may be addressed by structures of upper hierarchical level but as we can see on figure 6 they can affect object state only by subordinate structure executing certain works.

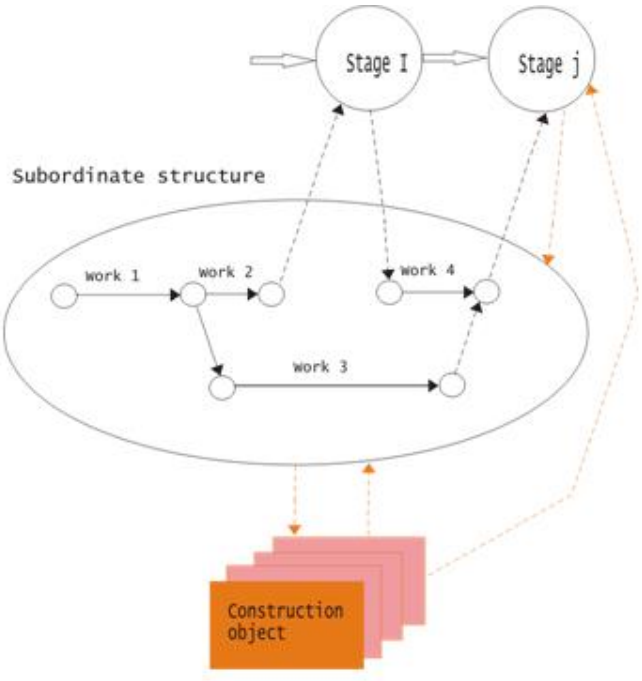

Fig. 6. Ties of the object in hierarchical structure of management system.

Thus the main complexity in realization of effective urban planning development program management system is a great amount of different functioning upper and subordinate structures having complicated system of documentation, reports and information resources used.

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