Influence of cloud computing on program and system engineering of information systems

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Abstract. In work influence of new information technologies and, first of all, technology of cloud computing on program and system engineering in the context of the document SWEBoK v3 is considered. The accent of reviewing is focused on creation, maintenance and development of enterprise information systems.

Keywords: Program engineering, system engineering, cloud computing, technology of cloud computing, life cycle of the software, SWEBoK.

Now one of the fundamental document regulating the maintenance of knowledge domains of program engineering is Guide to the SWEBoK.

In 2014 there was the third version of this document Guide to the SWEBoK v.3. Financing, the organization and coordination of this work were realized by IEEE Computer Society. In this version all knowledge domains of program engineering described in prior version of 2004 were updated. Five new knowledge domains were added, and the knowledge domain "Tools and methods of program engineering" was renamed into "Models and methods of program engineering". Tools of program engineering enter as subsection each knowledge domain now. Names of the disciplines connected to a Guide remained the same. Specifications of the description of knowledge domains, the annotated list of standards for each knowledge domain of the link to the documents quoted in a Guide are given in three appendices.

Knowledge domains in new and old versions of SWEBoK are given in tab. 1.

The disciplines connected to a manual (in both versions):

- Computer Engineering
- Computer Science
- General Management
- Mathematics
- Project Management
- Quality Management
- Systems Engineering

Table 1.

№№	SWEBoK v.3 (2014)	SWEBoK 2004
1	Software Requirements	Software Requirements
2	Software Design	Software Design
3	Software Construction	Software Construction
4	Software Testing	Software Testing
5	Software Maintenance	Software Maintenance
6	Software Configuration Management	Software Configuration Management
7	Software Engineering Management	Software Engineering Management
8	Software Engineering Process	Software Engineering Process
9	Software Engineering Models and Methods	Software Engineering Models and Methods
10	Software Quality	Software Quality
11	Software Engineering Professional Practice	
12	Software Engineering Economics	
13	Computing Foundations	
14	Mathematical Foundations	
15	Engineering Foundations	

Despite essential up-dating, the new version saved the main directivity of prior version – the basic engineering principles of creation of the software on the basis of the standardized life cycle, first of all for enterprise information systems.

Development in recent years new information technologies and the software created on their basis, and, above all forms and methods of use of this software as for corporate, and personal needs shows essential changes concerning the concept given above.

First of all, it is necessary to carry a trend on provision of the software to such changes and everything that is connected to it as service or as the replicated product developed not by the specific order, and on the basis of a study of the application-oriented markets. In the context of SWEBoK it is necessary to carry to these changes, first of all, cloud computing.

Despite rather intensive development and implementation of cloud computing for the last decade, it is impossible to tell now that they received all-round theoretical and practical reasons.

The current state of development of technology of cloud computing, and also the market of this technology is characterized by rather low level of standardization, heterogeneity of decisions, existence in the market of separate, rather simple services, absence of the publication of metadescriptions of these services, i.e. it is possible to state that both the technology, and the market of this technology are at an early stage of development.

Many analysts assume that a vector of development of the direction of cloud computing are enterprise cloudy systems. In this way it would be desirable to consider possible influence of such trend on traditional aspects of program engineering.

First, the principle of design of enterprise systems will change. They, most likely, will be configured from the separate services which are at different providers in different clouds. From this assumption it is possible to draw a conclusion on essential change of the design approach of enterprise information systems. From this it follows that it is necessary to adapt the principles and methods of component-based development of applications to corporate level, first of all regarding creation of the relevant libraries of services, mechanisms of their configuring and integration and appropriate work benches. Besides, the role of integration aspects increases during creation of aggregates of services and their integration with local segments of enterprise systems.

Secondly, approach to life cycle of such information systems changes. If traditionally life cycle of enterprise systems was projected from the appropriate standardized processes, then development of some new principles guaranteeing not disappearance of providers, reliability of services, quality assurances of services, etc. is necessary here.

Traditional operation with requirements to the developed information systems also shall undergo changes. If in case of the existing order requirements to the created customer-specific information system are developed, then in a cloudy situation of the requirement to development are set by the developer (provider) proceeding from the generalized requirements of the market. The appropriate methods and tools shall be for this purpose developed.

The testing approach changes. If in today's practice the emphasis is placed on verification of the created program complexes concerning requirements, then in case of cloudy design, probably, there shall be a shift towards validation of opportunities of separate services and their complexes under needs of the specific organization.

Also the problem of creation of an enterprise information system as complex of local software and hardware tools and cloud services interacting with it is subject to the decision.

Role layout of the players dealing with enterprise systems will change. If now the main players are the customer and the developer (integrator) of system, then in cloudy construction and uses of municipal model of provision of services now (or the ready replicated software), there are providers of the separate or configured services, and roles of the customer and the developer also significantly change.

Also the control diagram the services entering a configuration of a cloudy information system shall change. The new, third version of ITIL doesn't consider such task yet. The user, probably, will shall have a packet of SLA (Service Layer Agreement) which will guarantee to some extent to it reliability of the information system created thus. Development of methods and means of complex reliability assessment of a cloudy information system on the basis of SLA packet will be required, probably. From here need of control of such packet (with existence of appropriate work benches), and also monitoring of execution of these SLA and a possibility of response to their actual changes follows.

During creation of cloudy enterprise systems it will be necessary to consider infrastructure character of cloud services also. If during creation of the modern information systems all components of system belong to some local education, i.e. the information system has some integrity, then cloud services can be shared by other users also.

Problems of support of information security of cloudy information systems will also significantly differ from today's decisions in this area.

Now there is a transition from direct possession of all necessary for satisfaction of corporate information needs to municipal models of use of ICT. At the same time business models of the enterprises significantly change, TCO economy (Total Cost of Ownership) moves from CAPEX to OPEX (from capital expenditure to operating expenditure).

As well as now, the accent in case of design of information systems moves to the area of business processes and support of a continuity of business, these questions require the solution during creation of cloudy enterprise systems.

Complexity of the listed above problems will increase in case of the account coming, according to many analysts intellectualization of enterprise information systems in different application areas (application of so-called Smart – technologies), for example, transition to areas of training from the E-Learning systems to Smart-education.

Thus, in the real operation the possible directions of changes in program engineering connected to perspective of creation of cloudy enterprise systems absolutely are briefly designated. It is quite possible that these directions there will be significantly more also each of these directions now, practically, not only aren't considered rather deeply, but aren't even designated yet.

For more detail researches of influence of new information technologies on program and system engineering it is possible to use annually updated diagrams of a cycle of a maturity of the appearing and developing information technologies and their descriptions of firm Gartner.

Such diagram for cloud computing as of 2015 is provided on fig. 1.

On this diagram separate components of cloud computing pass a row of stages – the innovative trigger (growth of waitings from new technologies), a disappointment stage, a stage of understanding and the plateau of productivity.

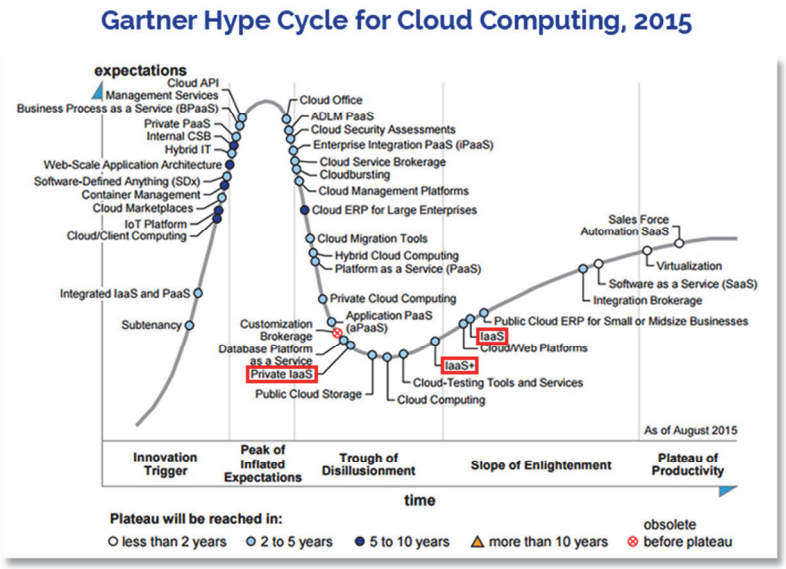

Fig. 1. Cycle of a maturity of cloud computing of firm Gartner, 2015.

Conclusion

Now we are at a critical stage of development, both information technologies, and methods and forms of their use in all areas of our life. There is a transition from possession of information means to municipal models of their use.

These changes significantly change approaches to program engineering, to consider it more widely, than it is done by traditional program engineering, taking into account use of the software in almost all areas of activity and need of quick response of the software to the changing business requirements.

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