Agile Stylized Approach to Manage Complex Project

Mikhail Belov

Deputy Chief Executive Officer, IBS, mbelov@ibs.ru

Abstract The paper is devoted to one of the practical approaches to manage complex projects. A case study of complex project management is described. This concerns transforming a Russian IT-company into an enterprise system and system of systems (ES/SoS) at the same time. Main elements of the transformation – the goal, solution, structure, and relations among constituents of ES/SoS, ES/SoS engineering process, and results – are represented. The analysis of the project –environment, constraints, risks, opportunities, and uncertainty – is considered. It is found that it is exactly uncertainty that causes grave problems in complex project management and that is responsible for the main challenges facing the governing body. An "agile stylized approach" to complex project management which was successfully used in the case study is described. The applicability of this approach to manage other complex projects and further research prospects are discussed.

1. Introduction

The traditional project management domain has been very well developed during the last several decades. The PMBOK@Guide [1] and other handbooks and documents of this area provide good theoretical and practical information background to initiate a project, to schedule project activities, to plan and allocate resources, to monitor work, to manage risks, etc. The traditional approach works perfectly in huge numbers of projects in practically any area of business or social life, thereby demonstrating its applicability and efficiency.

But the absolute insufficiency of this approach has shown up in some cases – in complex projects, those involving enterprises or other complex systems as well as projects dealing with new product development. Global business environment sophistication (enterprises, products, services, their interrelations, etc.) causes the complexity of the projects, so the complex project management theme has become more and more topical in recent years [2].

2. Exemplary complex project

The exemplary project [4] represents the transformation of complex ES/SoS encompassing different types of constituents, interlinked by different and sophisticated relationships, with "soft" and variable boundaries and complex ES/SoS engineering processes. Together these characteristics give rise to really "wicked" problems [5] and make the project truly complex.

In 2001 the top management of the IBS company initiated a fundamental transformation to change the company's strategy and business model. The company was one of the biggest Russian IT systems integrator at that time, with about 900 employees. Annual revenues of around $80M were mainly generated by IT infrastructure projects (complex computing systems, multiservice networks, etc.), hardware and software distribution.

IBS management forecasted considerable growth of the Russian IT services and consulting market based on the fast growing Russian economy . The economy was rapidly recovering from the national financial crisis of 1998. The largest corporations started overseas expansion and borrowed from international markets to finance this growth. IBS predicted corresponding growth in the complexity of business processes and their associated software and hardware systems all of which should require more consulting and IT services.

Based on this forecast, IBS established a strategy goal to double the share (in annual revenue) of IT services and consulting from 25% to 50% over one year. Further growth in this business was planned as a long term trend. The consulting and IT services business is very complex technologically and organizationally and dramatically differs from IBS's former infrastructure focus. Thus, a fundamental transformation was required, and it was executed during 2002.

To achieve this strategy goal, the company's management defined new capabilities required to sell and execute large, complex, and multi-disciplinary consulting and services projects. They thought sales and execution processes should be treated as absolutely standardized, regular, and routine procedures. Accordingly they defined five major groups of focused capabilities:

1. Deliver consulting and services.
2. Sell complex consulting projects.
3. Execute and deliver complex multi-discipline consulting projects as very effective and highly standardized processes.
4. Manage human resources effectively. (Highly skilled and experienced employees are the key performing engine of the consulting business.)
5. Measure and account for projects', business units' (BUs') and employees' performance. (The target business model is very dynamic, so on-line measurement and forecasting of key performance indicators is critically important.)

The IBS structure consists of a corporate governing center (CGC) and autonomous business units (BUs), figure 1.

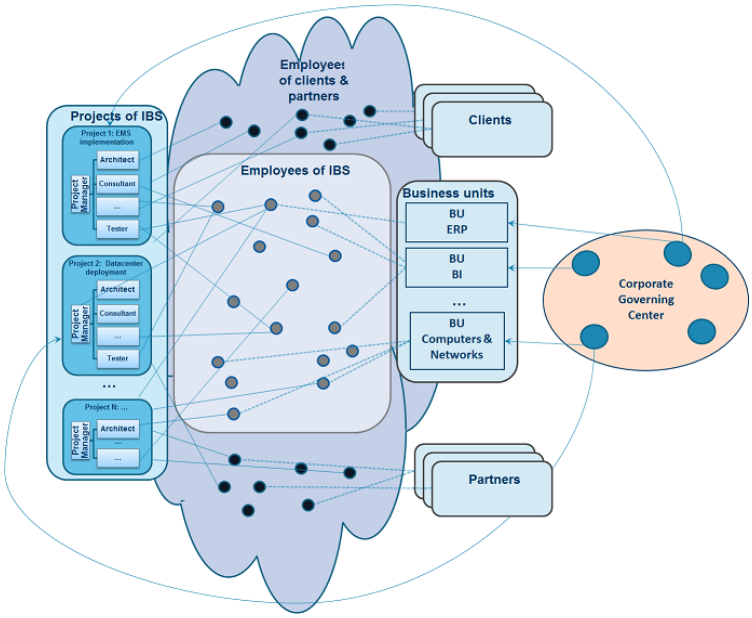

Fig. 1. Key business-agents and the relationships among them.

Different BUs execute the sales function, deliver the products and services through project execution, and provide back-office support for other BUs. In reality BUs serve as the resources pool that form project teams. The same employee may play different roles in different projects. For example, a BU head is often assigned as director of one project and an architect in another project. The BUs are independent to each other. There is no direct relationship between any two BUs (constituents); they are linked via their employees' participation in joint project teams. The CGC consists of the Chief Executive Officer (CEO) and his deputies who run the company; they supervise and coordinate BUs' activities rather than controlling them by directives.

The IBS business structure is more than just "BUs + CGC". Projects, project teams, and employees also play considerable roles. Employees as well as project teams and BUs are key business-agents of the company.

Almost always complex consulting projects are executed by joint teams which include employees of the consulting company (IBS), as well as its partners and customers. Thus the company forms an "extended enterprise" by involving employees of other firms in projects, and the transformation scope covered both IBS and its extended enterprise. Joint project teams are temporal objects (team lifetime equals project duration); so the boundaries of ES/SoS transformed are variable and temporal. The extended enterprise significantly differs from IBS company: the average supplement of "virtual" constituents is around twice or more (estimation of [4]).

In general the relationships inside an extended enterprise form a very complex network like that depicted in Fig. 1 which connects BUs, projects, and employees by different links (administrative or operational; project management; supervising; etc.).

The relationships are realized in practice by means of integrated processes of project management and accounting covering joint project teams formed of employees of different firms. The CGC is not the top root of a control hierarchy; rather it is at the center of a "star" of autonomous BUs.

A systems engineering (SE) task was established to develop the required capabilities for IBS to become an ES/SoS company. The SE process of the transformation consists of:

1. Mission analysis. In the initial analysis the mission was translated to capabilities. The transformation team found that capabilities might not be directly translated to any business-agent: neither BUs (resource pools), nor projects (temporal elements), nor employees might realize necessary capabilities.
2. Key areas definition. Realizing 1 above the transformation team defined several key areas of company's operations which were supposed to be changed to form new capabilities. Five key areas of operations or activities were defined: core technologies area – consulting and services area; project implementation area; BU growth area (hiring and newcomer integration); motivation of the employees area; and management accounting area.
3. New capabilities support systems development with pilot implementations and roll-outs (for each key area). In each of the areas the engineering and implementation of the systems to support new capabilities was planned. The support systems (procedures, guides, documents, and software systems) were implemented initially in pilot zones and later rolled out to the full extended enterprise. Processes and rules were developed as "end-to-end" and "crossing" ones to integrate all BUs, project teams, and employees.
4. Operational performance assessment.

As is now seen the Russian IT services and consulting market grew by more than a factor of five during 2001-2010, and IBS has been leading this growth, getting the main market share for the years 2009-2012.

- The mission was accomplished: new capabilities of BUs and the company as the whole were formed in areas of sales and delivery of complex projects; the business model and company strategy dramatically changed.
- Specially developed auxiliary and supporting systems serve as the tools to support new capabilities; the systems formed exactly the corporate infrastructure of new business model.
- The Extended enterprise was formed around the company through integration of employees of clients and partners into project teams.

3. Analysis

The main factors (and their origins) which caused wicked problems for the project governing body and project team in an exemplar project are studied and analyzed in this section.

Any project (or even any kind of human activity) might be characterized by the following shortages, limitations, or uncertainties which are absolutely universal ones:

- Recourses (finance, material, human, etc.);
- Time (schedule limits);
- Knowledge/information.

The importance and influence of each of these factors is best illustrated with a concrete case. Resource and time restrictions play key roles in repeatable or typical activities; here uncertainty is insignificant and might even be ignored. On the contrary in the exemplar transformation project as well as in other complex projects uncertainty is the most influencing factor; it should be considered very seriously in project management activities.

External factors affecting complex projects

The IBS company, as an ES/SoS, operates in a very sophisticated external environment that combines policy and law, economy, society and culture, technology, and even nature. ES/SoS's elements and environment interact on several different levels: IBS as the whole; BUs; projects; and employees. And not only does the environment affect ES/SoS but also ES/SoS influences the environment.

Besides generic external factors mentioned above national and industrial factors affected the transformation:

- The Worldwide Internet boom created very high business expectations of IT sector growth and attracted investors; also new technologies appeared very rapidly which expanded the IT market very fast. These factors forced IT companies (IBS as well) to spent resources to try to capture a niche in the growing market. For example, IBS management at that time established several BUs (customer relationship management systems, internet technologies, etc.), and some of them were reformed or closed later.
- The after crisis factor (after national crisis of 1998) – fast economic recovery, devaluated currency, and international expansion of Russian firms, on the one hand, initiated and pushed the transformation, and on the other hand, was embarrassing due to the fast growing labor cost which is the main cost component of a consulting and IT firm.
- The post-Soviet legacy played a considerable role in society (even now). Destruction of entrepreneurship during the Soviet period dramatically lowered business activities for the majority of employees, and this complicated necessary changes.

Specific corporate constraints and challenge

During the transformation period IBS management faced very specific corporate constraints.

The lack of experience in ES/SoS transformation, engineering, and the running of a consulting and IT services company (even the lack of any textbooks or guides in those areas) were the major challenges which IBS management faced. The task to be

solved did not impact organizational changes (a well-developed and described area) but did belong to ES/SoS engineering. In spite of IBS's lack of the experience it was decided to prepare and execute the transformation based on the companies' employees without external consultants' involvement. The following arguments supported the decision:

- The task to be solved was not typical, so there was no widely used and well tested algorithm, and there were few consultants exactly experienced in such things. So only consultants with similar experience (strategy consulting and organizational management) might be hired.
- In 2001-2002 the Russian consulting industry was not developed, so Russian consultants with appropriate experience might not be hired at all. Only foreign professionals were available but they would have needed first of all to study Russian economic specifics. Such study, naturally, would have increased time and cost of the transformation.
- Also, it was evident, that a joint team of IBS management and employees would have to be formed,: management would have to be interviewed and involved in decision making; and all employees would have to participate in change implementations.
- External consultants are "external people"; they are not stakeholders; so their level of interest in success might not be very high, and their output also might not be outstanding.
- Unwillingness to open professional secrets to direct competitors and other intellectual property issues limited external consultants hiring.

The final decision was made based on the comparison of pros and cons: to execute the transformation without involvement of external consulting resources. A special back-office unit (BoU) responsible for business processes development was established, and an "agile-stylized" program management approach was applied to take the challenges, pursue opportunities, and to mitigate risks.

Another challenge dealt with the transformation objective: a very high complexity IBS as an ES/SoS. Management recognized that the company was very complex, with a lot different agents, constituents, and inter-relationships, and that ES/SoS might become even more complex after the transformation. This complexification happened due to the company becoming an extended enterprise, with governing hierarchies weakening, and relationships increasing in sophistication.

One more business challenge was the risk of a mistaken forecast of IT market development: expected growth of the consulting and services market might have not happened, and in this case the transformation would have been senseless, this challenge generated additional emotional stress for management.
These specific corporate constraints engendered the shortage of knowledge – the uncertainty in the project, which created main challenges for the governing body. Time and resource limitations also existed: as with requirements to move as soon as possible, do not interrupt on-going business, and avoid external expenses, but time/resources restrictions did not play key role.

Sources of uncertainty, opportunities and risks

The ES/SoS opportunities were attractive but the lack of experience and knowledge were very serious concerns that induced considerable risks that needed to be managed. The ambiguity of the exemplar transformation might be expressed by whether:

- The implementation of auxiliary supporting systems and the completion of project activities would really create required capabilities;
- New capabilities would ensure the capturing of a considerable consulting market share;
- The prediction of dramatic growth of consulting and IT services demand would be correct.

To synthesize these issues we may conclude, that the main opportunities and risks were whether the:

1. System (ES/SoS) of interest being created (its architecture, design, properties, etc.) would get the required, functions, capabilities, etc.;
2. Technologies and approaches would be appropriate to create the system of interest;
3. System would be efficient in interaction with the environment;
4. Prediction of the status of the environment would turn to be correct.

The first and second aspects above are biased or specific ones – both of them might be avoided (theoretically, at least) by hiring external consultants. But the third and fourth aspects are inevitable ones – nobody knows the future.
Further, the fourth aspect relates to the lack of knowledge about the environment and its variability that engenders changeability of the requirements. This is a very natural characteristic of the complex projects focusing on ES/SoS development, transformation, or modernization.

Analytical summary

The following conclusions based on the analysis of the exemplar complex project are more or less common for the whole complex project domain:

- Generic, industrial, and national external factors intensify time and resources shortages and also reinforce uncertainty.
- Specific project constraints mainly (and very heavily) engender the shortage of knowledge – the uncertainty in the project.
- Rampant uncertainty causes wicked problems in complex project management and creates main challenges for the governing body. The four fundamental opportunities and risks listed above exemplify the core uncertainties of complex projects. All deal with the system of interest, but not with the project activities.

4. Agile stylized approach

The transformation team developed and used an approach which is very similar to the Agile Development approach of [3] to address the uncertainties.

The PMI defines a project as a "temporary group activity designed to produce a unique product, service or result" [6]. Previous analysis demonstrates, that main risks might not be studied and explained based only on "activities", there are other entities which cause main risks and which should be seriously considered in complex project management scope. The traditional approach is appropriate to manage the time and resources constraints, but it is not focused on the system of interest's uncertainty and the shortage of knowledge. So traditional SE's usability in complex domain is quite limited. Fig. 2 represents core entities of a complex project domain.

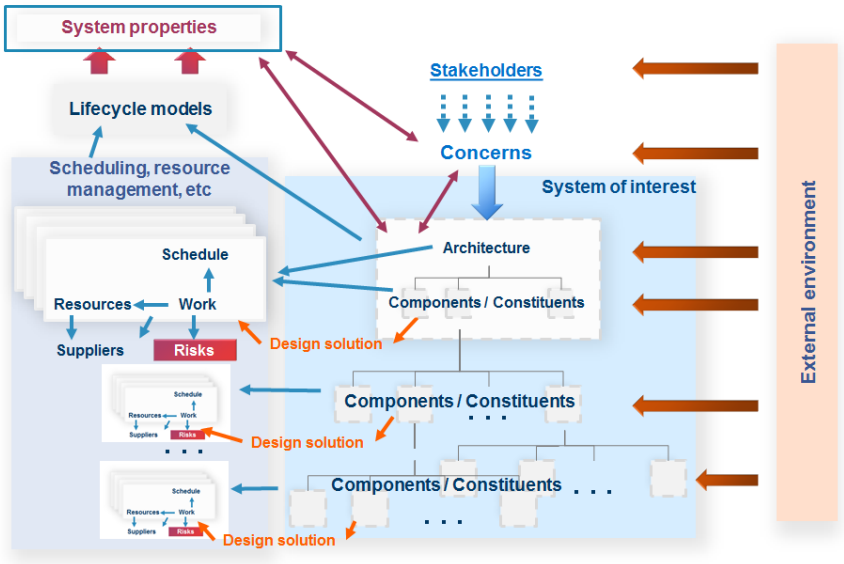

Fig. 2 The domain of complex project management.

The left-hand portion of the figure represents the traditional project management area – which is activities based: work, resources, teams, etc. All these entities are well defined and described in traditional project management documents like PMBOK [1].

The right-hand portion of the figure demonstrates the system of interest and external environment, which really cause the uncertainties described above.

The system (ES/SoS) of interest is represented by the system's architecture and the components (or constituents) which might be also complex entities or systems. The external environment affects the complex project by the following threads:

1. Direct influence on the system of interest;
2. Influence on the efficiency of the system operating in the environment;
3. Changes of the environment which causes changes of the requirement to the system of interest.

In this manner the left part corresponds to the resources and time constraints, and right part, to the uncertainty constraint; both parts cover all complex constraints and better (than traditional approach) represent complex project domain.

The transformation was, in reality, a quite compact program of projects. The project teams consisted of company's employees, and the program was governed by the CGC according to a single program plan. The transformation task did not look complicated from a project or program management point of view. Organizational change implementation was a quite standard activity with a well-known personnel resistance problem and tested approaches to overcome this resistance. Deep involvement of top management, headed by the CEO, guaranteed effective project management and execution as well as organizational management implementation.

The set of activities in all previously described key areas had to be executed to effect the transformation. All those activities were conducted in parallel to save time and resources. Integration and interoperability of the new capabilities' support systems (developed in key areas) required a thorough integration of parallel development tasks So joint workgroups of employees were formed at levels below the officers. CGC played the role of integrating the workgroups at the management level. In effect, a multi-level integrated workgroup was formed.

The major complexities and/or problems derived from the four uncertainties described in Section 3. These uncertainties could not be controlled by means of additional research and study – the ES/SoS team did not have time for that. Experiments and tests also would not help – there was no testing or training area to check solutions before implementation: all solutions were piloted within a working company.

The quick and effective creation of solutions and their practical testing is a very natural and rational approach to manage such uncertainties: the main idea was to accelerate the circle or loop, "define requirement–design-implement-validate", when there is no other way. Initial conditions and the approach mentioned led to plenty of changes in the implementation process, so it's necessary to manage them fast and effectively.

Based on the understanding of insufficiency traditional activity-based project management, the management team formed a "project kernel" including the description of core elements of the left- and right-hand portion of Fig. 2: <work and resource plan> and <architecture and core component solutions>.

Such a project kernel covers the whole complex project domain and enables the management of uncertainties. Both elements of the kernel were used as an aggregate: not only the plan but also the architecture description was used to monitor the progress, to make changes, etc.

The following principles were used to manage the portfolio of projects in case of lack of experience and ready-to-use algorithms and methods:

- Form solution as fast as possible (without regard to pure quality) and quickly test it in practice;
- Failures are unavoidable, perceive them easily and react rationally;

- In case of failure analyze the situation, find a new solution, generate changes, and update the plan;
- Work in parallel, verifying and coordinating intermediate results;
- The schedule might be corrected and updated but should not be violated due to improper execution;
- Formulate and test the most critical and questionable solutions first;
- Start with pilots and then (if they seem to be working) roll them out to the cover the whole scope;
- Use high level and high qualified management to control the piloting a developed solution (but not additional aspects) to avoid waste of the resources.

Following those principles, a quite strong executing discipline, a high level of the sponsorship, and the involvement of all employees enabled the transformation to be completed in time and without hiring consultants while keeping and developing on-going business.

5. Conclusion

The agile stylized approach represented in the paper made it possible to complete complex project in quite short time period; complicated transformation of ES/SoS was kept under full control during the execution period. And very importantly, this transformation had good business results – the IBS company played the leading role in the Russian consulting market during 2009-2012.

The analysis showed that the majority of properties or characteristics of the exemplar project are quite common to other complex projects dealing with ES/SoS. So the main ideas of the approach (the information project kernel and the acceleration of the loop "define requirement–design-implement-validate") might be recommended for practical usage in any complex project domain.
Further research might be focused on the development of the agile complex project methodologies or frameworks including models of project processes, manuals and guidebooks, reporting templates, etc.

References

1. PMI (2008) A Guide to the Project Management Body of Knowledge PMBOK@Guide. 4th Edition, Project Management Institute, USA.
2. Ireland V., Gorod A., White B. E., Gandhi S. J., Sauser B. (2013) A Contribution to Developing a Complex Project Management BOK. In Project Perspectives. The annual publication of International Project Management Association
3. INCOSE (2010) Systems Engineering Handbook v. 3.2 INCOSE, January 2010
4. Belov M. (2013) IBS Group, Eastern European IT Services: Capability-Based Development for Business Transformation. In Case Studies in System of Systems, Enterprises, and Complex Systems Engineering Gorod A., White B. E. Ireland V., Gandhi S. J., Sauser B. (eds.) New York, NY: CRC Press, Taylor & Francis, New York (scheduled for Fall, 2013)
5. Conklin J. Chapter 1 of Dialogue Mapping: Building Shared Understanding of Wicked Problems. (2005) "Wicked Problems and Social Complexity," CogNexus

Institute, http://cognexus.org/wpf/wicked_problems.pdf (accessed 15 February 2013) t
6. PMI (2013) What is Project Management? http://www.pmi.org/About-Us/About-Us-What-is-Project-Management.aspx Accessed 5 April 2013.