International experience of E&P software solutions development

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Abstract. The international market is full of high-quality solutions for reservoir modeling provided by specialized service and consultancy companies. Nevertheless, oil and gas operators independently develop their own home-made software solutions, although, at first glance, it is much easier for them to buy ready-made package solutions. What is the purpose of spending time and money on this activity? What do companies need today to successfully create and commercialize software products?

An example of the development of a software package based on own solution in the Skolkovo start-up system is given.

Keywords: reservoir modeling, in-house software solutions, IT-technologies, start-up Skolkovo

1. Introduction. Geoscience and modeling, tasks and solutions

Geoscience is a scientific method for studying the planet Earth and its geological systems and natural resources in the past, present and future. For the purpose of developing hydrocarbon resources, the methods of various Earth sciences are applied: geology, geophysics, geochemistry, petrophysics, geomechanics.

Based on data collected from different-scale sources, specialists in geology, geophysics and engineers study the processes occurring in oil and gas systems and reservoirs (Fig. 1).

If we make a small excursion into the history of the development of computer simulation methods in our country, we will see that these methods appeared and are developing very quickly, in the time scale of one human life. Until the 50s of the 20th century, wells were drilled along the structural grid, then with the development of seismic prospecting, decisions were made on structural maps. A qualitative leap in the study of oil and gas systems occurred in the early 80s, when the software for computer modeling began to actively develop.

During the life cycle of a field, a large amount of diverse and varied data with a high level of uncertainty is continuously recorded (Fig. 2). For example, seismic information, on the basis of which the interwell space is modeled, has limitations related to the resolution of the signal recording. All these data must be processed and taken into account for the construction and monitoring of the model.

2. The experience of Western oil companies in the development of in-house software – own modeling software

Two major groups of companies specializing in the development and sale of software products compete on the international market:

- oil service "giants", such as Schlumberger, Halliburton, CGGVeritas, Emerson Electric. For them, the development and creation of software is not the main business, for example, Schlumberger's revenue from software sales does not exceed 1-2% of total revenue;

- companies for which the development and sales of software – the main business: Kappa Engineering, RFD, TGToil and others. Figure 3 shows a graph of growth in the global market for software for oil production (Analytical Report on Oil Production Technologies, 2018).

But there is another type of software – operator companies, holdings that profit primarily from oil production. They also allocate considerable resources for creating their own software products.

So why are Western oil holdings developing their own software if the market is filled with high-quality solutions? Companies have super profits, and, at first glance, it is much easier to buy ready-made package solutions.

Let us consider a few examples of the successful creation of home-made software:

- Concern Total has a large research center in the south of France in the city of Pau. It develops software in the field of seismic image processing of sub-basement complexes (Sismage) and modeling of gOfrac fracture reservoirs. Total, along with Chevron, it is part of a consortium to develop an Intersect simulator, supplied by Schlumbrger.
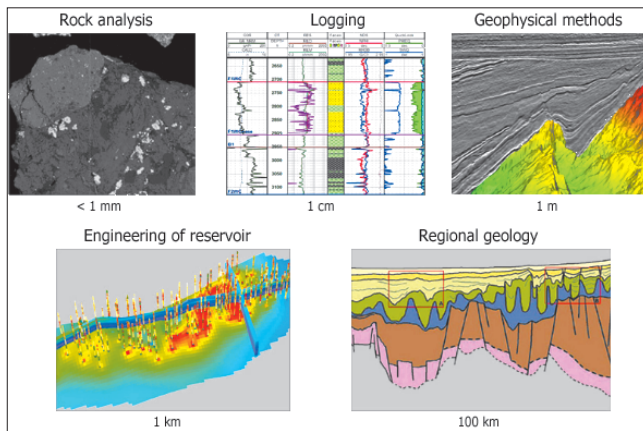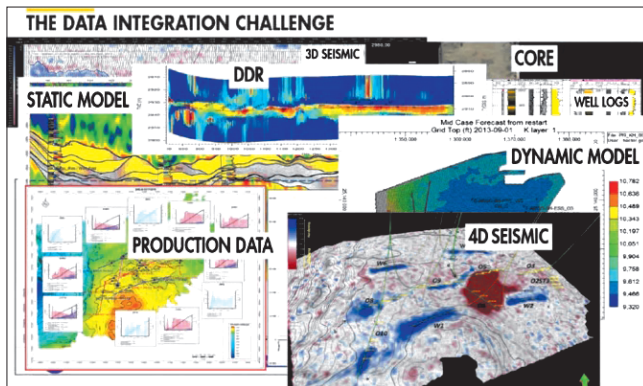
Fig. 1. Diversity of input data

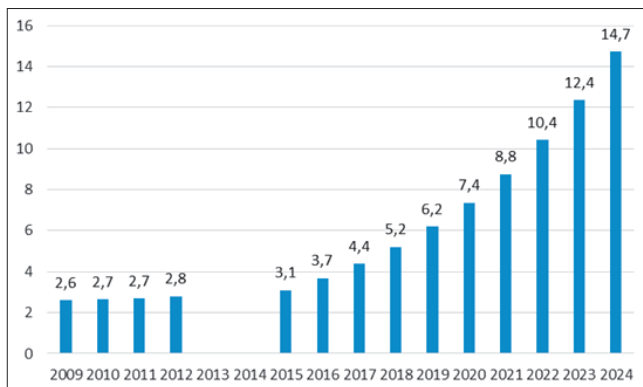*Fig. 2. Integration of modeling stages*

Fig. 3. Dynamics of the global market for software for oil production (in US dollars). Skoltech Assessment (Analytical Report on Oil Production Technologies, 2018)

- Shell has its own research center in the Reichveyk where the MoReS simulator was developed. Openworks drilling applications are developed in collaboration with Halliburton (Innovation through research and development. https://www.shell.com/energy-and-innovation/).

- BP-Amoco – in the past, the developer of the Falcon simulator, now the ownership of the product with the commercial name Nexus has been transferred to Halliburton.

Analysis conducted on the basis of available information and several interviews with specialists of these companies showed that no company sells its products on its own.

The objectives of creating their own developments by Western operators are as follows:

- to maintain the image of a high-tech company,

- for the formation of highly professional competencies of its specialists for analysis and testing for other vendors,

- to create their own solutions that are not dependent on plans for the development of new products by major vendors,

- in the case when the cost of acquiring and maintaining licenses is comparable to the content of its own staff of programmers.

The programs are used internally, and products are transferred to vendors for commercialization on the foreign market, since oil companies do not have their own marketing and software structure.

The peculiarity of the American market is that there are a huge number of tens of thousands of small companies creating software and competing with each other. The role of oil and gas holdings – support for start-ups and small companies, despite the fact that only one of the 10 companies really "shoots".

3. Experience in the development of in-house software by Russian oil companies

The first SCS-3 complex for processing and interpreting geophysical data, which all the country's trusts were equipped with, was created back in the 70s in the CGE. Currently, there are a number of software systems created by people from the CGE (Geoplat, Prime) and other independent developers.

Russian holdings are also actively developing software to ensure less dependence on Western suppliers (Rosneft, Gazpromneft, Tatneft, Surgutneftegas). However, 90% of the purchases of software are still carried out by traditional vendors, while only RFD has entered the wide international market from Russian suppliers.

4. What a startup needs today to successfully create and commercialize software products?

- It has to have the development demanded by the market;

- Go to the niches and be the best in them;

- Have advantages in speed of calculations and convenience interface. 10-15 years ago, the most successful creators of software were the algorithmic specialists; now the world is moving towards the quality of visualization and the simplification of human-computer communication;

- Have a strict motivation, which is possible only if you have a common goal and receive a salary in a startup. Not your business – motivation is falling;

- Have about 10 people with different specializations

per engineer in a team: technologist, programmers, tester, support specialist, instructor, lecturer, marketing specialist, salesperson;

- Create in conditions of free competition, fight for grants. if there is only state regulation or state order, the market will be destroyed.

With the oversupply of traditional offers on the market, the future lies in universal commercial platforms to which it will be possible to attach the necessary modules to solve any tasks.

5. An example of the development of a software complex based on its own solution, focused on the implementation of an algorithmized production problems in the start-up Skolkovo system

Project name: Development of a software and methodological complex to improve the management methods for the development of oil fields.

The choice of topic was based on the successful history of cooperation between TATNEFT PJSC and KAPPA Engineering, as well as the importance of the task – with the help of Government support (Skolkovo Foundation) by start-up companies to ensure the solution of important tasks for the government to improve the efficiency of oil field development management.

Project Development Plan for 2016-2018:

- obtaining the Skolkovo Foundation resident status,

- creating a startup after obtaining resident status,

- conducting parallel studies with the aim of creating a methodology at the end of 2016 and software technology at the end of 2018.

- submission of documents for the grant.

Start the project. At the beginning of 2016, work began on creating a methodology for optimizing the operating modes of wells and at the same time creating an application for obtaining the Skolkovo resident status on the topic "developing a software and methodological complex to improve the management methods for developing oil fields".

In December 2017, the application was accepted by experts with a score of 28 out of 30 possible points. At present, the resident company Skolkovo ETA Engineering has been established.

The plan for the subsequent development of the project in the Skolkovo IT cluster:

- Technical development. Designing an automated data collection system at the field within the framework of the concept of an intellectual field, creating plug-ins, developing a batch module, or integrating with already existing solutions.

- Commercialization. Market research, marketing: participation in international conferences, seminars, publications in specialized journals, promotion of technology in the foreign press, implementation of

pilot projects. Development of technical and customer support systems.

- Carrying out optimization calculations, improving algorithms, searching for ideas and projects to expand the range of innovative solutions to optimization problems (drilling, geophysics).

Development prospects. Work on the creation of a portfolio of R&D projects and a flexible system of external start-up projects are advantageous for the company, since it will allow to receive tax benefits, grant financing (not only from Skolkovo), to attract external Russian and international experts for specific tasks for the duration of the project.

6. Conclusion. Generation-Z is the future

The stages of development in the whole IT industry can be represented in the form of three platforms. We are now at the level of the 2nd platform, based on traditional personal computers, the Internet, client-server architecture and hundreds of thousands of applications (The 3rd Platform is Evolving https://www.idc.com/promo/thirdplatform).

The concept of the Third Platform is based on four elements: big data, mobile devices, cloud services and social technologies. Applications, content and services built on the basis of the Third Platform technologies will be available to billions of users (Review and assessment of the prospects for the development of the global and Russian IT markets, 2015).

New IT technologies (neural networks, artificial intelligence, machine learning, cloud technologies, Big data) will develop very quickly, followed by application programs (Fig. 4). It is possible that, under the influence of the development of IT industry tools, the generation-Z
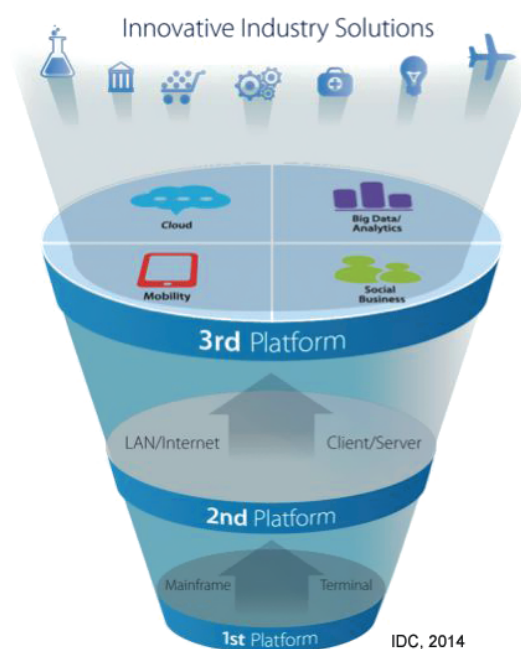

Fig. 4. Three platforms in the e-fusion of the IT market. According to IDC, 2014

will create new algorithms and software that will give a new qualitative leap in the development of oil and gas IT technologies.

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