Methods of end-to-end automatization for telecom company

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Abstract. The article reviews the methods of end-to-end automation of business processes and the basic architecture of telecom operator systems. Nowadays, the main goal of any telecom operator is to minimize manual operations at all stages of the company's operations: from receiving the order for the service to its full activation. However, today any telecom operator already has the necessary infrastructure to carry out its activities. This leads to two possible automation methods: sequential updating of existing system or full “end-to-end” automation. The authors analyze the basic modules of the telecom operator’s system and conclude that it is a complex multi-module system. The authors compare the automation methods and justify that full “end-to-end” automation the most profitable automation method in case the telecom operator has decided to completely upgrade all modules of the system.

1. Introduction

Nowadays, in the period of actively developing technologies, communication services, Internet and television are irreplaceable and in demand as never before. That is why the number of telecommunication companies that providing these services is growing every year. Undoubtedly, this fact increases competition in the telecom industry. In order to maintain competitiveness and save market positions, each telecom operator needs to perform automation of business processes.

The main goal of such automation is:

- to minimize manual operations at all stages of the telecom operator's activity (from receiving an order for a service to fully connecting it);
- to simplify the task of management in controlling a complex huge process;
- to ensure business continuity [1-3].

However, today any telecom operator already has the necessary infrastructure to carry out its activities [4-5]. That is why there are two ways of solving the automation issue:

1) full “end-to-end” automation - using “out of the box” solution that automates all the operator’s business processes;

2) automation in the directions - sequential updating of components of the existing system [6-8].

Minimization of manual labor does not necessarily lead to a reduction employees in telecom company. First of all, automation allows to simplify processes, reduce the possibility of mistakes related to the human factor, and improve the quality and control of processes. All tasks and work on the customer’s order will go through a single system. This approach is convenient for employees of all departments of the company: at any time, every employee of any department of the company can see information about the order, find out the status of task or monitor its realization.
There are a number of factors that determine the most effective way for a particular telecom operator: the main goals of the company, tasks that are superimposed on automation, the size of the company (the number of its customers), the presence or absence of certain system modules, etc [9-10]. In the article «Automation and management control in dynamic environments: Managing organisational flexibility and energy efficiency in service sectors» Paul Brown, Tuan Ly, Hannah Pham, Prabhu Sivabalan recommend following automation approach regardless of areas activity of the company: for small companies, it is recommended to install a comprehensive “out of the box” decision and for large companies – go through consistent updates to their existing system. However, on practice the final decision in such cases always remains with management of the telecom operator, depending on its goals and financial capabilities.

The objective of the current study was comparison of automation methods and justification of the most profitable automation method in case the telecom operator has decided to completely update all system modules.

2. Methods
We analyze the architecture of telecom operator’s systems to determine which way of automation is the most effective.

The domestic telecom operators market has a similar structure of departments engaged in the technical exploitation of networks [11-12]. It includes three main departments. Of course, their number for different operators may be different. However, the tasks and functions that each department will perform will be the same for all operators, regardless of how the structure is organized.

Interaction with customers is carried out by the subscription department, which provides all information about services and tariffs, organizes the connection of new services to the client and changes to existing services, etc [13].

Network prevention, reception and processing of applications for malfunctions of its operation, equipment connection and disconnection are handled by the equipment interaction department. It also controls the activities of the department and the work performed on the network [14-15].

Accounting of all equipment of the operator is carried out by the technical control department, which is a kind of "warehouse" of equipment with constantly updated information. Thanks to current data on the availability and condition of equipment, such functions as network monitoring, analysis and planning of its capabilities are carried out.

Each department is characterized by many tasks, therefore, a system that automates all the activities of a telecom operator consists of several modules. Each module performs its function. Besides, the modules are divided into executing and controlling. The controlling modules include modules that implement the logic of the system, and the executing modules are responsible for the logic of the operator’s equipment [16-18].

Let consider in more details the main modules that are found in all systems that are used by telecom operators. The basic modules and their interaction are shown in Figure 1.
The core of the system is the controlling module which names “order management”. This module performs the following main functions:

- Definition of the main managing business logic for all operator services. The module allows to create and edit logic for each service.
- Consistent execution of tasks defined by business logic. When order is received by module, then the system determines its type and begins to perform its characteristic tasks prescribed by business logic.
- Receiving and processing responses from other modules / systems. As a result of its work, the module receives reports from other modules and systems with which it interacts to perform tasks on the order. After processing these reports, the module updates the status of the order and monitors the updating of information in the technical control system.

The Determining technical capabilities module determines the possibility of connecting a service to a client due to the presence of a network location [19].

The Automatic activation of network elements module and the Managing technical support actions module carry out, respectively, automatic and manual configuration and activation of equipment at a given location.

The Order entry module carries out direct sales of services by forming an order - the item with which the system will continue to work. The module is a visual representation with all the necessary information about the products and services of a telecom operator [20].

In Figure 2 we can see the logic of working the basic modules with their main tasks.
In general, the end-to-end system process has following steps. The client initiates the creation of the order by connecting, changing or deleting a service through the appropriate module. Typically, a client can do this in several ways:

- Come and contact the sales agent in specific point of sale;
- Call the call center operators;
- Use the operator’s online portal by logging in to his own account

In the first two cases, the operator’s employees will enter all the data into the system and create an order by himself. In the third case, staff assistance is not required, as the client can create an order automatically. Next, the Order Entry module relates the order to one of the types predefined by the operator and sends it to the main control module - the Order management module.

The Order management module receives the order and starts working with its parameters:

1) Using the customer’s unique number verifies that he has an account in the database, as well as the number of the active subscriber line;

2) Discovering the possibilities of providing technical capabilities, sending him the client number and the number of the active subscriber line, in order to identify the capabilities of the infrastructure to provide the required services. If it is impossible to connect it, the Order management module notifies the client or employee about this;

3) Preparation for activation of services: sets up of existing equipment or sends requests of new equipment in the database of the technical control system and creates tasks for the necessary installation of the subscriber line through the Managing technical support actions module, which in turn appoints and notifies the responsible employees;

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**Fig. 2** – Logic of working of basic modules
4) When the response from the Managing technical support actions module is received, it starts the activation of the service, transferring the relevant information to the Automatic activation of network elements module;
5) Processes the results of equipment activation and updates the order status, customer information, equipment database.

3. Results and Discussion

Due to the fact that the telecom operator’s system is a complex multi-module system, the question of the automation method is relevant for each telecom operator who has decided to update his system.

Table 1 presents a list of the main tasks for each automation method that the company-vendor needs to solve for full end-to-end automation of all the processes of the telecom operator.

| №   | Necessary tasks for automating business processes | Automation in the directions (sequential updating of components of the existing system) | Full end-to-end automation (using “out of the box” solution) |
|-----|--------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------|
| 1   | Domain Analysis                                  | +                                                                                    | +                                                              |
| 2   | Collect system / module requirements              | +                                                                                    | +                                                              |
| 3   | Analysis of requirements and writing technical documentation | +                                                                                    | +                                                              |
| 4   | Scrutiny an existing customer system             | +                                                                                    | +                                                              |
| 5   | Analysis of integration methods for existing and new system modules | +                                                                                    | +                                                              |
| 6   | Rework of the “out of the box” solution in accordance with the requirement of the customer | +                                                                                    | +                                                              |
| 7   | Development of methods for integrating new modules with modules of the customer’s system | +                                                                                    | +                                                              |
| 8   | System / Module introduction                     | +                                                                                    | +                                                              |
| 9   | Testing                                           | +                                                                                    | +                                                              |
| 10  | User training                                     | +                                                                                    | +                                                              |
| 11  | Experimental and industrial operation of the system / module | +                                                                                    | +                                                              |

The total number of main tasks 11 8

As can be seen from the table, the list of the main tasks that the vendor needs to solve during the automation in the directions (sequential updating of components of the existing system) exceeds the number of tasks required for full “end-to-end” automation (using “out of the box” solution). Accordingly, the cost of a complete system upgrade for a telecom operator in the first case will be significantly more expensive than the installation of “out of the box” solution.

Based on this, the judgment of the authors of the “Automation and management control in dynamic environments: Managing organisational flexibility and energy efficiency in service sectors” article turned out to be correct in relation to the telecom company.

4. Conclusions
Thus, we can see that systems of telecom operator consist of a large number of modules, which makes their sequential updating and integration a rather lengthy and costly process. Indeed, to solve a similar task the vendor needs:

- to study the existing modules of the systems,
- collect the requirements for their completion,
- solve the problem of integrating new and old system modules.

In practice, such sequential updating of system components takes longer and often costs more than comprehensive automation of “out of the box” solution.

In addition, “out of the box” solution has several advantages:

1) the speed of implementation - solution already have a set of functions and automated business processes that can be used immediately after installation;
2) the possibility of further development of the system - vendor companies constantly improve their product, therefore in case of necessity to update any function of the system telecom operator can contact the same vendor;
3) technical support – opportunity to contact with vendor company in case of any questions or issues.

To sum it up, “out of the box” solution can be more convenient and cheaper decision in case of complex automation of telecom operator system. But in practice, to make such a decision, companies carry out a complex analysis in order to understand which method is more profitable. The final decision always remains with the managers of the company.

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