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# Formation of requirements for IT services of a research department at a digital university

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**Abstract.** To maintain competitiveness, modern universities need to constantly look for ways to improve performance. One of these ways is digitalization of processes. The level of digitalization in Russian universities is very different. Universities seek to build these competencies and pool resources to increase competitiveness. However, there are still no common standards for connecting data and services, and this seriously hinders universities development. For digitalization, it is necessary to create a list of requirements for the services of the future information system. Research is an integral part of any university, so it is important to find ways of digitalization also for this activity. Services such as tracking current tasks, informing about standard procedures and cataloging scientific articles will simplify the work of the research department. It is also necessary to understand the purpose of implementation and what benefits digitalization of research processes can bring. As a result of creating an IT system that implements the services described in this article, the university discovers many opportunities for further development.

**Keywords:** digital university, IT services, research activities, IT services architecture model.

## 1. Introduction

The modern system of higher education is undergoing significant changes in our time. The advent of various modern digital systems has given not only new opportunities, but also new requirements for every higher education institution that wants to digitalize its processes. This article will discuss the requirements for IT services of a research department who wants to transfer its processes to a digital platform. The digital university uses digital technology, “lives in digital” and creates an appropriate environment in which future specialists acquire skills in working with digital technologies. The level of digitalization in Russian universities is very different. Universities seek to build these competencies and pool resources to increase competitiveness. However, there are still no common standards for data integration and requirements for digital services, and this is seriously hindering development.

A digital university should provide students and teachers with convenient services that help organize the educational process, project and research activities, communications, competently build individual educational tracks, and quickly respond to possible problems [1]. All the accompanying processes of a modern university should be built on the basis of digital technology. This requires a transition to the use of digital platforms that provide the digital services implementation, the processing and management of



big data, starting with working with applicants or monitoring the employment of graduates and ending with an analysis of educational behavior or research.

The research object is research department in university in digital transformation stage. The research subject is IT services model. The goal of research is formation of requirements for IT services of a research department at a digital university, and development IT services architecture model for research department. To achieve the goal, it is necessary to solve the following tasks:

- to analyze the business function of the university;
- to develop the University Business Model Canvas;
- to develop motivational expansion of IT services architecture for research activities in digital university;
- to formulate the requirements for IT services of a research department at a digital university;
- to develop IT services architecture model.

## 2. Methods

The following methods were used in the study:

- Analysis.  
The current processes of the research department are analysed, and parts of the processes that can be automated are identified [2]. It is important to understand that research is a creative process in which standardization is not necessary, however, various routine procedures such as: searching for information, tracking progress, designing articles, access to equipment, etc. can be automated using information systems.
- Modelling.  
The main method used in the formation of requirements for IT services is the ADM method of the TOGAF architectural approach [3]. Using this method, the reference business function model, the model of motivational expansion and a scheme of IT services of the research department are compiled. Also we use the approach offered by A. Osterwalder and I. Pigne for building University Business Model Canvas.
- Literature review.  
The digitalization of higher education institutions has been reviewed in many articles [4-9]. Information system developers offer both local and global solutions for modern higher education institutions. The most popular solutions are electronic document management systems, learning management systems and library information systems. Also, in the work of the university can help systems for tracking errors and corporate content management [10-11]. It is important to understand that this is not about the implementation of all these systems, but about the use of the services that these systems provide. The market offers many opportunities for adding your own modules, so when digitalizing you can not implement a large number of different systems, you can customize one global system for all your needs, and thanks to modern integration capabilities, you can just slightly change the existing IT architecture instead of completely replacing the entire information system [12].

## 3. Results and Discussion

Consider the reference model of business functions of the university (Fig. 1-3) [13-15].

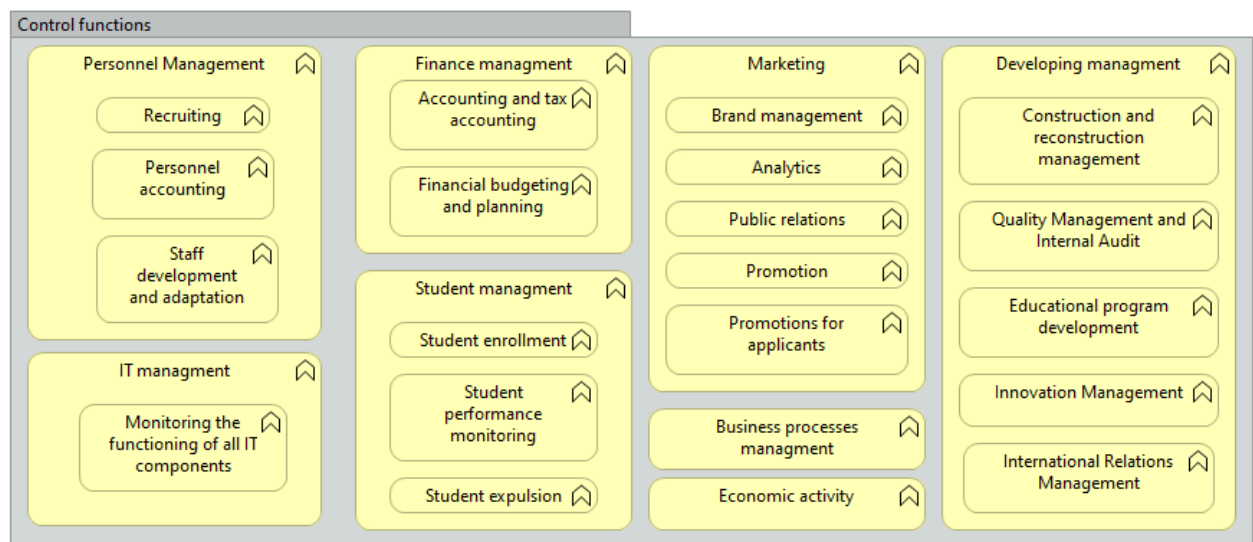


Figure 1: University control functions

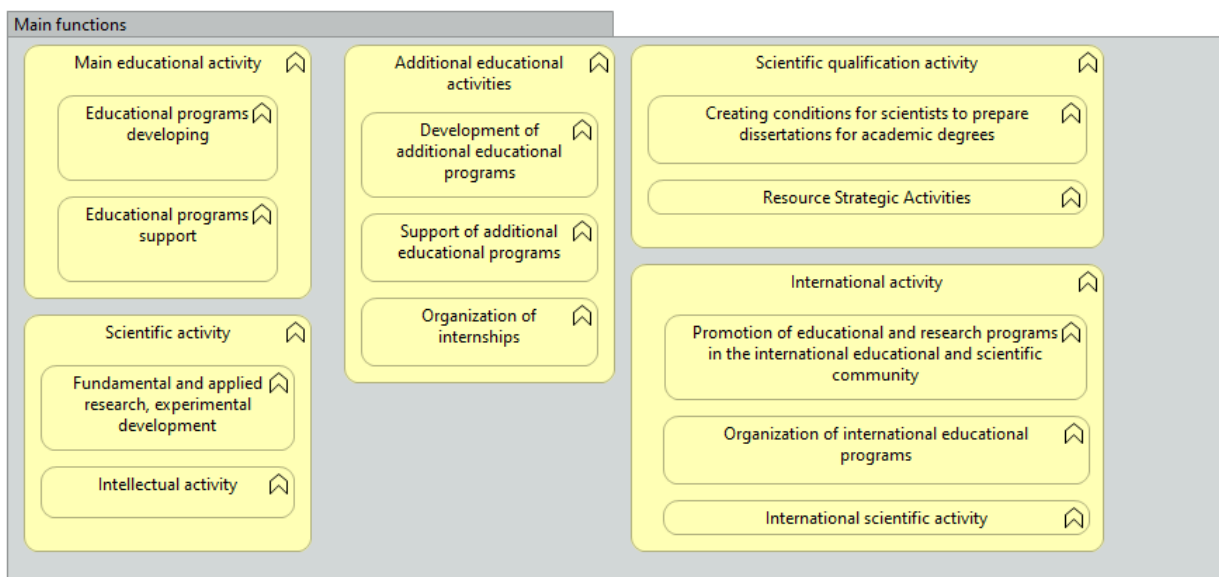


Figure 2: University main functions

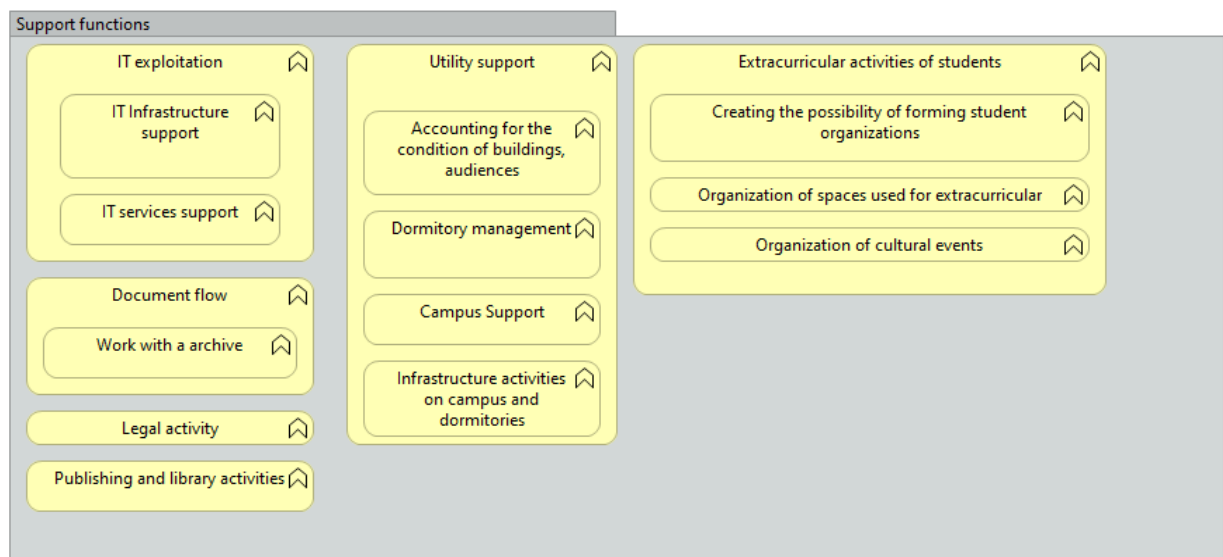


Figure 3: University support functions

One of the main processes of the university is to create an environment for writing a dissertation for applicants for academic degrees. This task also implements such university values as reputation support and research and development, reflected in the business model of a higher educational institution (Fig. 4) [16-19].

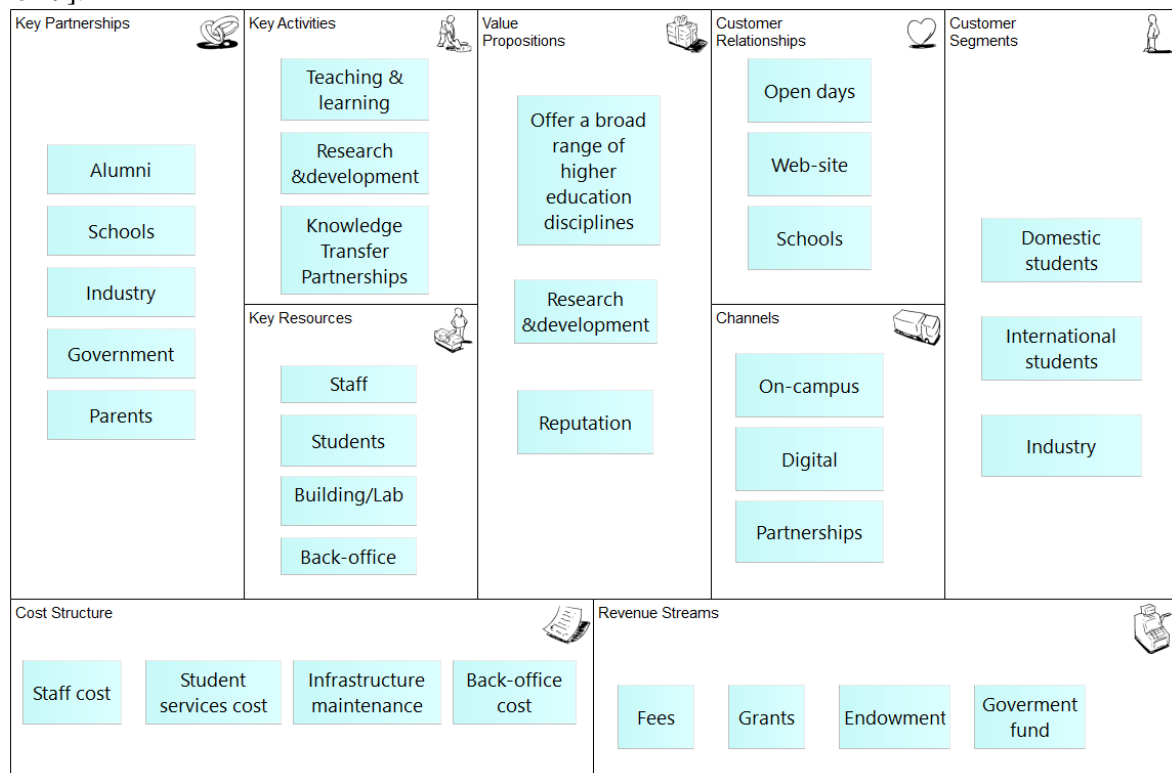


Figure 4: University Business Model Canvas

Thus, assistance to applicants for scientific degrees is a process for which it is necessary to constantly find ways to improve. Thanks to modern information systems, the university research department can automate and standardize processes, which will simplify routine procedures and will provide an

opportunity to concentrate on research and development. It is necessary to understand what processes should be driven by automation and what information systems will automate these processes.

To formulate the requirements for IT architecture, we will consider the motivational expansion of the vice-rector for youth affairs. The proposed architecture can be considered not only in the context of increasing the number of PhD, this example simply covers many aspects of the research department, and perfectly illustrates the possibilities for its digitalization.

Suppose that, within the framework of the university's policy, a decree has been received to increase the number of candidates of science among graduate students, based on this, the following motivational expansion follows (Fig. 5).

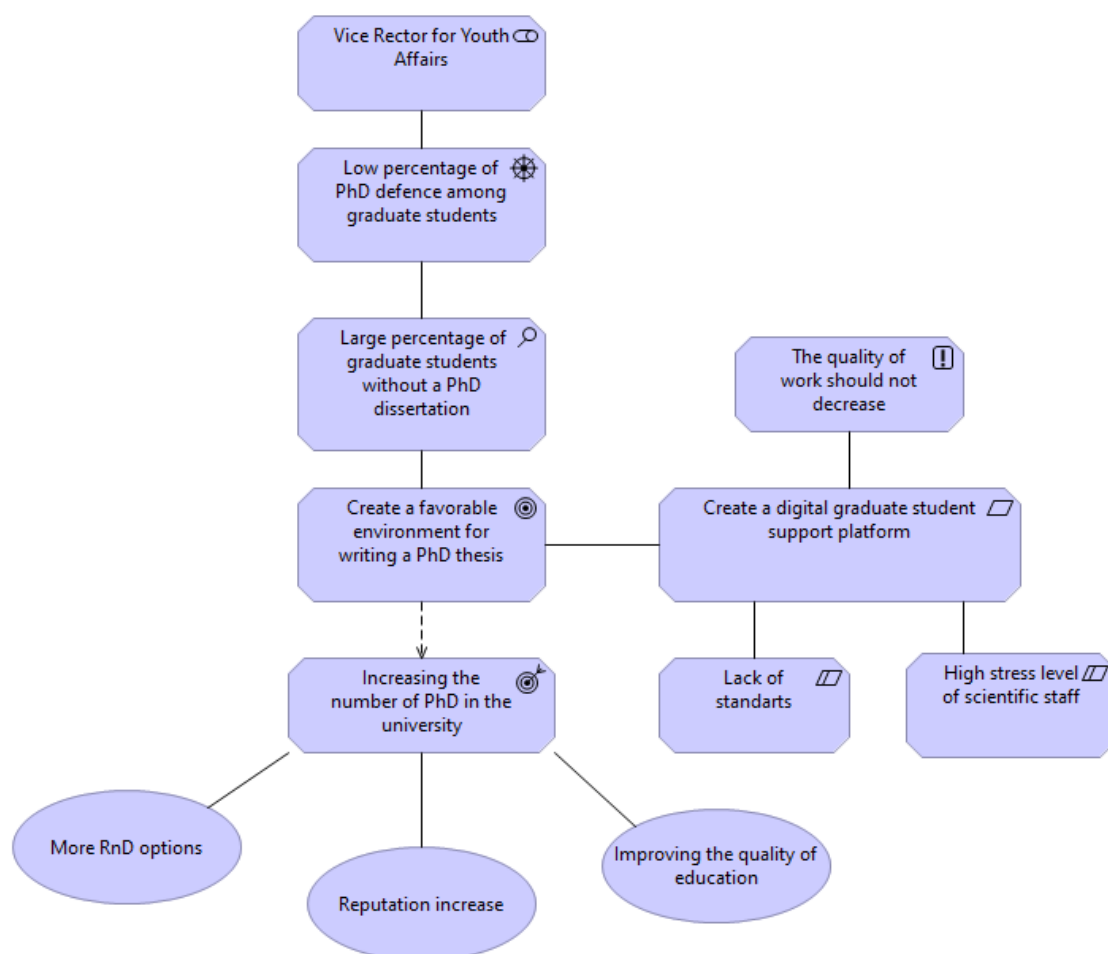


Figure 5: Motivational expansion of IT services architecture for research activities in digital university

The main limitations for digitalizing work are:

- Consistent quality of work.  
Due to digitalization, the quality of research should not suffer, moreover, one of the consequences of digitalization is to increase the citation of the works of university authors.
- Lack of uniform standards.  
Due to historical, cultural and other factors, each university has its own approach to supporting applicants for scientific degrees. The task of digitalization is not to change the existing process, but to complement it and bring new opportunities for implementation.
- High load of researchers.

As a result of scientific activity, each researcher in one way or another has to deal with routine processes that are not directly related to the study, filling out various official documents, completing articles, gaining access to equipment. As a result of a large number of different tasks, the study may suffer. The task of digitalization in this case is to create for scientists the most comfortable environment within which they will be able to do research without various distractions.

Thus, based on the restrictions on the future digital platform, we obtain the following list of requirements that must be implemented using digital systems:

- **Transparency of the process.**  
Each task performed by the researcher should have a clear goal and an understandable result, it is also necessary to know where the task comes from and who will be the end user of the research result.
- **Standardization of processes common to the entire university.**  
Any scientific research is primarily a creative process, but in it you can find processes similar to any researcher. For example, for entering an article in a knowledge base, recording a consultation or admitting to equipment, you can create clear instructions with a minimal amount of action on the part of the researcher.
- **Quick access to information.**  
The system should provide the most accurate and quick access to the information that the researcher needs.

In forming the requirements for digital services, we focused on research conducted in this area [20-24]. Based on the requirements for the system, we compile a model of IT services and systems that implement these services (Fig. 6):

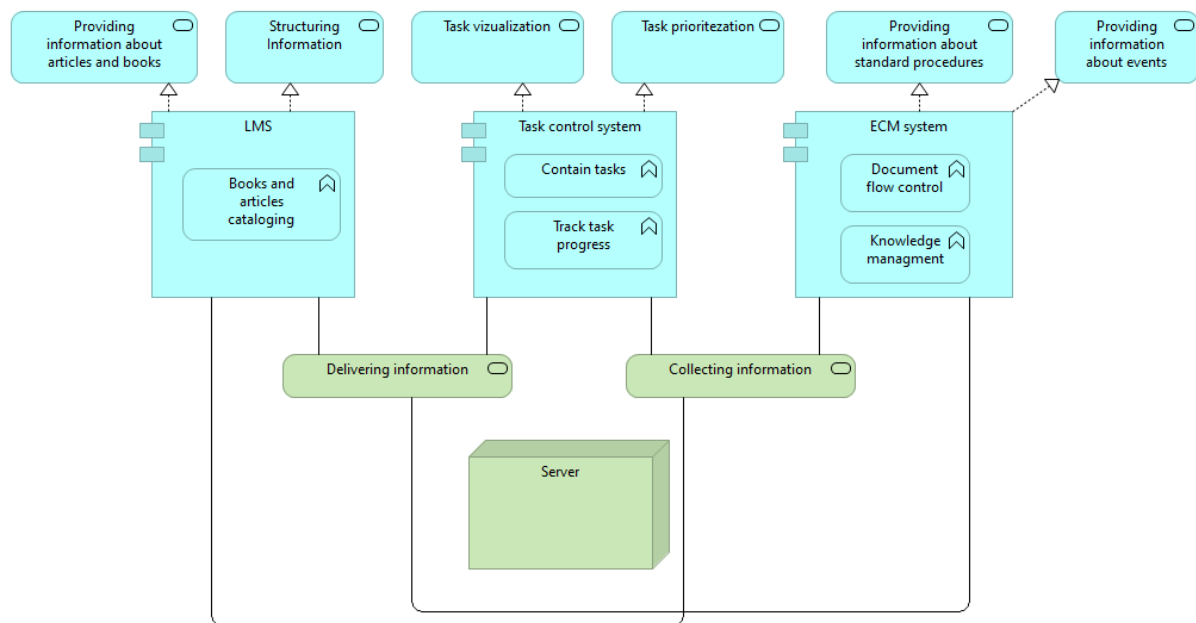


Figure 6. IT services architecture model of a research department at a digital university.

This model presents the most popular types of systems that implement the necessary services, these tasks can be performed by one customized system, the choice of which remains with the university. Consider the proposed services and information systems:

- **LMS (Library management system)** - this class of systems allows you to automate the processes associated with the management of the library fund. When compiling a catalog, it becomes

possible to search for the necessary literature not only by name, but also by keywords, which greatly simplifies the process of selecting sources for research.

- Task control system - initially this class of systems was used in the development environment to track various errors in programs, but today the scope of this type of program has grown significantly. With the help of such a system, it will be possible to track all the tasks that must be completed. A task prioritization system will allow you to clearly plan working hours, which will increase the overall performance of employees [25-26].
- ECM (Enterprise content management) - these systems are used to support a single life cycle of unstructured information of various types and formats. There is an opportunity to create a knowledge base on the specific procedures of individual departments and institutes. Also, the document management function will allow faster and better to draw up the necessary formal documents, and tracking current events in the scientific environment will give employees information about events in which they can manifest themselves [27].

The following advantages appear for the university administration:

- Ability to track employee time.  
The work process of employees will become more transparent, it will be possible to track what tasks an employee is currently working on, evaluate labor costs at one time or another and clearly see at what stage work is underway on various projects.
- Reducing the level of errors in formal documents.  
Employees will clearly understand what and how to fill out, thus reducing the percentage of errors in formal documents, which will positively affect the speed of workflow in the institution.
- Reduced employee stress.  
The digital system will help to efficiently distribute tasks between employees, the number of processing will be reduced, and the tasks themselves can be distributed in accordance with the competencies of the employee.

There will also be new opportunities to improve the quality of employees, for example, through gamification. This approach, for example, with the introduction of various kinds of achievements and statistics, will increase internal motivation and job satisfaction for employees, which will positively affect their overall mental health and ability to work [28]. Thanks to the library system, due to cataloging, the citation index and the overall involvement of researchers in the process of international scientific activity will increase, which will positively affect the reputation of the university.

However, to obtain a result from the implementation of information systems, the following conditions must be met:

- Availability of budget funds for implementation.  
The introduction and maintenance of information systems is a big expense item, you must understand that these changes can only be profitable indirectly, as they are primarily aimed at simplifying the research process and increasing the overall prestige of the university.
- Willingness to change among employees.  
To work with the new system, it will be necessary to conduct training among employees. If they do not have the opportunity to learn as a result of high workload or the system itself will not have a user-friendly interface, the effect of the implementation can be reduced to zero [29-30].
- Sufficient computing power  
To implement the system will require a large number of computing power. If the system will constantly hang, and the information will not be recorded and transmitted properly, the effect of the implementation will also be significantly reduced.
- A common understanding of development strategies.  
The management team must clearly understand the purpose of launching a project to digitalize the research department and what results are expected as a result of the introduction and launch of the system.

Under these conditions, one can expect an increase in the efficiency of the research department in the implementation of digital systems.



#### 4. Conclusions

As a research result in this paper we consider the reference model of business functions of the university and University Business Model Canvas, develop Motivational expansion of IT services architecture for research activities in digital university. It allows us to make requirements for IT services of a research department at a digital university and to develop IT services architecture model.

For digitalization, the university needs to clearly understand why to create these services and whether it is ready for their implementation. If all the conditions are met and the university's strategy has the goal of digitalizing the research department, it is necessary to create the following IT services:

- Tracking and prioritization of tasks
- Informing about standard procedures
- Information on events in the scientific community
- Search for necessary literature
- Article loading system

Thanks to the services, transparency of work will increase, labor costs for the necessary routine procedures will decrease, and the work capacity of employees will increase. For different universities, the list may vary, depending on requirements, the availability of part of the necessary services, etc. The proposed list is a necessary minimum of services for digitalization of the research department, which will allow the university to open up new opportunities for development and increase the prestige of the educational institution as a whole.

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