# Development of the Support Information System of the University

Andriy Andrukhiv [1][0000-0001-5915-8855], Maria Sokil [2][0000-0003-3352-2131], Alina Petrushka [3][0000-0002-8769-4599] and Yuriy Syerov[4] [0000-0002-5293-4791]

Lviv Polytechnic National University, S. Bandera str. 12, 79013 Lviv, Ukraine
[1]andriy.i.andrukhiv@lpnu.ua, [2]mariia.b.sokil@lpnu.ua
[3]alina.i.petrushka@lpnu.ua, [4]yurii.o.sierov@lpnu.ua

**Abstract.** The study examines the processes of implementation by Universities of modern information and computer technologies in the field of information support of the educational process. The main aspects of University informatization are analyzed and substantiated. A formalized presentation of integrated data processing of adaptive provision of the educational process of the University with information materials of the library has been developed. The advantages of comprehensive automation of higher education in all its activities are obvious, but in most University in our country, it has not happened for many reasons: lack of funds, specialists and so on. Therefore, only fragments of such systems have been created, adapted to the specifics of a certain University

**Keywords:** University, Higher Education, Educational Services, Information and Communication Technology (ICT), University Library, Information System, Automated Control System, Library Information System

## 1 Introduction

The modern information society is characterized by the development of scientific and technological progress, where information becomes the most important strategic resource, a tool of society management, a prominent factor in social and intellectual development. The formation of a new information society, the development of the Internet, increasing the number of electronic resources formed new conditions for the functioning of free economic zones. Modern University is not just a structure that provides educational services or represents scientific achievements.

Today, University are actively implementing the latest information and communication technology (ICT) in the learning process: web and Internet technologies; e-textbooks and e-learning systems, as well as distance learning tools; computer-aided design systems; multimedia systems; learning technology with the use of international information archives, electronic libraries; cluster technologies, etc.

Higher education occupies a leading place among the factors of economic development of society. The progress of any state depends on the professionalism of spe-

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cialists whose training is entrusted to higher education. Higher education acquires new features and expands its functional purpose.

## 2 Related Works

Current research in the field of informatization of the university was conducted in the following areas.

Modern university library should involve in its activities the latest services for the purpose of natural integration into the system of functioning of the university and to improve its information services [5].

Through the integrated application of Library information system and campus culture was proposed concept of integrated construction of college campus culture and library information system on informatization condition.Researchers propised to use library information resource medium to integrate into cultural connotation serving regional economy on the basis of knowledge architecture [10].

Scenarios of the University information activity in condition of low productivity are presented. The analysis of the integrity and completeness of coverage of the information image of the University is carried out [6].

Analysis of information provision of the educational process in the university for implemention of new information technologies and software into all spheres of university academic activity. The ways to improve information support for students during educational process and implementation of these methods in Lviv Polytechnic National University work are developed [2].

New services that the Scientific Library of Lviv Polytechnic National University offers to its users are described. It is noticed that proposed services helps University to increase the quality of educational process [1].

Analysis new web-services of university library for improvement of quality of educational and scientific activity of University were conducted. Datailed description of each service and define measures for quality evaluation were presented [3].

Ground analysis of problems and improvements of university libraries' informationization was conducted [9].

Analysis of smart libraries as a system of library and information services developed to support research and training activity is proposed. Review of both classical library services and oriented on modern education is given [4].

Resultes of analysis of the interactive means in education process was proposed. It was concluded that the use of interactive means in university has high effectiveness [8].

Interpretstion of the meaning of education informatization and physical informatization in ordinary colleges and universities is proposed [7].

# 3 Results

## 3.1 The main aspects of University informatization

Among the factors that ensure the functioning of the higher education system an important place is occupied by information support of the educational process. Information support is the process of meeting the information needs of students, teachers and scientists for conducting education, research and various forms of professional and teaching activities. To rationally implement these tasks, modern tools for access, search, storage, and presentation of library information materials are needed.

In this regard, the University faces the task of improving the quality of education, in particular by streamlining the work with the help of information support of the educational process with educational and methodological literature. At the same time, the function of a continuous automated security monitoring process remains relevant.

When considering the issue of informatization of University, we can distinguish three main levels:

- level of management – effective provision of senior management team and heads of units with credible strategic and operational information, and decision-making support by administrative staff;
- level of teachers – information support of the educational and scientific activity and implementation of modern ICT;
- level of students – provision of access to educational and scientific information.

You can also identify the following main areas of informatization:

- development and implementation of the scientific and technical policy of University in the field of informatization;
- design and the gradual creation of information infrastructure of University ;
- formation and development of components of the automated control system (ACS) of University, subsystems of quality management of training specialists and educational process, systems of information support of education;
- creation, support and development of a corporate or local network of universities;
- provision of quality access to knowledge clusters and the Internet from all workstations of the corporate network, etc.

The quality of information support of the University is influenced by the following factors:

- introduction of electronic educational and methodical complexes of disciplines;
- creation of a single educational information space (SEIS), which will contribute to the formation of web representation of universities in the world information space (a set of information, technologies for its processing, storage and transmission, operating based on common principles and common rules). The SEIS should provide information interaction of all automated workplaces, university users according to tUniversity r information needs and authorized access, as well as interaction of all

participants through electronic document management in a distributed information environment based on a single data warehouse of the University.

To implement all these aspects of informatization, the question of the main structural unit, with which you can implement all the tasks, arises. For Lviv Polytechnic National University, such a unit is a Scientific library.

Integrated data processing of adaptive provision of the educational process of the University with information materials of the library

Creating an information environment that helps to increase the efficiency of the main activities of the University (education, science, management, economic activity) is to introduce information resources targeted at certain groups of users, including management, faculty, graduate students and students.

An effective solution to the problem of providing the educational process with information materials lies in the plane of close interaction between library and all structural units of the educational institution and the organization of mutual integration of data.

The library is a structural unit of the university that is directly involved in the educational process, providing it with the necessary information resources. This is the focus of almost all technological processes of the library. To ensure this process, information from the information systems (IS) of the University and the library information system (ALIS) is required.

The main tasks of integration of the university IS and ALIS are:

- synchronizarion of directory information from different IPs;
- transition to the exchange of electronic versions of documents and changes in technological processes;
- provision of the principles of one-time data entry and personal responsibility for the quality of this information;
- reduction of the number of errors during the transformation and the transfer of information to / from the library;
- creation of specialized portals to facilitate access to educational and scientific materials.

When selecting data sources and users for the integration of ALIS into the information environment of the university use the following criteria:

- the need for mass regular data exchange with ALIS;
- authority of information arrays (responsibility of IP administrators for certain reference, factual information arrays);
- completeness and quality of data.

The main ISs of the university that meet the above criteria for ALIS are the following:

- virtual learning environment (VLE) or virtual learning management system;
- IS to support the learning process, such as IS "Dean's office";
- personnel IS, such as the "Personnel department";

– documentary IS, such as institutional repositories;
– IS of educational and methodical management;
– IS of the Research and development department.

The integration of ALIS with university information systems will allow to combine library-specific information (for example, information on violations of internal regulations, debts, etc.) with general reference and factual data about the student or employee. Information about the debt to the library can be passed to the deans' office, accounting department, etc. This will allow you to exclude from circulation some documents, such as bypass letters. Information on the terms of enrollment and expulsion of students from IS "Dean's office" should be used to determine the start / end dates of student services in ALIS. The general scheme of integration of ALIS with information systems of support of educational process (ISSEP) is shown in Fig. 1.

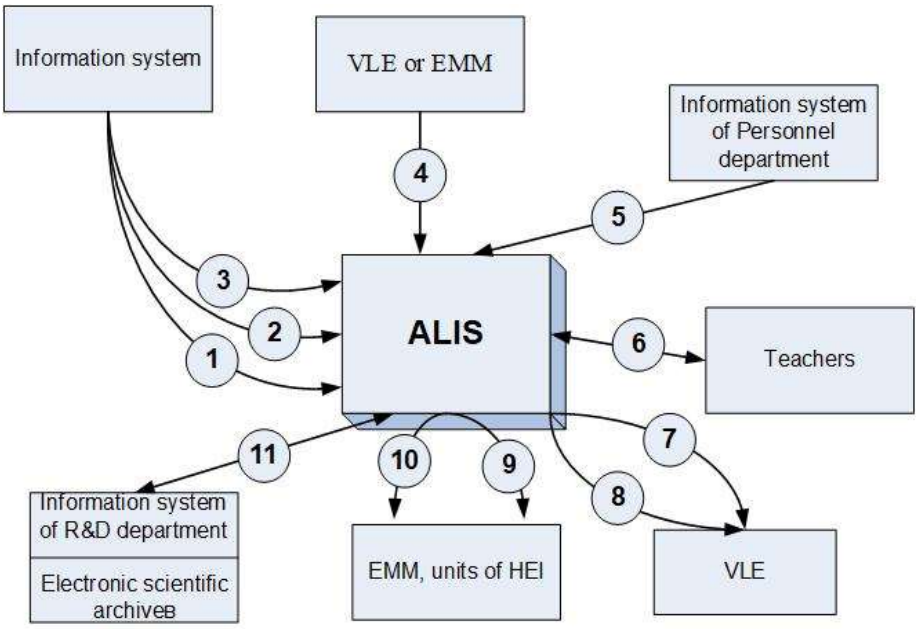


**Fig. 1.** The main information flows of the integration of ALIS and ISSEP

This diagram presents the main elements of the IS to support the learning process and data flows that arise during the integration of ALIS with ISSEP.

Consider in more detail these data streams transfer and refinement (verification) of the list of disciplines from the information system of the educational process support (for example, from the system "Dean's office"):

1. transfer and clarification (verification) of data from the information system to support the educational process (list of departments);
2. transfer and clarification (verification) of data from the information system of support of educational process (list of students and orders concerning student structure);
3. transfer of work programs of disciplines, in particular the list of the recommended literature. The source of information can be Virtual Learning Environment (VLS) or Educational and methodical management (EMM);
4. transfer of information on university employees from the information system of the personnel department (place of tUniversity r work, orders on transfer, dismissal, enrollment of the employee);
5. clarification by teachers of information on the list of recommended literature for the discipline;
6. transfer to the VLS of the thematic list of literature formed by ALIS;
7. transfer to the VLS of information on thematic new acquisitions in the library;
8. information for calculating the book supply index of the university institution;
9. transfer of the list of publications and methodical developments for UNIVERSITY ;
10. exchange of information on the list of scientific publications with the R&D department (RDD).

Data sharing of the library, EMM, RDD allows developing special information products for different categories of users.

In Fig. 2 a scheme of data exchange between the university and the library is presented.

This scheme specifies the data flows that exist between the library and the university is the basis for the creation of integrated information systems for managing the educational process.

During processing the list of recommended literature, the librarian searches the electronic catalogue for the necessary bibliographic descriptions (in University absence, can create) and connects them with the disciplines for the study of which this literature is recommended as basic or auxiliary.

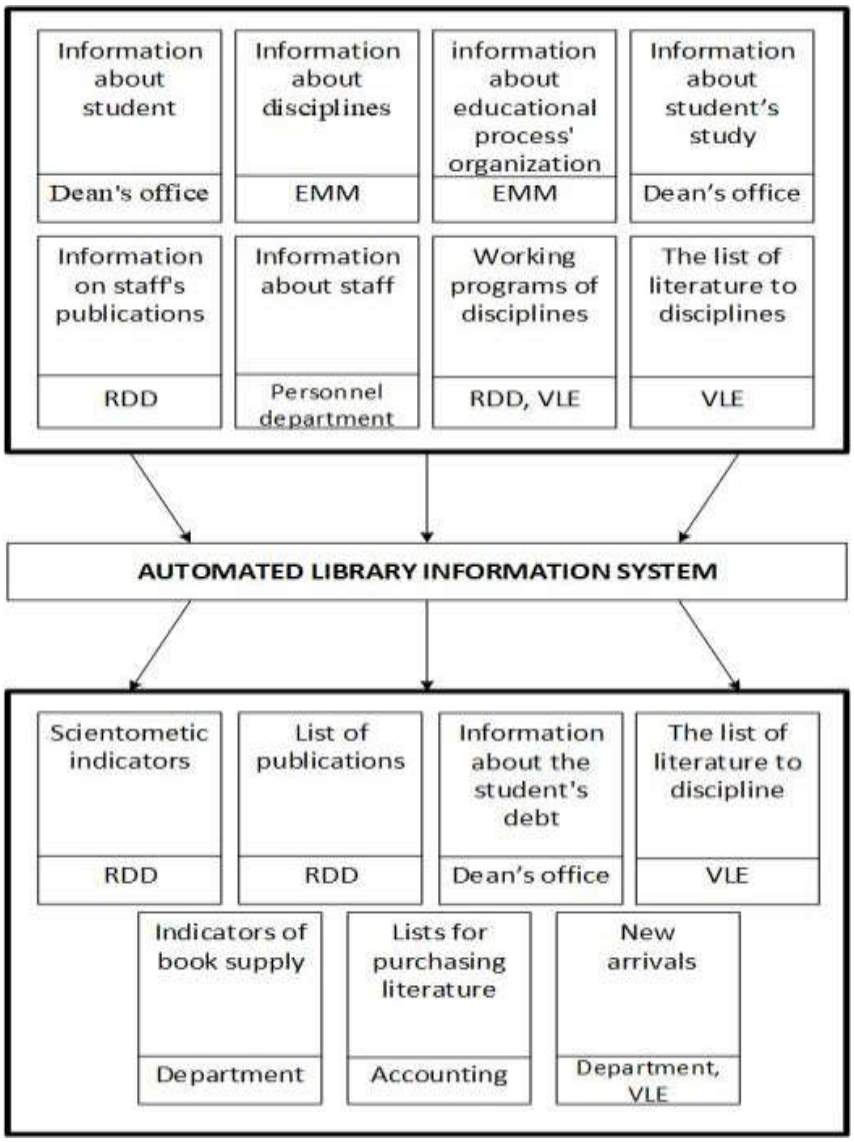


**Fig. 2.** Scheme of data exchange between library and university information systems

Thus, the initial filling of data about the information support of the discipline is performed. The cyclical nature of the learning process allows organizing effective procedures for copying existing data from the book supply to next year's curricula and make minor adjustments. The availability of data on the book supply of disciplines allows planning a semester publication of educational literature and organizing the offer of library information resources. This information is required for accreditation

(licensing) of specialties, departments or other institutions. The indicator is formed by means of ALIS and can be displayed by means of a web-page.

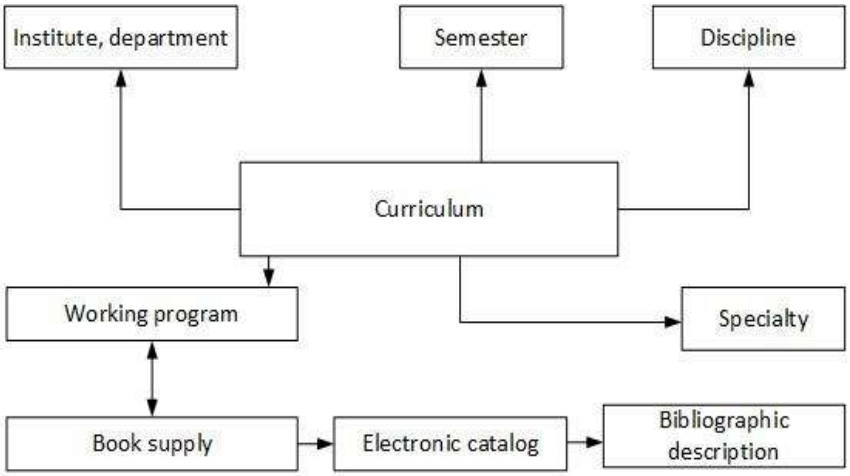


**Fig. 3.** The scheme of information interaction of the library and the UNIVERSITY

The following aspects should be taken into account when organizing the work of the consolidated data processing system of the library and university information system:

- first, it is necessary to ensure the maximization of the processes of processing document flows in electronic form. To minimize the number of errors in data processing, all major document streams should be transmitted exclusively in electronic form. For example, the transfer to the library of curricula, work programs of disciplines or the transfer to the appropriate departments of bibliographies or indicators of book supply.
- secondly, it is necessary to take into account the fact of a possible division of the institution into smaller substructural units and in this case, all information flows should be preserved.
- thirdly, it is necessary to ensure the integrity of the system and automate all processes as much as possible, including the formation of reports (for example, a report on the book supply of academic disciplines, the organization of the educational process). Ensuring integrity ensures that all components of the system and University relationships are preserved. For example, a key link in the organization of the educational process - curricula without which it is impossible to form a base of work programs of disciplines (see Fig.3).

Timely provision of relevant information to the university departments plays an extremely important role in the organization of high-quality information support of the educational process.

From the set of all information flows we select the following:

- information on the structure of the university;
- data on curricula, state educational standards, work programs, etc .;
- information about the contingent of students and the list of specialties in which they study.

In Fig. 4 shown a diagram of the interaction of library and university processes.

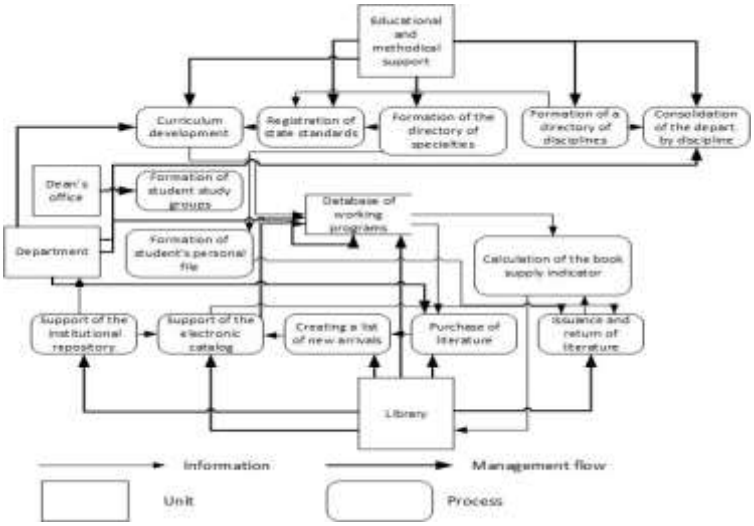


**Fig. 4.** The scheme of interaction of the library with the departments of the university

As can be seen from this diagram, the library is an important structural unit of the university and has complex organizational links with the units that shape the educational process.

An important element of the library's interaction with the University is the constant monitoring of processes, which allows obtaining data on the state of the components.

This will allow timely management decisions in the process of improving the information support of University students (see Fig. 5)

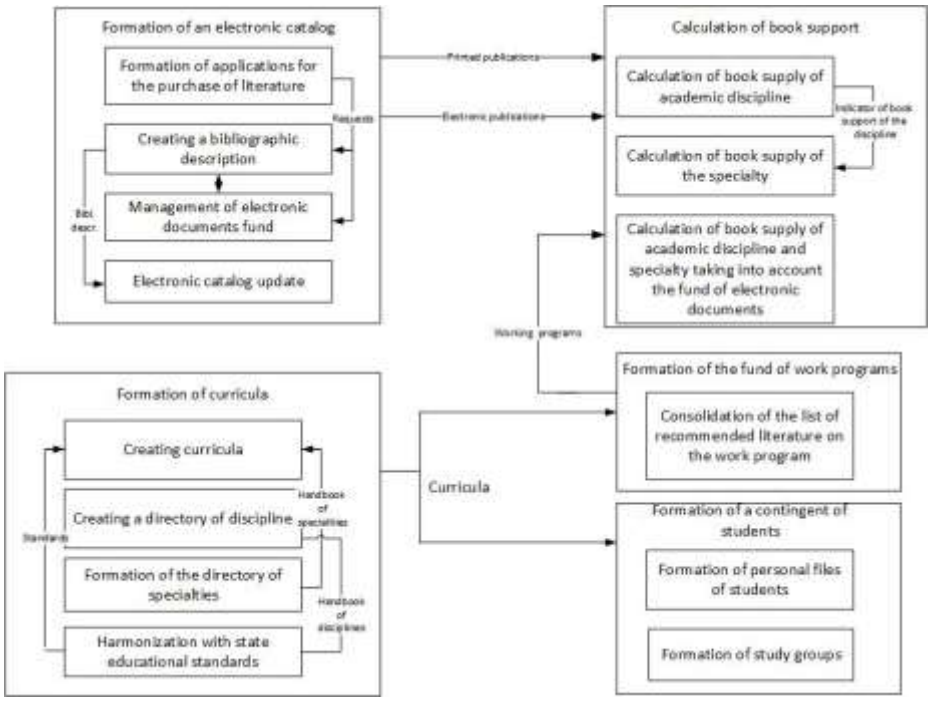


**Fig. 5.** The scheme of management of information support of educational process

As mentioned above, the basis of the organization of the educational process are the curricula, as the main regulations of the University. The process of University design is presented in Fig. 6 and Fig. 7.

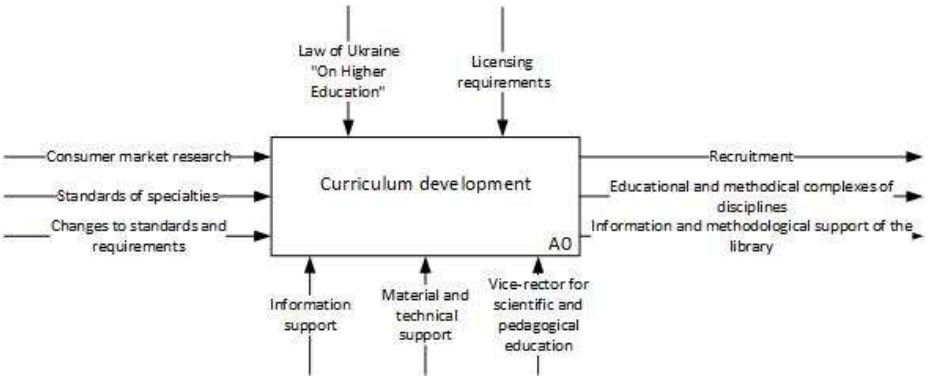


**Fig. 6.** Curriculum design: external factors

Since the basis for the formation of the list of recommended literature for the discipline is the curriculum, we will consider this process in more detail and build a mathematical model.

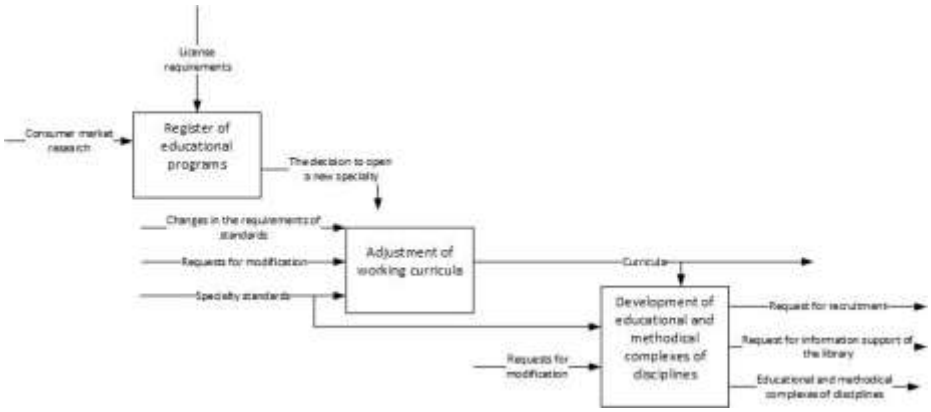


**Fig. 7.** Internal interaction of curriculum formation processes

Given the above, it is possible to form an appropriate mathematical model that will describe the relationship between structural units of the university with ALIS, to provide users with the necessary educational and scientific information sources.

## 4 Conclusion

The advantages of comprehensive automation of higher education in all its activities are obvious, but in most University in our country, it has not happened for many reasons: lack of funds, specialists and so on. Therefore, only fragments of such systems have been created, adapted to the specifics of a certain University. ACS of University is a large complex dynamic system, which requires first of all the development and implementation of the concept of the university management system; creation, support and development of a set of technical means of information infrastructure of the University of Ukraine (which can then be a component of the knowledge cluster). The management of the University should be well aware of the prospects and benefits of automation of the educational institution, which are, in particular, the introduction of distance education; creation of a subsystem for quality management of education, multimedia and electronic textbooks, software and methodological complexes; automation of scientific innovation, personnel, planning, economic and financial activities, as well as improving retraining of specialists. The ultimate goal of informatization is to provide quality access to university and world information resources for management, faculty, graduate students and students of the institution. Thus, there is an obvious need to develop a single unified concept of construction of an educational information environment of the University, which would fully take into account the possibility of creating, disseminating and applying distributed and integrated databases and knowledge focused on educational services taking into account national requirements and international education standards.

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