A.A. Adizov
Fiscal institute under the tax committee of the Republic of Uzbekistan
Dosent of the Department of M and IT. Tashkent, Uzbekistan
Phone: +99897 343 06 03
a-adizov@mail.ru

I. S. Nabiyeva
Tashkent University of Information Technologies named after Muhammad al-Khwarizmi Samarkand branch
Teacher of the Department of Computer system, Samarkand, Uzbekistan

S.B. Abdullayeva
Samarkand State medical institute
Teacher of the Department of Information technology,
Samarkand, Uzbekistan

GENERAL TECHNOLOGICAL REQUIREMENTS FOR MIS. INTEGRATION OF INFORMATION STREAMS

Abstract: This article formulates the main technological requirements that a modern MIS must meet. MIS storage facilities allow you to work with practically unlimited volumes of information located in any storages - in local and regional networks, as well as on the Internet.
Key words: MIS, principle, advantages, flow, Integration, technology, stage.
Language: English
Citation: Adizov, A. A., Nabiyeva, I. S., & Abdullayeva, S. B. (2021). General technological requirements for MIS. Integration of information streams. ISJ Theoretical & Applied Science, 12 (104), 1001-1006.
Soi: http://s-o-i.org/1.1/TAS-12-104-106   Doi: crossref https://dx.doi.org/10.15863/TAS.2021.12.104.106
Scopus ASCC: 1700.

Introduction
GENERAL PRINCIPLES AND CONCEPTS.

MIS are based on a huge number of devices: on computers, including PDAs, on scanners, from tablet computers to tomographs, on storage devices, devices for video and photography, sound recording and playback, etc. Moreover, thanks to network technologies, integrated MISs can have heterogeneous architecture. Flexible access to the information you need is becoming a key requirement for medical software products. In this regard, the priorities in their development are shifted towards the integration of information from various sources.

As already noted, the main requirement for a medical information system is the requirement to ensure staff access to the necessary information. In other words, this requirement means that any information passing through a medical institution must be entered into the information system and then available at any time from anywhere in the organization at the request of personnel, if this requirement does not contradict the rules of access to this information (for example , the access rights of this employee in accordance with the security system operating within the medical organization). For example, when a patient enters the admission department of a medical institution, his demographic information (gender, age, passport data) is entered into the subsystem of the admission department of a medical organization. In the case when the MIS used in the organization meets the requirement of integration in terms of information coverage, this patient data becomes immediately available in all other subsystems and can be used to identify this patient in all other medical, diagnostic and

Clarivate Analytics indexed

administrative processes in which he will be involved. [1.4].

Table 1. General requirements for MIS

Requirement	Benefits provided
Integration Information flows	Unified information environment (semantic integration). Coordination of information management and storage processes.
Synthesis of centralized and distributed technologies	Flexibility of data management processes: centralized access to information (implemented for each clinical case or each patient) and distributed infrastructure of the information system (in accordance with the physical structure of the medical organization). The basis for implementing component architecture.
Component architecture	It allows you to give the information system the property of modularity, that is, explicit structural or functional divisibility into subsystems.
Openness and support for standards	Reducing the complexity of development. Providing flexibility and adaptability of the system. Using lessons learned to minimize the likelihood of errors.
Scalability and portability	Compliance of the system with the level of technological and informational requirements of the customer.
Reliability and fault tolerance of the system	Minimization of the probability of failure of the information system and its recovery after failure or failure.
Ensuring the security and confidentiality of information	Responsibility for maintaining confidentiality throughout the medical system.

Thus, we can say that the integration of information flows passing through the entire medical organization allows for an integrated approach to the presentation, analysis and management of data. This thesis primarily means that the integration of information becomes the main way to quantitatively increase the number of different, simultaneously covered information indicators (for example, various indicators related to the condition of a particular patient at any given time and obtained from various sources: observations of nurses, records of the attending physician, the results of diagnostic studies from laboratories, etc.) and thereby qualitatively improve the efficiency of the work of all medical personnel. It follows from this that it is the integration of information flows that can first of all ensure the compliance of the MIS with its main purpose: increasing the efficiency and quality of medical care. Moreover, it can even be argued that the functionality of this system as a whole directly depends on the degree of integration of subsystems within a single system, and this statement can be attributed not only to medical information systems, but also to any complex systems in general.

The concept of information integration can be intuitively logically related to the concept of its centralization in the sense of coordinated mechanisms for managing this information. However, this does not mean at all that the integrated system is centralized in the classical sense of the term - centralized in terms of architecture. Centralization in the sense of coordination of actions can manifest itself at various levels of the organization of the system and each time

provide a new way to increase the integration of information flows.

The first of these methods is integration at the highest level - at the level of information presentation. This method of integration is provided on the basis of centralized, that is, unified, user access to any necessary information. It does not matter how this information is stored and presented within the system itself or within local subsystems and how it is transferred from one subsystem to another. This way of integration faster means that the user can get any information of interest to him from a single information environment. Integration at the level of information presentation can be called semantic integration, since it allows us to consider the information received in the context of its semantic load [5].

The next way of integration is integration at the logical level. Here we are talking about centralized information processing. In this case, again, it does not matter how the information gets into the subsystems responsible for its processing, how it is stored and how it becomes available to the user. To provide this method of information integration, it is necessary to provide for the possibility of interaction of various subsystems with each other so that each subsystem responsible for information processing is able to receive information of interest from other subsystems. For this, subsystems must have the property of being active. This integration can be called subsystem-level integration, or logical integration.

The third method of integration is integration at the level of information organization, provided by the

centralized management and storage of information within the system. Such a method of integration can usually be provided by some centralized storage of information, or a data warehouse, often called an information system repository, where information in some way gets from various subsystems, forming a coherent information structure, which is essentially a model of the real world. This integration can be called physical integration of information flows.

In order to assess which method of integration should be chosen as the main one when developing an information system, it is necessary to take into account, first of all, the following:

- possible ways to classify potential users of the system in order to most adequately organize the workplaces of each user;

- the number and degree of connectivity of logical subsystems (functional, organizational, administrative units) within the organization and the extent of their coverage by the time the development of the MIS begins (that is, the number of legacy systems);

- volumes, types, methods of access and requirements for information passing through a medical organization.

A detailed analysis of these three aspects will make it possible to realistically assess the need and degree of integration of information flows in the developed MIS [4,5].

SOME TECHNOLOGIES OF INTEGRATION

The main problems arise from the need to ensure accessible and comprehensive information flows passing through a medical organization, centralized with respect to data about each patient and allowing staff to automate the execution of operations included in their job responsibilities. In the context of the coexistence of several systems within one medical organization, the task of ensuring the completeness, consistency and availability of information in each of these systems inevitably arises. To solve this problem, it is necessary to provide mechanisms for the interaction of systems in order to allow one system to receive the information it needs from another system. Most medical organizations understand this problem, so they rely primarily on technologies that contribute to an increase in the degree of information integration. Let's consider the main methods used to solve the problem of information integration.

The most promising technological solution recognized by most medical organizations is the creation of repositories, or data archives, for storing patient information from various sources. In this archive, which is a centralized data storage, any operations with information carried out anywhere in a medical organization are recorded. The ordering of incoming information is usually carried out on the basis of linking it to the resource or resources to which this information belongs (for example, a patient, a doctor). Then the content of the archive is a complete historical picture of all changes in relation to each resource.

Another popular way to ensure the separation of information is to support global patient identification (and other resources) in the network of a medical organization (main patient index). This approach means that information is stored locally, in the information store of the system into which it was entered. In this case, each resource is assigned a unique identifier within the medical organization, which allows different systems to exchange information about this resource. In particular, magnetic plastic cards, on which the identifier and key information about the resource are recorded, can be used as a tool for identifying the resource. Thus, the global identification mechanism ensures the virtual unity of information [1,4].

Another technological solution that has a high priority both now and in the future is the provision of remote access to information (more on this below). This is especially true for medical information systems developed for geographically dispersed medical institutions. Such organizations usually have a rather complex structure of information flows and must exchange information between several physically remote departments. Remote access is understood as the ability to obtain the necessary information from any source, regardless of its location. Transparency, that is, the naturalness of such operations is ensured by the use of network communication protocols that hide the details of this process from the participants in the exchange of information. One of the methods of remote access to information is the use of technologies and services of the global information network Internet in the development of information systems. The use of web browsers as an internal corporate means of accessing information is a promising task for the near future.

The task of creating a so-called automated medical history is also very promising. This approach assumes the storage of any medical information about the patient, regardless of the format of its presentation. The stored information can be laboratory results, word processing documents, appointments with a doctor, presentation of clinical cases, data from medical equipment. From the point of view of this approach, it does not matter whether the information is stored centrally or distributed. But there must be some kind of mechanism that guarantees centralized analysis, management and organizational integrity of all inputted information about each patient. Such a centralized management system should provide for the generation of integrated reports containing data from different systems, exception handling and message generation for different users, transparent information retrieval and terminological consistency

(or the possibility of terminological translation) natural languages used in various information sources.

Currently, in the IT industry (including medical informatics), XML is becoming more and more widespread. This is in no small part due to its many strengths:

- More convenient search for information due to the clear structuredness of data arrays.

- Ability to develop flexible web applications.

- Integration of data from heterogeneous sources of information (texts, different databases, etc.).

- Integration of data from different applications (using different formats).

- Possibility of local calculations and data manipulations, i.e. a combination of local (on the doctor's computer) and remote (on the server) calculations.

- Multiple views of the same data (i.e. the flexibility to customize the display presentation).

- XML is a family of open and evolving standards for representing, validating, displaying and binding data [1,2].

- Effective presentation of information on the Internet (XML is a textual format that can be used in transmission over HTTP in the same way as it is done with HTML).

- Improved scalability of applications (i.e., relying on XML, developers can embed special procedural representations into documents containing information about how to process data of a particular type. This mechanism allows you to transfer a significant part of the user interaction to his own computer, which leads to a decrease in network traffic and system response time).

- Compression support (XML documents are compressed very well due to the frequent repetition of tags used to represent the data structure. The need for compression of XML data depends on the specific conditions of transmission and on the amount of information transferred. XML can use the compression standards used in servers and clients communicating over HTTP 1.1)

- Support from leading software vendors (Microsoft, Sun, Oracle, etc.).

The combination of these properties of the XML language allows it to be used in any area where there is a need for the exchange and transmission of information. Therefore, in medical information systems, XML is increasingly used as a universal transport format.

Electronic health records have different forms of function, depending on whether they are viewed from the point of view of individual practitioners or from the point of view of hospitals.

Electronic health records are usually presented as a collection of all medical information related to a patient. Most of this information is stored in text form, but it can include images, graphics, and other types of data. In this case, we are talking about a multimedia electronic medical record. Electronic medical records are usually considered as static and historical (ordered in time) arrays of information [5,6].

In the figure, we can see the history of the improvement of electronic medical records.
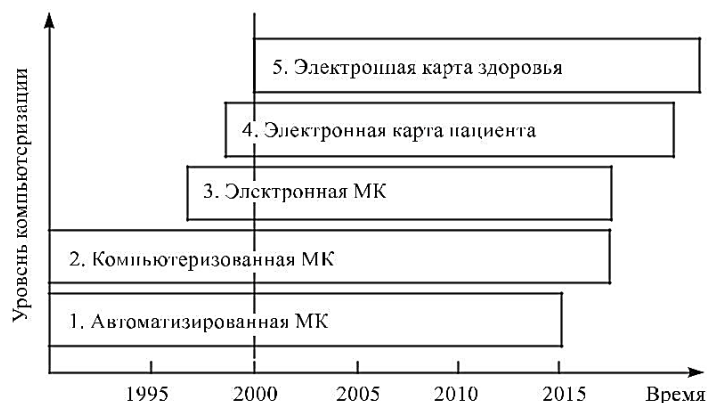

Figure 1. Stages of IEC improvement.

Each of these levels reflects a certain stage of technological improvement and the adoption of medical standards:

The first level of MIS is automated medical records. This level is characterized by the fact that only about 50% of patient information is entered into the computer system and in various forms is issued to its users in the form of reports. In other words, such a computer system is a kind of automated environment for the "paper" technology of patient management.

Such automated systems usually cover patient registration, discharge, hospital transfers, input of diagnostic information, appointments, operations, financial issues, run parallel to the "paperwork" and serve primarily for various examples of reporting.

The SECOND level of MIS is the Computerized Medical Record System (Computerized Medical Record System). At this level, the improvement of MIS, those medical documents that were not previously entered into the electronic memory (first of

all, we are talking about information from diagnostic devices, obtained in the form of various types of printouts, scans, topograms, etc.), are indexed, scanned and stored in electronic storage systems images (usually on magneto-optical drives). The successful introduction of such MIS began practically in 1993.

The THIRD level of improvement of MIS is the introduction of electronic medical records (Electronic Medical Records). In this case, a medical institution should develop an appropriate infrastructure for inputting, processing and storing information from workplaces. Users must be identified by the system and given access rights appropriate to their status. The structure of electronic medical records is determined by the capabilities of computer processing. At the third level, improving the MIS, the electronic medical record can already play an active role in the decision-making process and integration with expert systems, for example, when making a diagnosis, choosing medicines taking into account the patient's current somatic and allergic status, etc.

At the FOURTH level of MIS improvement, which the authors called Electronic Patient Record Systems (or, according to other sources, Computer-based Patient Record Systems), patient records have many more sources of information. They contain all the relevant medical information about a particular patient, the sources of which can be one or more medical institutions. For such a level of improvement, a national or international system of patient identification, a unified system of terminology, information structure, coding, etc. is needed.

The fifth level of improvement in MIS is called the Electronic Health Record. It differs from other types of electronic charts by the existence of almost unlimited sources of information about the patient's feeling. Provides information from the fields of alternative medicine, behavioral activities (smoking, sports, dieting, etc.).

There is a debate about whether to treat an electronic medical record as a set of documents or a set of messages.

It is important to point out that one of the current trends in the modern IT industry is the continuous increase in the share of software products containing certain intellectual mechanisms designed to analyze and manipulate data. Such systems can include some automated patient record systems, software for scheduling the use of resources, etc. [2, 3].

Conclusion

More and more healthcare organizations are realizing the importance of developing managed-care software. This term medical informatics refers to software for tracking the course of the disease of each patient. A feature of this class of systems is the need for constant analysis of incoming information in the background. At the same time, the patient's condition is assessed based on the characteristics of the given clinical case (main and concomitant diagnoses, drug intolerance, etc.), and recommendations or warnings for doctors are generated.

Recently, the priority has been for developers to use standardized mechanisms for interaction between systems: data exchange standards, standard object component models, and the like (this issue is discussed in more detail in the following chapters). This approach not only saves developers time, but also allows you to get integration mechanisms, increasing the number of potential systems that can interact with this system.

The results show that within the framework of one medical organization, some combination of the above methods is usually used. Consequently, these methods are not contradictory, moreover, each of them demonstrates one of the planes of understanding the automation of a medical organization, and, therefore, they are complementary and sometimes interdependent, that is, the use of one method can affect how and what other methods will used. Thus, another feature of software development for medical organizations is the need to ensure the integration of methods and technologies.

References:

1. Karshiev, A., Nabieva, S., & Nabiyeva, I. (2019). Medical information systems. *International Scientific Journal Theoretical & Applied Science*. SECTION 4. Computer science, computer injineering and automation. Issue: 04 Volume: 72. Published: 30/04/2019, pp.505-508.
2. Primova, X.A., Nabiyeva, S.S., Malikov, M.R., & Shukurov, L.E. (2021). Problems in the field of medical information reporting. *ResearchJet Journal of Analysis Inventions,* ISSN: 2776-0960 Volume 2, Issue 5 May, 2021, pp. 391-397.
3. Muxammadiyeva, D.T., Primova, X.A., & Nabiyeva, S.S. (2021). Overview of early diagnosis of «diabetes». *International Scientific Journal Theoretical & Applied Science*. Computer science, computer injineering and

Clarivate Analytics *indexed*

automation. Issue: 10 Volume: 102. Published: 13.10.2021, pp.443-446.

4. Abdullayeva, S.B., Shukurov, L.E., & Nabiyeva, I.S. (2021). *Direction of standartization in medical informatics*. Proceeding of International Conference on Research Innovation In Multidisciplinary Sciences, 2021 Hosted From New York USA www.econferenceglobe.com

5. Nabiyeva, S.S., Rustamov, A.A., Malikov, M.R., & Ne'matov, N.I. (2020). Concept Of Medical Information. *European Journal of Molecular & Clinical Medicine*, 7 (7), 602-609.

6. Safarov, T.S., Turakulov, S.X., Nabiyeva, I.S., & Nabiyeva, S.S. (n.d.). The effectiveness of medical information systems in diagnostics, *Theoretical & Applied Science*, 301-305

7. Nabiyeva, S.S., Axmedov, O.B., Malikov, M.R., & Shukurov, L.E. (2020). Laboratory information systems. *Archive of Conferences*, 9 (1), 282-286.

8. Sakiev, T., & Nabieva, S. (2018). Architecture of the medical information system. *International Scientific Journal Theoretical & Applied Science*. Section 4. Computer science, computer injineering and automation. Issue: 05 Volume: 61. Published: 14/05/2018, pp. 35-39

9. Primova, H.A., Sakiyev, T.R., & Nabiyeva, S.S. (2019). *Development of medical information systems*. International Conference on Information Science and Communications Technologies: Applications, Trends and Opportu-nities, ICISCT, 2019, 9011867.

10. Primova, H.A., Sakiyev, T.R. , & Nabiyeva, S.S. (2020). Development of medical information systems. *Journal of Physics: Conference Series*, 1441 (2020) 012160 IOP Publishing doi:10.1088/1742-6596/1441/1/012160 (Scopus) https://iopscience.iop.org/article/10.1088/1742-6596/1441/1/012160

11. Mukhamedieva, D.T., & Primova, Kh.A. (2014). Approach to problem solving multicriterial optimization with fuzzy aim. *International Journal of Mathematics and Computer Applications Research (IJMCAR)* ISSN(P): 2249-6955; ISSN(E): 2249-8060 Vol. 4, Issue 2, USA. 2014, 55-68. Impact Factor (JCC): 4.2949

12. Karshiev, A.B., Primova, X.A., Nabiyeva, S.S., & Egamkulov, A.S. (n.d.). Architectural integration problems of MIS. *ISJ Theoretical & Applied Science*, 05 (85), pp.733-739.

Clarivate Analytics indexed