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**Information technologies in accounting
and auditing**

Text book

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Material in this textbook is represented in a logical order convenient for the perception and the subsequent study. The basics of the information technologies application and organization of accounting while using the computer information systems are given at first. Then approaches to the development of computer systems of accounting are described, and application of information technologies in audit is considered.

Each chapter contains questions for discussion. At the end of the textbook there are tests. The appendixes include the list of information systems used at enterprises of the developed countries, and the characteristics of the basic classes of accounting software.

For students, graduate students, accountants, managers, researchers, lecturers and students of economic universities, specialists receiving the second higher education, and for those who pass certification and raise the level of their skill.

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PREFACE

The organization of accounting and auditing at an enterprise today is impossible without application of information technologies. The workers of practically all spheres of economic life (production, trade, service) use computers. But not all of them have the proper definition about the possibilities of modern computer technologies and can use them in the most effective way.

The distribution of information technologies in economy and, in particular, in accounting caused enormous revolutionary changes. The information systems began to change the ordinary structure of management. If earlier it was considered that a leader had enough knowledge to control all the work, in the information environment every employee has specific, inherent only to him functions and knowledge. Besides, the use of the related information systems in the management of different production systems leads to the single methods of the conducting of business, finances, accounting, office work and management. Thus, a technological information environment destroys a permanent hierarchy, creating more flexible free structures instead.

Computer facilities substantially increase the quality of accounting information processing. At the same time the use of computers changes content and organization of accounts personnel's work: the quantity of the manual operations of source documents processing, systematisation of registration indexes, filling in the registers and current forms diminish. Accounting work becomes creative, directed on organization and improvement of accounting.

The organization and conducting of auditing also change substantially. Now auditors estimate not only the work of accounting clerks but also the quality of data processing algorithms, realized in the computer programs.

The aim of this text-book is the preparation of specialists, able not only to work in the accounting programs, but foresee the ties between the information registration system, the variant of administrative decision on the base of this system, and events which on the decision is made. This is related to the fact that today a tendency prevails when the computer information system of an enterprise "...is being created without a particular help of the specialists in the information systems and technologies and seldom works under their control. It is created and controlled by the specialists in finances" [71].

The basic advantage of this work is that not only the basics of the use of information technologies and organization of accounting with the computer information systems are written in a quite accessible language, but also the approaches of creation of the computer systems of accounting and information technologies in an audit are defined.

The appendixes include the list of the information systems used on the enterprise of the developed countries and the descriptions of basic classes of accounting software.

The book consists of 4 chapters.

Chapter 1. The basics of application of information technologies. Tells about the importance of information technologies in the economy of enterprise; types of the computer information systems of enterprise (CIS) and about information protection in CIS. Particular attention is paid to application of network technologies at enterprise.

Chapter 2. Organization of accounting using computer information systems. Describes the approaches to application of elements of accounting method with the use of the computer information systems. Tells about the computer forms of accounting. Organization of accounting work with the application of the computing engineering is studied.

Chapter 3. Development of the computer accounting systems. Basics and the order of creation of the computer accounting systems on enterprises are presented. Attention is paid to the control of the use of registration records and software.

Chapter 4. Information technologies in auditing. Definition of the computer auditing is given. The features of audit of enterprises applying the computer information systems are presented. Public accountant activity software is described.

The text-book can be useful for students, graduate students, accountants, managers of enterprises, research workers, teachers and students of economic institutes and universities, specialists who obtain the second higher education and people who pass certification and raise the level of their skill.

CHAPTER 1. THE BASICS OF APPLICATION OF INFORMATION TECHNOLOGIES

After studying this chapter you will know about:

- *information technologies in the economy of enterprises;*
- *types of the computer information systems of enterprises (CIS);*
- *information protection in CIS;*
- *application of network technologies at enterprises.*

1.1. INFORMATION TECHNOLOGIES IN THE ECONOMY OF ENTERPRISES

Definition of economic information

In the process of administrative activity information becomes a more important resource than materials, power, labour and financial resources. During information processing the role of the articles of work is executed by primary data on the production and commercial operations, acquisition and sale of commodities, knowledge and habits and working duties of people, and obtained hereupon information plays the role of the product of work; it is used for the analysis and making administrative decisions. Accordingly, the particular importance is attained by the methods of processing and use of information, and also hardware thanks to which transformation of information into an important production resource becomes possible.

The word *information* comes from Latin *informatio*, which means exposition, elucidation of some fact, event or phenomenon. In its usual meaning information is determined as data on some aspect of material world and processes that take place in it. Initially, information was understood as data passed by people orally, in writing form or in other way via conditional signals, technical means, etc.

Information is distinguished by the semantic loading. It is very diverse and is classified on the basis of the types of human activity that it is used in: scientific, technical, production, administrative, economic, social, legal, etc. Each type of information has a technology of processing, semantic loading, value, forms of presentation and representation on physical carriers, requirements to exactness, authenticity, and operative.

Economic information is information, which characterizes production relations in society. Wider and deeper economic information can be characterized as the data set related to functioning and management of economy that is with planning, accounting, control, regulation of economic objects' activity. It is possible to fix, pass, convert and save this data.

Economic information also includes economic data. This is data about the process of production, material resources, management of production, financial processes, and economic information, which is exchanged by different systems of management.

Information that serves the processes of production, distributing, exchange and consumption of material welfare and provides the solution of tasks of organizational-economic management on macro- and micro levels is called *administrative*. It includes

various economic, technological, social, law, demographic and other data. In the information process of administrative activity information is one of important resources equally with power, material, labour, financial resources.

Economic information is the major component of administrative information. It contains data on the composition of labour, material and money resources and the state of objects of management on the definite moment of time. Economic information reflects activity of enterprises and organizations by natural, cost and other indexes. It can be used during planning, accounting, control, and analysis on all levels of management. The major properties of economic information are [28]:

- validity;
- value;
- completeness;
- clearness.

Information is valid, if it does not distort the real state of affairs. Invalid information can lead to misunderstanding or to the wrong decisions. The value of information depends on what tasks it allows to solve. Information is complete if it is sufficient to understand and make the decisions. Incomplete information detains the process of decision-making and can lead to mistakes. Information becomes clear, if it is expressed in a native language of people who needs this information.

According to the sources of information it can be *external and internal*. External information is data on different aspects of economic, ecological, political, social and other spheres which surround an enterprise. It is difficult to access and expensive. The channels of getting such information are various: expert questioning, statistical researches of the state of market, study of tendencies in production and sale of commodities, press, television, etc.

Internal information is data which appeared mainly in accounting of an enterprise. A character and amount of information is also different. Internal information is more accessible, as it is created on the enterprise. If there is the automated system of documents and accounting on an enterprise, all necessary information is saved in corporate databases, which according to the scales of an enterprise and set system of automation, can be both of the same type (dBase, Access, Paradox and dr.), and made from a few types of databases.

Economic information allows carrying out the great number of operations, which are combined into information procedures (processes) according to the homogeneity and objective functions. All procedures can be grouped into the following stages (fig. 1.1).

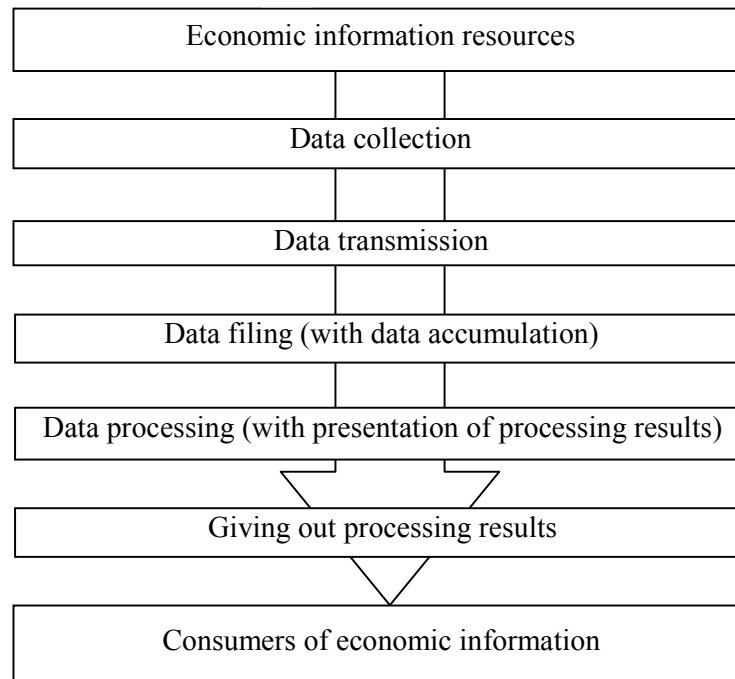


Fig. 1.1. **Stages of economic information processing**

Economic information is characterized by:

- large volumes;
- multiple repetitions of cycles of its receipt and processing in the definite periods of time (month, quarter, year and etc.);
- variety of sources and users;
- essential part of logical operations during processing.

These properties of economic information determine a necessity and financial viability of use of computing engineering facilities during gathering, accumulation, transmission and processing.

Information systems and technologies

System is «...a great number of elements being in the relationships and communications with each other, which forms definite integrity, unity»¹. One of the types of systems is *the information system* (the organized set of elements) that collects, processes, passes, stores and gives data.

Information system includes people, equipment, processes, procedures, data and operations. For example, in the USA all writing and electronic forms of distribution of information, data processing and exchange by ideas are considered to be the information systems². All forms of writing intercourse within an enterprise (lectures, reports, bulletins and

¹ БСЭ, т.23. – М.: Советская энциклопедия, 1976. – С. 463.

² *Современный бизнес*, 1995, с. 238

duty messages) and all electronic information facilities (e-mail, conference calls and video conferences, Internet and Intranet) can be included into them.

Often the information system is understood rather narrowly – as the aggregate of hardware which is intended for accumulation, storage, processing and information transfer, is. Sometimes the definition of the information system also includes the spheres of activity in which this system is used. Anyway, in essence, attention is concentrated on hardware only.

Definition of the information system should not be reduced to the use of facilities of the computing engineering. It requires much deeper understanding. The term «system» in this case should be used in two meanings:

a) as a definite method the essence of which lies in rational uniting of all the elements in time and space so that each of them contribute to success of activity of a whole object. To such interpretation, understanding of co-ordination and synchronizations of actions of managerial staff are related;

b) as an object which has a rather complex inner structure.

The information system includes the following components:

- structure of the system – the set of elements of the system and links between them (for example, organizational and production structure of an enterprise);
- functions of every element of the system (for example, administrative functions – taking decisions in certain structural subdivisions of an enterprise);
- input and output of every element and system on the whole (for example, material or information streams which enter the system or which the system enters itself);
- purpose and limitations of the system and its separate elements (for example, profit maximization; financial limitations).

When computers are used a computer information system of enterprise (CIS) processes the economic information at the entity. It is a set of data, methods, and models, technical, program, and technological facilities and decisions, and specialists that perform processing of information and make administrative decisions within the framework of an enterprise. CIS is an equally important part of production infrastructure as technological equipment, resources and personnel.

Information systems have functional and providing parts [105, p.27].

The *functional* part of CIS is essentially the model of the system of management of the entity. Since a complex system is always multifunctional, the information system can be classified on different criteria: the level of management (top, middle, operative); the type of the managed resource (basic means, labour, material, financial and information resources); range of application (banking information systems, statistical, tax, accounting, stock market, insurance systems, etc.); functions and stages of management.

Providing part of CIS includes technical, information, technological, mathematical, organizational, legal, ergonomics and other types of providing.

Computer information systems play an important role at modern enterprises. Information systems directly influence planning and taking managerial decisions, production nomenclature and technology, and sales of goods and services.

Analysis of computer information systems is related to a number of problems of technical, sociological and economic disciplines (fig. 1.2).

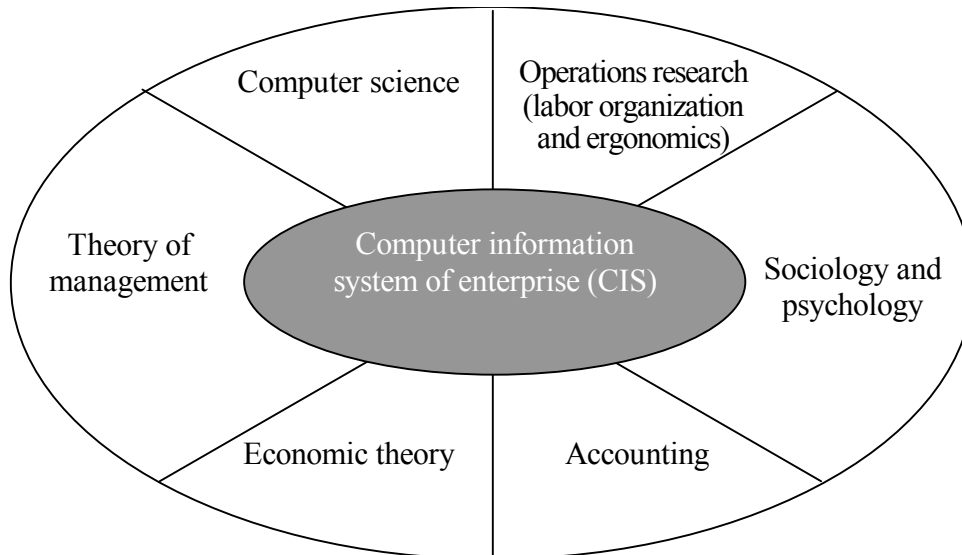


Fig. 1.2. Scientific disciplines on which construction of the computer information systems of enterprises is based

Information systems use information technologies. In its wide sense, technology is a science about production of material goods that has three aspects: information, instrumental and social [113, p. 6]. Information aspect concerns description of principles and methods of production, instrumental one deals with instruments of work used for production, social aspect concerns personnel and its organization. In its narrow, industrial understanding technology is treated as a sequence of actions performed over an article of work with a view to receiving a finished good.

Any information system has a technology of transformation initial data into result information. Such technologies are called information technologies. Information technology cannot exist separately from technical and program environment. The term «information technologies» is connected with a huge number of various technologies in different computer environments and subject domains.

The definition of an information technology emerged in the last decade of the 20th century in the process of development of computer science. Computer science as a science about production of information emerged because people began to treat information as a real production resource equally with other material resources. What is more, production of information and its highest level – knowledge – has decisive influence on the modification and creation of industrial technologies.

Information technology has two constituents:

a) ability to generate an information product by a query;

б) means of delivery of this information product in convenient time and in a convenient form for a user form.

Every information technology is oriented to processing of information of a certain kind: data (systems of programming and algorithmic languages, database management systems – DBMS, spreadsheets); text information (word processors and hypertext systems); static graphics (graphics editors); knowledge (consulting models); dynamic graphics, animation, video, sound (set of tools for creation of multimedia appendices which include means of animation and video and sound operation). Information technologies differ in the type of information, which is processed, but they can be united to form the integrated systems, which have different technologies.

As professor V.I. Podolskiy notices, to terminologically distinguish the traditional technology of decision of economic and administrative tasks, the term *subject technology* was introduced [105, p. 25]. Subject technology is the sequence of technological stages of modification of primary information into result one in any subject domain and by contents does not depend on the use of means of the computing engineering and information technologies (fig. 1.3).

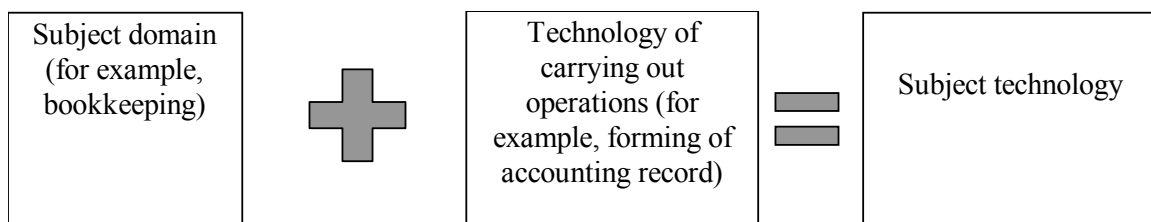


Fig.1.3. **Forming of subject technology on the example of accounting**

Subject domain and information technologies have influence on each other. The use of computer for accounting changed subject technology, having excluded from processing the far of journals and reports (registers), which are used in the traditional systems of accounting, and having given principally new operative possibilities. On the other hand, subject technologies, filling information technologies with specific content, direct them wholly to definite functions. Such technologies can have a typical or unique character depending on the degree of standardization during implementation of these functions.

Stages of development of information technologies

Professor V.I. Isakov considered that automation of processes of work naturally passes a number of stages: partial mechanization, complex mechanization, partial automation and complex or complete automation [79, p.7]. It is also true of the computers in accounting, as its facilities were created and perfected in the same way as other devices, machines and equipment intended for facilitation of human's work: if a certain need emerged, technical

facilities intended for its satisfaction appeared too. On each stage of science and production development a certain approach was used, and appropriate structural solutions and elements were offered (table 1.1).

Table 1.1.

Stages of development of information technologies on enterprises

Period	Computing facilities	Solved tasks	Type of computer-aided information technology
1	2	3	4
End of 1910s – beginning of 1940s	Printing and calculating key machines	Mechanization of some elements of managerial work	Mechanized
1940s – beginning of 1950s	Complexes of mutually complementary machines – calculating perforation complexes	Mechanization of some pieces of work in the system of management	Mechanized
End of 1950s – beginning of 1960s	Computers of the first and second generations	The use of computers for solving the most labour intensive tasks on the extra charge of wages, warehouse accounting, etc.	Partial electronic data processing
1960s – beginning of 1970s	Computers of the second and third generations	Electronic processing of the planned and current information, saving normative-reference data in computers' memory, printing machine graphs on paper carriers	Electronic system of data processing
1970s	Computers of the third generation	Complex processing of information at all levels of management, switch-over to the development of MIS (management information system) subsystems: material and technical supply, commodity turnover, control of supplies and transportations, accounting of finished products sales	Centralized automated data processing in computer centres for collective use
1980s	Computers of the fourth generation	Development of TPMIS (technological processes MIS), CAD (computer-aided designs), EMIS (enterprise MIS), tendency to decentralization of data processing,	Specialization of technological solutions on the basis of minicomputers, personal computers and access to the data arrays with

		solving of tasks in the multi-user mode, transition to without paper exploitation of the computing engineering	simultaneous universalising of methods of data processing on the basis of powerful super computers
From the beginning of 1990s – till now	Computers of the fifth generation	Complex solution of economic tasks; object-oriented approach depending on system descriptions of subject domain; wide spectrum of appendixes; network organization of information structures; user-machine interaction during exploitation of the computing engineering. Realization of the intellectual man-machine interface, systems of support of decision taking, information-reference systems	NIT (new information technology) – unification of computing engineering facilities and communication means

From user's position, every improvement was directed, foremost, at the increase of the level of mechanization and automation of technical operations which are often repeated; at the creation of new means of data input and output; at the increase of memory volume; at the development of new data carriers, etc.

It is considered that the first application of electronic calculating machines for business accounting purposes was introduction of computer system for wage calculation at a plant in Louisville in the state of Kentucky in 1954 by the American company General Electric [23, p. 4]. When such machines appeared, data processing and data search systems began to develop rapidly. In this period (beginning of 1960s) in the USA and Western Europe off-line computer systems of data processing for the management of enterprises and firms divisions were developed. However, due to insufficient reliability of equipment and complicity of programming, and their high cost only large enterprises were main owners or tenants. Small and medium firms usually bought machine time of such systems.

Creation of the next, third generation computers allowed to remove most disadvantages of the systems built on the calculating machines of preceding generations. Mass production of third-generation computers, their fast-acting, possibility of work in the modes of time allocation and remote processing, the use of high-level algorithmic languages caused spreading of these machines in many spheres of economic activity, science, health protection, etc.

Further development of technique and technology of electronic data processing and improvement of the system of their transmission led to spreading of computer networks at the beginning of 1970s. Introduction of minicomputers and built on their basis terminal devices

on small and middle enterprises also made for it. Many large companies began to unite computers located in different geographical points into large computer networks.

The production of hundred thousands cheap personal computers was the next stage. Thus not only large and middle, but also small enterprises got a possibility to create their own data processing systems and use improved scientific methods of management.

In the 80s the problem of creation of computer-integrated manufacturing (CIM) became foremost in the developed countries. The systems of this class have the following characteristics:

- the use for operations management of the full functional systems like ERP (Enterprise Resource Planning);
- application and integration of ERP-systems and Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM).

From the mid 1970th to the end 1980th years the CIS in a technological aspect developed by moving the information providing from the file systems into the sphere of different database management systems (DBMS), complication of hardware and increase of its power and the list of the decided tasks.

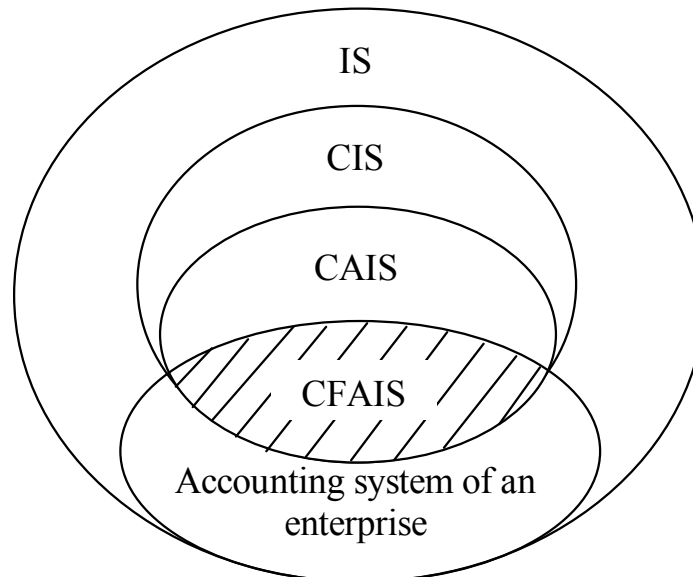
During the 90th there was a development of the systems of support of taking decisions, consulting models and intelligence systems. The process of introduction of complex decisions began to develop on the basis of local and global networks, powerful DBMS, newest technologies of planning and development of the program systems.

Information technologies developed during a long period of time and every stage of this development has its particular information processing facilities and information carriers. The modern level of information technology development is named *a new information technology*. The basic features are the developed computer technique, "friendly" software, reliable communications, and dialogic method of intercourse of a user with a computer.

A new information technology makes it possible to integrate various possibilities of information processing on one workplace, including with computations, reference-information, service. The systems built on principles of a new information technology can flexibly react on the changes in composition the functions and decided by them tasks, in the algorithms of computation, in the information necessities of users. The interactive mode of work of the system provides satisfaction of urgent information necessities of users, efficient exchange by information and reaction upon the request. A new information technology is characterized by the work of a user in the mode of efficient co-operation with data; through information support of a user on the basis of the data integrated base; without-paper process of preparation of document, when only its final version is fixed on a paper. In the conditions of new information technology collective forming, filling of documents and adaptive alteration of forms and methods of presentation of information during solving the tasks become possible.

Personnel, structure, working procedures, policy and culture are the key elements of every organization. The computer information system is also a major instrument for realization of administrative functions. The English author K. Laundon mentions in this connection that for some types of business, for example for banks, activity without the computer information system is today practically impossible [20].

Information system of enterprise, the system of accounting and their computer subsystems are closely connected (Fig. 1.4).



IS – information system of enterprise; CIS – computer information system of enterprise; CAIS – computer accounting information system; CFAIS – computer financial accounting information system

Fig. 1.4. Place of the computer information systems in the information system of enterprise

Enterprises create the economic information system, which includes connected subsystems that provide a managerial staff by necessary information. Hereby an accounting subsystem is the most essential, as it fulfils a major role in the direction of information stream about the management object's state in all subdivisions of enterprise and the interested persons out of it.

The primary objective of functioning of the computer financial accounting information system (CFAIS) as the component of CIS on an enterprise is to provide the managerial staff of the enterprise by financial information for taking grounded decisions while choosing the alternatives of the use of the limited resources.

1.2. TYPES OF COMPUTER INFORMATION SYSTEMS (CIS)

Classification of information systems

Incredible diversity of economic activities promotes the occurrence of a plenty of economic information systems that incorporate all features of management structure, circuits of decomposition of administrative tasks and subject technologies. According to the sphere of application information systems divides into: banking, insurance, taxation, stock market, industrial enterprises.

Prof. N.T. Beluha in [42, p. 14] points out that economic literature shows no agreement concerning to the classification of information systems, however this is very important for the creation of optimal information streams that support requirements of administration. Information systems can be classified by various attributes (fig. 1.5).

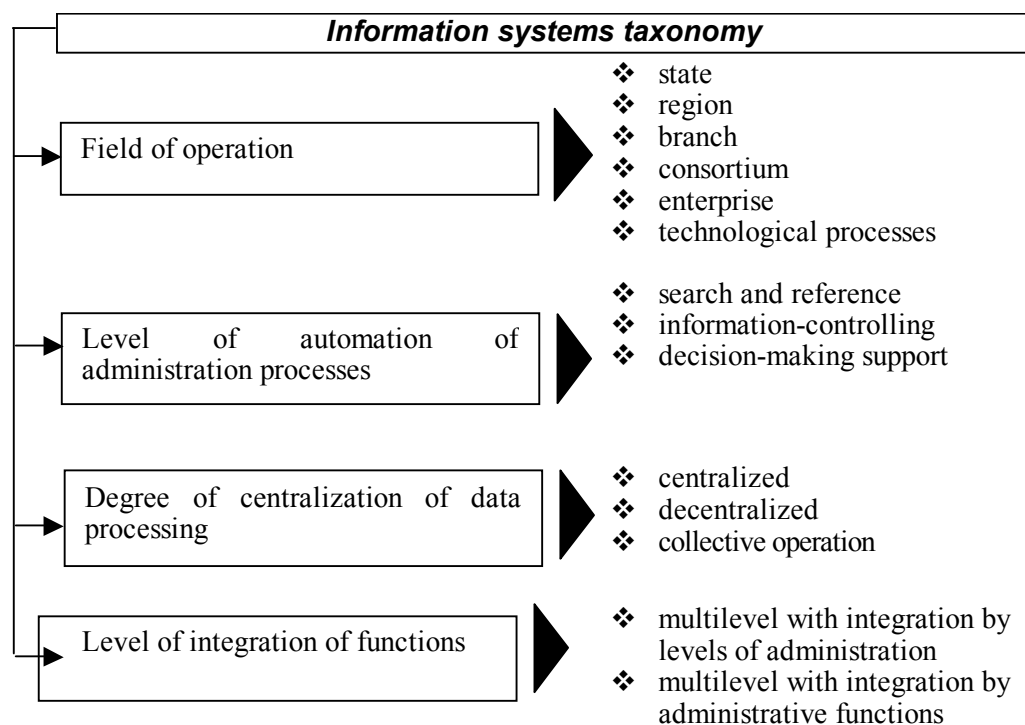


Fig. 1.5. Classification of information systems by different attributes

Product of the manufacturing management information system is processed information. Immediacy of this information is vitally important for optimisation of decisions made as well as for the control of their realization. In this connection prof. N.T. Beluha considers, that technical means of information processing are the basic criterion for information systems classification [ibid., p. 15]. The same says prof. V.S. Rozhnov. He understands management information system (MIS) as system of management "... which is disposed to wide and complex use of technical means and economic-mathematical methods for the decision of information tasks of management " [108, p. 12].

By degree of automation of economic information processing information systems can be divided on: non-mechanized (manual), half-mechanized, mechanized, automated and automatic systems [42, 108].

In *non-mechanized* systems processing of accounting and economic information is performed manually, and simple computer facilities like calculating machines and calculators are used casually for selected calculations.

In *half-mechanized* information systems processing of accounting and economic information is made with the help of computers with manual data input (key machines) that were used in machine-calculating bureaus.

In *mechanized* systems processing of accounting and economic information is performed with the help of computers with mechanized data input on machine carriers. These are perforation machines used at machine-calculating stations.

Automated information systems perform fixing, gathering and processing of accounting and economic information with the help of computers, communication facilities, and peripheral electronic equipment. In the automated systems part of management or data processing functions (subsystems) is accomplished automatically, and human makes another part.

In *automatic* information systems all functions of management and data processing are performed without participation of human (for example, automatic control of technological processes).

By sphere of application the following classes of computer information systems could be allocated:

- systems for scientific researches;
- systems of automated design;
- systems of organizational management;
- manufacturing execution system.

From the named classes we shall determine two in detail:

Information systems of organizational management are designated for automation of functions of the administrative (managerial) staff. This class incorporates systems of management of both industrial objects (enterprises), and non-industrial objects (banks, stock exchanges, insurance companies, hotels etc.) and separate offices (office systems).

Manufacturing execution systems are designed for automation of technological processes (flexible production processes, metallurgy, power engineering etc.).

Components of computer information system of the enterprise

Reviews of periodicals and Internet publications [68, 80, 89, 98, 130] allow us generate the following list of CIS components (for more details about information systems components used at enterprises, see app. A).

1. Enterprise resource management system (the following abbreviations are used: MRP (Material Requirements Planning); MRPII (Manufacturing Resource Planning); ERP (Enterprise Resource Planning).

2. Logistic management system (SCM – Supply Chain Management).

3. Products data management system at industrial enterprises (PDM – Product Development Management).

4. System of automated designing and technological preparation of manufacturing (CAD/CAM – Computer-Aided Design/ Manufacturing).

5. System of document circulation (docflow).

6. Automated information accounting system (AIS – Accounting information System). Accounting information system supports two basic business functions – registration of economic transactions and support of decision-making. This is a part of information system that concerns to valuation, analysis and forecasting of income, profit and other economic events at the whole enterprise and its particular subdivisions.

7. System of data delivery to the management for further analysis (MIS – Management Information Systems).

8. Workplace organization systems (workflow).

9. Internet/Intranet environment.

10. Systems of electronic commerce (e-commerce).

11. Specialized software products or systems for other tasks.

Any of mentioned CIS subsystems, in turn, may be rather complex and may consist of several software products and methods of management.

Practically all considered types of CIS information subsystems irrespective to sphere of their application incorporate identical set of components (fig. 1.6): functional components; components of data processing system; organizational components.

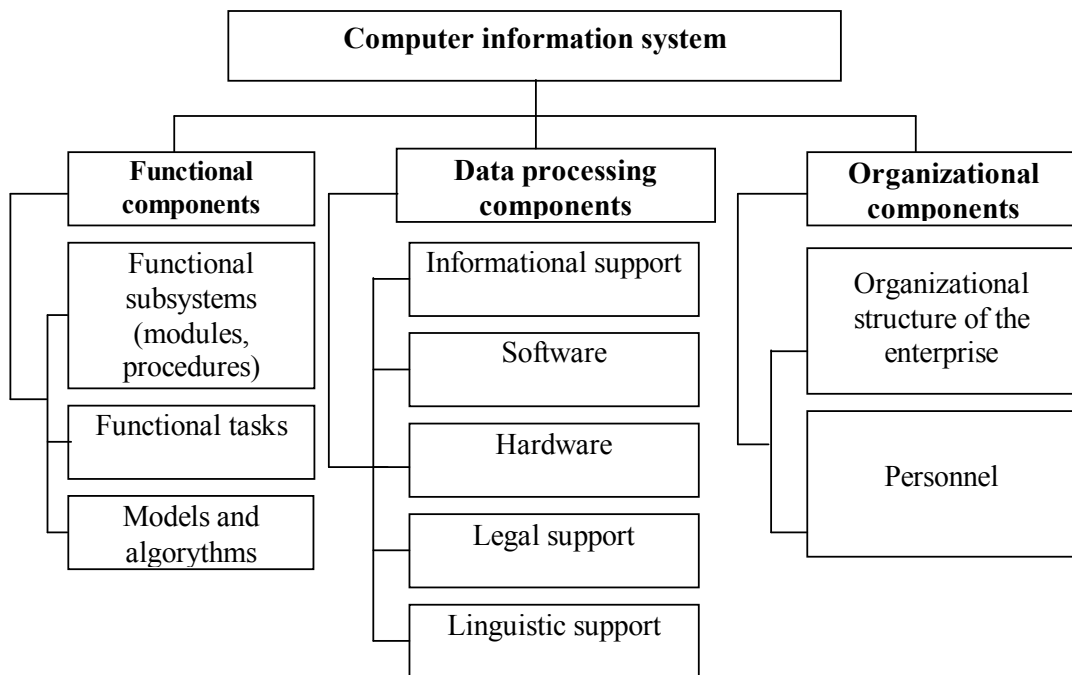


Fig. 1.6. Structure of computer information system of the enterprise

Today any complex software product cannot completely cover all the mentioned CIS subsystems. However, it is necessary to agree with D. Kazansky [80], that “corporate information system is the same part (absolutely equivalent and necessary) of an industrial infrastructure, as the production equipment (machinery), resources and the personnel.

MRP/ERP Systems

Today the most important for the Ukrainian enterprises are such CIS concepts as MRP II and ERP that actually are the world standards. They represent sets of the common rules formulated, accordingly, in the beginning of 1980s and 1990s by American Production and *Inventory Control Society* (APICS) that embraces leading American companies.

Contemporary automated systems of the organization and material support of manufacturing come from systems of material requirements planning (MRP) created at the end of 1960's – in the beginning of 1970s. They have been directed to the decision of problems, actual and today, namely: accounting and estimation of requirements for raw materials and finished commodities sales management. With the help of these systems it is possible to plan purchases or manufacturing of all components of end product and to perform valuation of stocks considering goods in process and sales forecasts.

At the end of 1980s idea of creation of uniform model of the data within the framework of the enterprise began to draw attention of the international industrial companies that looked for the way of simplifying the production management. MRP became the first step in this direction. In a measure of development of MRP systems it became clear, that for successful operation of business it is necessary to provide closer connection and coordination of all subdivisions of enterprise responsible for design, manufacturing, supply, service, sales and marketing. This stimulated occurrence of new generation of software products called *Manufacturing Resource Planning* systems – MRPII. Together with function of material requirements planning, MRPII systems possessed other functions (automated design, management of technological processes, imitating modelling, etc.). MRPII concept is a methodology of detailed planning of manufacturing at the enterprise which includes accounting, planning of manufacturing capacities load, planning of requirements for all production resources (materials, raw materials, accessories, equipment, personnel), production costs planning, modelling of production process, modelling of its accounting, planning of manufacturing output, online correcting of manufacturing schedule and production tasks. And all this is based on the unified integrated database.

MRP in its turn turned into *Enterprise Resource Planning* – ERP that sometimes is called *Enterprise-wide Resource Planning*. ERP is based on the principle of creation of uniform data warehouse (*repository*) which contains all business information accumulated within the organization while performing business operations, like financial information,

manufacturing data, HR management data or any other. It eliminates necessity of data transmission between subsystems. Besides any part of enterprise information becomes accessible simultaneously for all employees who have corresponding rights.

ERP concept became very popular in industrial manufacturing sector because resource planning allowed reduce time of production, decrease volume of stores and stocks, and also to improve a feedback with consumer together with reduction of administrative staff. ERP systems provide performance of all listed accounting and control functions, and not only for homogeneous and locally placed industrial enterprises, but also for versatile enterprises and corporations with branches and subdivisions in many different cities and the countries.

ERP systems distinct from MRPII by the following attributes:

a) universality. These systems have all necessary means for organization of integrated process of manufacturing management and planning irrespective of its size, character of production, and geographical accommodation;

b) support of various types of manufacturing. ERP systems initially include such modules: *Make To Stock – MTS*, *Make To Order – MTO*, *Assemble To Order – ATO*, *Engineer To Order – ETO*. It is necessary to note that types of manufacturing may change with growing maturity of enterprise, for example, from ETO typical for initial stages of manufacturing, to MTS typical for standardized production manufacturing stages. ERP software systems provide support transformation of types and their coexistence at one enterprise;

c) cosmopolitanism. Frequently branches and subdivisions of the enterprise are placed in several different countries that entail language barriers, and cause a necessity to consider peculiarities of legislation and currency systems of these countries. In such situation ERP system provides all conversion maintenance for the correct performance of business-transactions.

The modern management system of enterprise built in conformance with ERP concept, may include:

- *Supply Chain Management, SCM, earlier – DRP, Distribution Resource Planning;*
- *Advanced Planning and Scheduling, APS;*
- *module of Sales Force Automation, SFA;*
- *Stand Alone Configuration Engine, SCE;*
- *Finite Resource Planning, FRP;*
- *Business Intelligence, BI, Online Analytical Processing, OLAP;*
- *Electronic Commerce module, EC;*
- *Product Data Management, PDM.*

ERP system allows tracing not only manufacturing, but also other resources of the enterprise (finance, market etc.). ERP concept has wide functionality, and much attention is paid to finance and means of decision-making support. It enables planning and operating not only for production processes, but also for the whole (business) activity of the enterprise to achieve optimisation of time and resources.

Rather often all set of tasks inherent to ERP concept is realized not by one integral system, but by certain set of the software products. Basis of such set as a rule is original ERP package to which specialized products of the third firms are connected through corresponding interfaces.

In any case in ERP class system one should allocate three basic blocks:

a) formation of the basic plan grounding on client orders and forecast of demand. This is an organizational-algorithmic process that includes procedure of fast attainability check for resource schedule, so-called *Rough Capacity Planning*;

б) requirements planning which means formation of the production schedule for lots of products of own production and the schedule of materials and accessories purchase. Here completely certain calculation algorithms of order volumes and start dates of order processing are applied based of network models. At this stage is also performed calculation of resource load or balancing of the resource schedule – procedure of *Capacity Planning*;

в) operative management. Check of set and start of orders, management of production process through mechanisms of production cycles, priorities, size of orders. Meanwhile accounting operations and orders execution and stocks accounting are kept.

Systems of ERP class should include means that allow simulating of all production process with the certain variant of master schedule to foresee possible problems and bottlenecks. ERP systems should support *Just-In-Time* methods. They also should plan activity of services of sales department, supply and manufacturing as a through schedule of interdependent orders. Such systems should embrace means of budgeting, advanced system of the managerial accounting and financial planning, and also a system of accounting that works both in domestic and in western (GAAP, IAS) accounting and reporting standards, or an interface to such system.

Accounting tasks are solved in ERP systems together with production planning tasks (fig. 1.7).

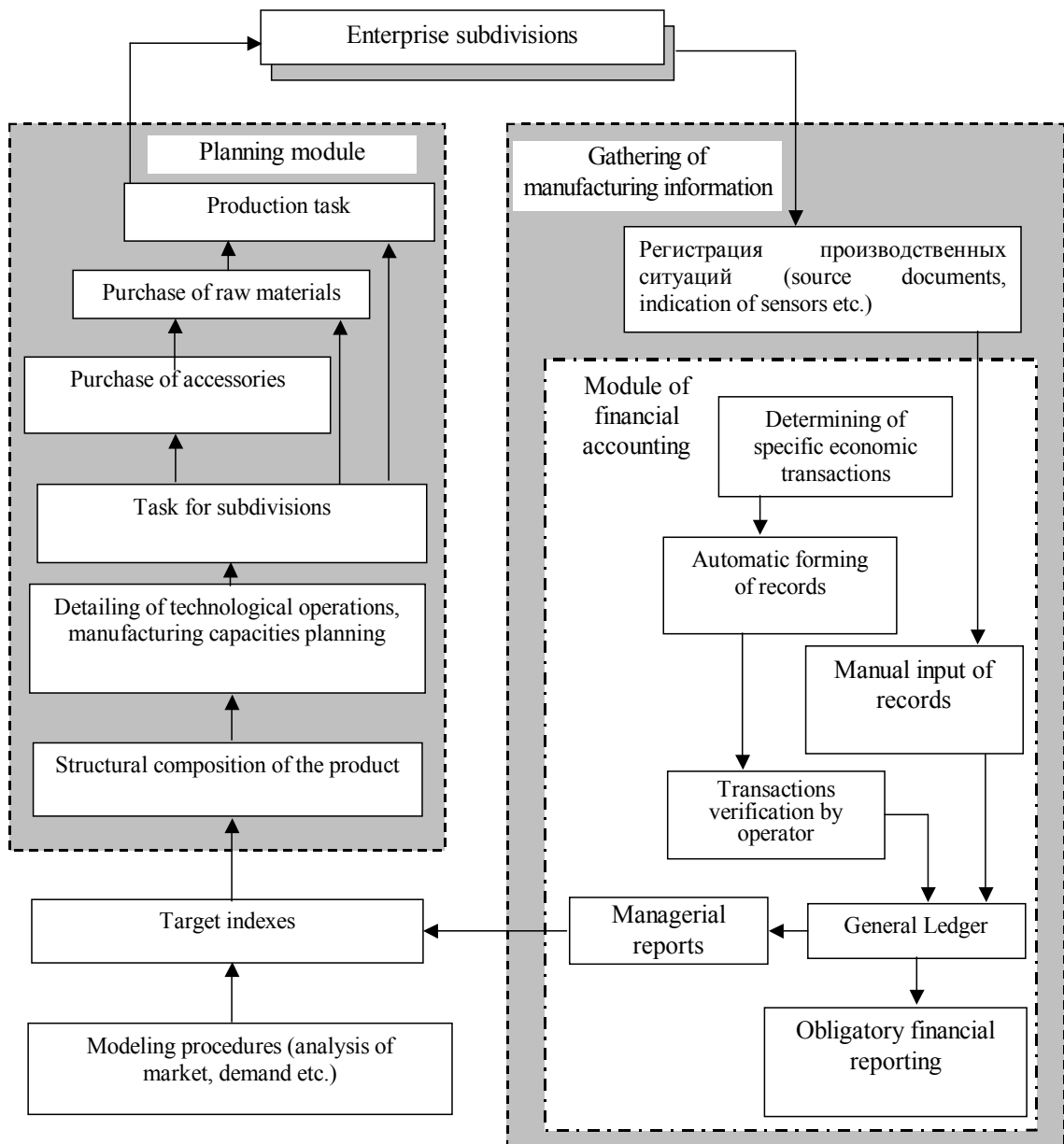


Fig. 1.7. Functions of ERP-systems

Depending on character of manufacturing for different enterprises it is rational to use different management concepts and different information systems. On fig. 1.8 five types of manufacturing according to number of types of goods manufactured, and make quantity in natural parameters are represented conventionally.

The first type includes enterprises that produce complex products by order, so this is an individual manufacturing. It is distinguished by potentially wide variety of types of produces goods, and individual product release. It is characterized by universal equipment like CNC tools, robots and flexible automated manufacturing. The personnel are highly skilled adjusters and machine operators of wide specialization.

The second, third and fourth types include different variants of a batch production: small-lot, medium-size and large-lot. The larger is the lot, the less universal is equipment and

the narrower is specialization of staff. Less number of types of goods manufacturing, bigger make quantity.

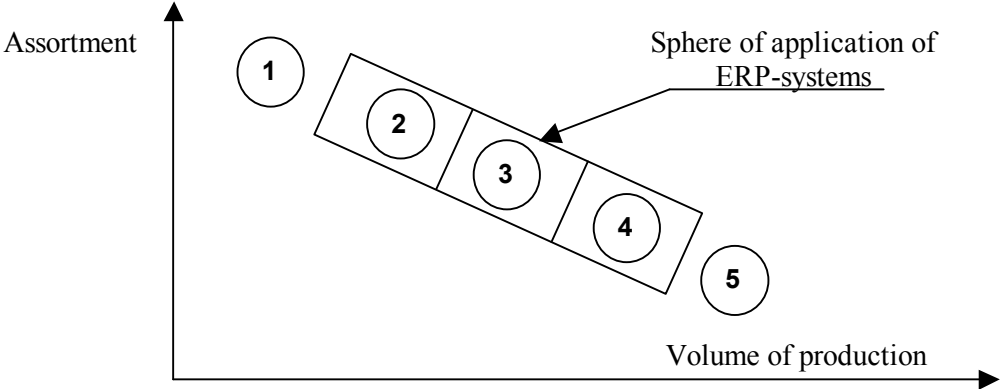


Fig. 1.8. Types of manufactures according to volume of output and assortment [98]

The fifth type includes mass production. There are specialized equipment, conveyors, product lines, and technological complexes. The least number of types of goods manufacturing and the biggest make quantity.

Each type of manufacturing corresponds with the methods of management. For the enterprises of the first type it means various network models: PERT³ and critical way methods, and ERP standards of management that contain methods of network calculations. Today computer facilities allow to apply more flexible and complicated algorithms of manufacturing planning. It results in appearing of software products that realize flexible management of production schedules and tasks – APS (*Advanced Planning and Scheduling*). With their help process of material requirements calculation takes few minutes, and the task is successfully accomplished in conditions of limited capacities.

Enterprises of the second, third and fourth types are a sphere of ERP standards application. Requirements of mass production enterprises of the fifth type satisfy the systems that support JIT concept (*Just-In-Time*). ERP-systems can work there as well though for rather simple manufacturing of this type ERP are too powerful.

Influence of MRP/ERP program systems on business is very considerable. ERP usage contributes aggregation, reduction of operations number, declining of mistakes; it improves opportunities of the forecasting and planning that can lead to significant reduction of expenses and improvement of manufacturing process. Due to that advantages of resource planning systems are obvious and effective, leading manufacturers have been actively applying MRP and ERP for more than 30 years.

³ PERT – Program Evaluation and Review Technique – System of planning and management of the development; method of network planning and management.

Perspective information systems

In spite of the fact that today more and more enterprises show interest in ERP systems, during the exploitation some their features were found out in spheres of manufacturing, sales and HR management. Because of these features industrial enterprises often cannot obtain the needed data. ERP-systems are always focused exclusively on internal processes of the enterprise. ERP optimises reception of orders, production planning, purchase, manufacturing, delivery and administration that all are internal operations. However today advantages in competition achieve those enterprises that concentrate on full process of movement of consumer cost to the buyer. In those conditions ERP model seems to be insufficient.

In contrast to MRPII and ERP concepts focused on internal processes of the enterprises last years one can see the tendency of intensive development of management technologies directed on improvement of interaction with subjects outside enterprise and its industrial chain, in other words with customers, suppliers, partners etc. Goal of such “coming out” of enterprise is to organize management of full cycle of goods manufacturing, from design considering customer requirements to guarantee and after-sale service. The mentioned technologies today are: MES (Manufacturing Execution System), CSRP (Customer Synchronized Resource Planning), SCM (Supply Chain Management), CRM (Customer Relationship Management).

Usually data of MES systems contain information about movement of work pieces on conveyor or raw material consumption for a real time interval, and also the information for quality assurance and maintenance. With the help of bar codes or other means of automation of manufacturing management enterprises in developed countries avoid practice, when operator must stop system manually to make records. Correctly used data of MES systems allow managers to significantly simplify the process of comparing parameters of work of different shifts and supervising amount of accessories, manufactured goods, waste and spoilt goods.

The main task of ERP systems is to reduce enterprise expenses on service of economic transactions, – performance of orders, accounting and purchasing. Data that could lead, for instance, to reduction of production cycle time or revealing problems on conveyor line, frequently remain beyond capabilities of ERP systems. On the other hand, data from conveyor and are a part of MES-system, help to supervise such kinds of activity as use of the industrial equipment, raw materials, accessories, and management of the manufacturing personnel as well.

Manufacturers should integrate a buyer into the process of planning of enterprise activity as well. Integration of buyer into key business processes requires a new model of enterprise activity management – planning of resources synchronized with buyer – CSRP (Customer Synchronized Resource Planning). The essence of CSRP technology is that at planning and operation of business take into account not only industrial and material resources, but also what usually consider as auxiliary or superimposed (that is such which use

during marketing, works with the client, after-sale service etc.). There is a transition from the planning of manufacturing to the planning of customer requirements satisfaction. Realization of this technology allows manage the execution of clients' orders and the work of all enterprise much better. There is an opportunity of hourly change a production schedule, what is practically impossible in ERP systems (though it often happens on actual small and medium manufacturing enterprises). It becomes possible to perform a detailed cost analysis of the order and even of specific article at stage of its registration.

ERP development logically led to systems of logistic management – SCM (Supply Chain Management). There appeared a concept of supply chain integration that united buyers and suppliers within uniform data processing framework. SCM provides management with the expanded industrial chain, that is not only internal resources of the enterprise, but also with the most important external ones (for example, accounting of customers and suppliers payments). In SCM the latest technology of management described in CSRP standard is realized which supposes that in the system could be facilities that manage external concerning enterprise elements of a production cycle. SCM technology suggests transition from delivery management to management of logistic supply chains that cover all business infrastructures like distributors, dealers, manufacturers, suppliers etc. In other words, in the analysis of financial and economic activities take into account all cycle in which the goods from raw material turn to a finished article and then through a network of sales gets to the end user. And in contrast to CSRP that makes accent on internal peculiarities of manufacturing, SCM is focused on external logistics and processes external concerning manufacturing.

Orders management problem promotes the development of systems of interaction with the customer (Customer relationship management – CRM). CRM is a technology of management of ties and interaction with enterprise clients based on forecasting of contracts, their accounting, support of after-sale services, support of ordering and selling processes.

Today modules that implement CSRP, SCM and CRM technologies are the integral part of leading ERP-systems. They can also be designed as separate CSRP, SCM or CRM systems.

Another modern tendency is to integrate ERP systems with Internet up to providing Web-based interface to ERP system. In particular, such functions are implemented in new versions of *R11* by Oracle Applications, *OneWorld* by J.D. Edwards, and also in *SAS System* software products (SAS Institute, USA). Integration of ERP systems with other external systems ("client - bank", electronic docflow, computer-aided design, management of technological processes etc.) is also rather common.

1.3. INFORMATION SECURITY IN CIS

Essence of the problem of data protection and safety in CIS consists in providing of the whole complex of organizational, technical, and regime measures and working with personnel directed on keeping commercial secret and proper control of work of enterprise employees (fig. 1.9)

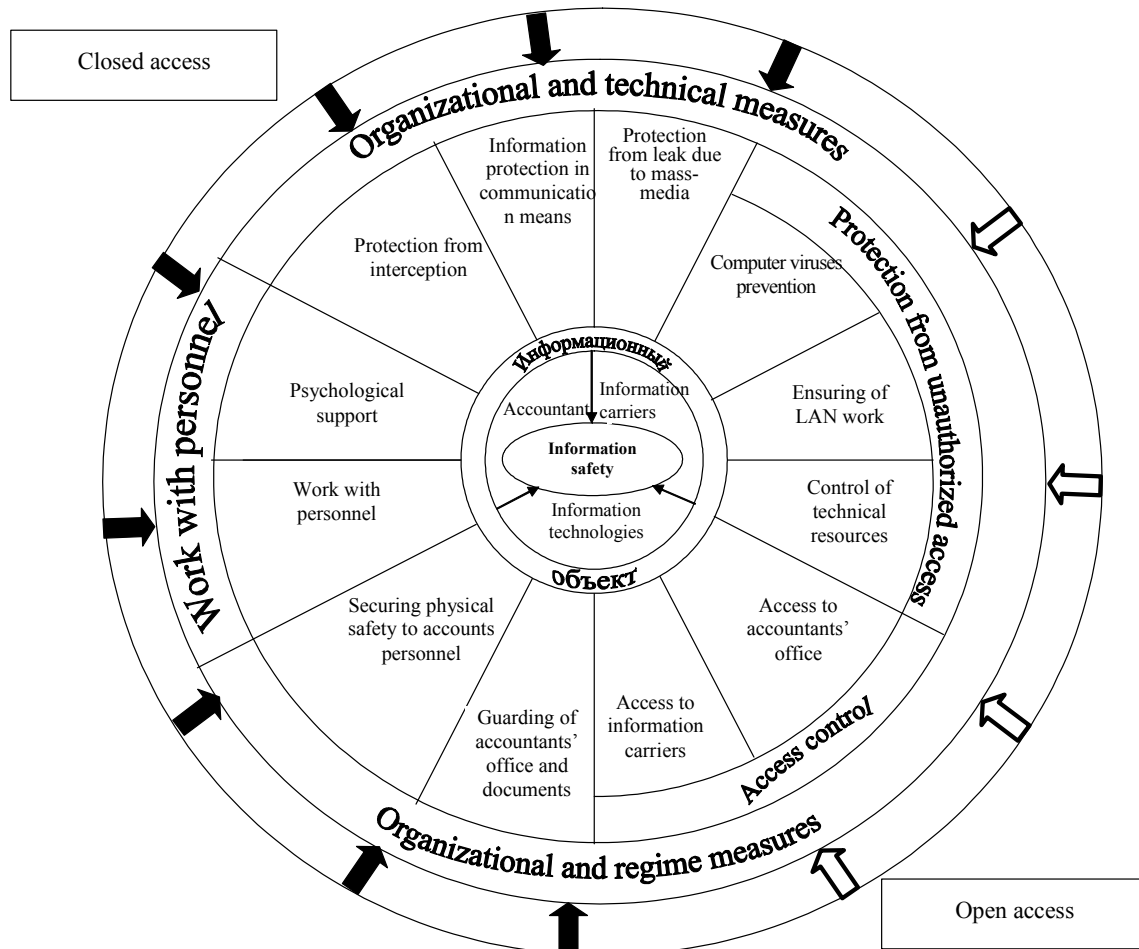


Fig. 1.9. Order of providing of information safety in accounting

The specifics of computer facilities utilization require special methods of providing of data security in CIS.

Whereas before CIS introduction all information about the work of an enterprises was «scattered» in separate documents, folders, etc., with beginning of the use of computer information systems all information has become concentrated in one place — in a database server (i.e. on the hard disk of a computer). As all workers know this place, information becomes accessible to an indefinite range of persons. Therefore outsiders' access to information, which is a commercial secret of enterprises, should be limited by the special internal regulations (orders, instructions), and the mechanism of control of report information that goes out an enterprise should be set. For example, in the published information on the financial report, there should be no superfluous details, those not required by the legislation or

agreement with the users of the report. It is necessary also to conduct thorough work with personnel, which consists, on the one hand, in ensuring of physical safety to employees, guarding of the office and documents, and providing explanations, and on the other hand, in ensuring severe supervision over personnel's actions.

Big enterprises with developed CIS must work out their own internal standards of organization of safety and protection of information. Such standards should set the requirements to the normative base, systems of distributing of access, control of integrity, cryptographic protection of information, and mechanisms of physical protection of automated system components. In addition, standards can include requirements on ensuring of continuity of protection, for example those to the order and periodicity of reviewing the rules of categorizing or information of users' privileges.

Depending on the type of a threat to CIS safety it is possible to apply different controls and protection facilities.

It is possible to avoid *unauthorized data alteration* only by protection from unauthorized access. Access to the equipment room can be prevented via determining the list of apartments where only persons with special permits can enter. Organizations, which exploit big computers, use exactly this type of data protection. Under access to data through small terminals and personal computers this method is not used and is hardly possible. That is why the danger of accounting data manipulations in such case is considerably higher than in the apartments with the limited access.

For this reason International auditing practice statement 1001 «IT Environments — Stand-alone Computers⁴» determined the restriction of access to the computers in non-working time — by door locks and other safety facilities – as one of methods of providing safety. The additional methods of providing safety can be used, for example:

- saving of a computer in a safe or a protective cover;
- the use of signalling which starts acting when a computer is disconnected or moved from its place;
- attaching of a computer to the table;
- locking mechanism for the control of access to the pushbutton. These measures do not prevent computer theft but increase the efficiency of unauthorized access control.

It is necessary to limit access to the computer of both persons not directly connected with work and programs which are not related to the implementation of the put tasks, in particular playing programs which can bring programs-destroyers (so-called computer viruses) in a computer. It is possible to lock the computer with a key, which will allow to lower the probability of unauthorized access. It is necessary to check all the programs that are loaded in a computer for presence of computer viruses by special anti-virus programs.

⁴ Here and further: Handbook Of International Auditing, Assurance, And Ethics Pronouncements 2004 Edition // www.ifac.org.

Data must also be protected from *unauthorized use*. In the record-keeping of organization data which are related to different legal entities and natural persons are partially saved, for example those related to employees, suppliers, clients, creditors and debtors. These data should be saved and processed only under certain conditions and must be inaccessible for unauthorized persons.

To prevent the *disclosure of such information* it is necessary to take measures that would increase workers' responsibility for the disclosure. Foremost, accounting information (except for the financial reporting) should be characterized as a commercial secret of enterprises. For this purpose, an enterprises must:

- legally secure for itself a right to the commercial secret, i.e. fix such right in enterprises regulations;
- determine scope and composition of information which is a commercial secret;
- organize its protection.

It is necessary to fix who determines the order of commercial secret protection, and secure a right for the enterprise's chief to require from the employees admitted to commercial information keeping the set order and rules of its saving.

A big problem is data security in the case of accidental or intentional damage of hardware or electronic storage media. The solution of this problem consists in creation of several back-up copies whose time of storage depends on the term during which the data array will be corrected. Such method of storage of back-up copies of arrays is called «storage of information in generations». Three generations of an array are usually kept (in the case of appearance of the fourth copy the first copy is destroyed). They are kept during long time and are used as references for audit conducting or information updating.

Except for application of protection facilities built into software (passwords, data encoding etc.), organizational and administrative measures should be taken. Security service of an enterprise is obliged to ensure that accounting office interception, presence of eavesdropping devices in computers, computer networks, telephones, copying technique, etc. are impossible.

Accounting information contains almost everything about enterprise activity; therefore it often is an object of competitors' attention. For this reason accounting information must be the primary object of protection. However, market offered accounting software are in different positions relative to data protection. So, in *Solo dlya byhgaltera s computerom* and *Finansy bez problem* there is no system of access control at all. In *Parus, IS:Buhgalteria* such system consists in a password for the logging on the system. *IS:Buhgalteria* gives a possibility to organize access to certain accounts areas — cash desk, wage computation, stock accounts, etc. — to certain persons who have their passwords.

This allows not only protecting an enterprise from unauthorized outflow of commercial information, but also protecting it from the fraudulent actions of personnel, which is directly

connected with the work of accounts department. However, database files in this case often are unprotected and can be stolen by a person with minimum computer skills.

1.4. APPLICATION OF NETWORK TECHNOLOGIES AT ENTERPRISES

Computer networks on enterprises

One of the technical facilities, which have an essential influence on the organization of computer accounting, is computer networks. Computer network is a set of program, technical and communication facilities which provide effective allocation of computational resources (tab. 1.2.).

Table 1.2.

Classification of network technologies

Specialization	Method of organization	Method of communication	Computers	Territory scope
Universal Specialized	Peer (one-level) Two-level	Cable Wireless Satellite	One type Different types	Local networks (Local Area Networks, LAN) Global networks (Wide Area Networks, WAN)

On small, compactly located enterprises local area networks (LAN) are used most frequently. They provide integration of a certain number of computers located up to 2 km from each other and are placed directly where accounting and economic information appears and later is gathered, processed and used, and where wide area networks arise. The moment when a local area network grows into a wide area network is not defined exactly. However, it is considered that, as a rule, a wide area network is created by external telephone flow lines or satellite channels, optical fibre lines.

Computers can be united in a network physically with the use of⁵:

- flow lines;
- network adapters;
- repeater;
- hub.

Logical communication is provided by:

- switch;
- router;

⁵ Компьютерные сети. // <http://mail.spb.fio.ru/internet/lect1.htm>

- gateway.

Their use allows to transmit information directly from one computer to another, to enjoy an advantage of client-server technology, to use e-mail and be connected to the Internet, which gives access to a great deal of various information.

The use of computer networks considerably increases efficiency of work of all categories of workers who use computers, including accountants.

Alternative to the use of the personal computers in the CIS development is the use of «network computers» — NC, opposite to the PC — *personal computer*). The idea of a network computer is very simple: a maximally cheap, having no hard disk computer terminal connected to the Internet or to LAN [122]. As a result, a user can have access to the Internet. But NC possibilities are not limited by viewing Web-sites and e-mail exchange. In theory, a user can load and start any program on the terminal with LAN or the Internet. Advantages and disadvantages of network computers in comparison with personal ones are shown in table 1.3.

Table 1.3.

Comparative description of personal and network computers

Parameters	Personal computer (PC)	Network computer (NC)
1. Price	From \$330	From \$170
2. Expenditures on administration (setting of the programs and their setup)	Considerable expenditures on administration (about \$300 per year in Russia or Ukraine)	Does not require administration
3. Work in networks	Possibility to work both in autonomous regime and in networks	Requires presence of local network and use of servers
4. Possibility of upgrade	Possibility of upgrade exists	The limited possibilities of upgrade

The low price is the basic NC advantage. Due to the fact that a user buys the computer of the limited configuration — without a store on hard magnetic drives, without disk drives, additional sockets for connecting of the associated units, this computer (WebStation computer) costs about \$170, which is average twice cheaper than a good personal computer. Besides, no less than \$300 per year⁶ is spent on support of capacity of the personal computer, plus charges on administration of network and software work. Concept of the «network computing» is built on the decrease in the total cost of computer ownership due to virtualisation of business functions during the use of new technologies and software product. Although the idea of a network computer is not new, it did not become very popular because of the lack of attention to such a computer from leading world producers during 1990s. The

⁶ In 2003 in Russia

long pause was interrupted only in 2003-2004 with the *WebStation* (Lindows) issue, *blade-PC* (Hewlett-Packard, ClearCube). They can help companies to save money due to the centralized management of desktop PCs.

Network technologies in the organization of accounting work

Network technologies are used in many ways in accounting. For example, today one of the most widespread facilities of information gathering is the Internet search. It is possible to look through the information about technical descriptions of commodities on producers' Websites, compare prices of goods and services of different suppliers, get reference information about addresses, telephones, time-tables, etc. This is useful for purchase and sales departments but can be also useful for accounting, for example, during the search of normative documents or for communication with colleagues. According to data of American company Sage and Accountancy Age weekly, most American accountants spend not less than half of the working day at the computer, 80 % from them use accounting software and 69 % have an access to Internet. The Internet use varies from e-mail (82 %) and search for professional information (44 %) to granting reports about their activity (15 %) and conducting marketing research (16 %) [48].

Integration of accounting data by traditional means of communication (mail, couriers, teletype, telephone) is ineffective and expensive. Internet and, in particular, e-mail are alternative means. The advantages of e-mail are secrecy, low cost and high functionality, and also decrease in time for preparation of letters, high speed of delivery, possibility to attach files to letters and send one letter to many users simultaneously, speeding up of contacts, paperless office work. Another effective mean of communication is electronic bulletin boards, which can be created both by e-mail and on the base of Web units.

In accounting organization information and legal provision of accounting is also very important (with the help of the Internet it is possible to obtain any information about the issuing of new normative acts, about the advanced methods of work of hardware, etc). Everyone who uses the Internet gets necessary information only from there and stops using ordinary reference books and bulletins — in Internet it is possible to get practically instantaneous access to millions of data banks, photographic, audio and video information. And most important is that through Internet it is possible to contact government and scientific organizations, educational institutions and business corporations — from international corporations to individually working specialists in the whole world.

Intranet networks allow organizing co-operation of workers within an enterprise more effectively. An Intranet network is the Internet within one enterprise. The Intranet networks got wide popularity when enterprises learned that they could create their own separate networks that are based on Internet technologies and standards. Using such opened technologies an enterprise can almost immediately give the information to the employees no matter where (territorially) these workers are at that moment, and this method of information

transfer is the cheapest possible. As in this case a network belongs to one firm or separate subdivision and is under their control, its work, unlike Internet's, is strongly regulated. Thanks to this the safety of data is guaranteed. All computers within one Intranet are known, and every user has strictly defined rights for access.

The publication of documents in Intranet is the most efficient and quick method among all means of electronic co-operation. Every worker that has a properly set up workstation can read the documents prepared in a certain format and placed on the Intranet server. On having created an Intranet, an enterprise can change contents of published documents with very small additional expenditures. If there is no Intranet on an enterprise and there is a necessity to change the contents of the sent electronic report, it is necessary to send a new report to each user. In this case there can be several versions of electronic report in every user's mailbox.

Another perspective way of using Internet technologies is the creation of so-called «teams» in subdivisions of an enterprise. In the world practice of management more and more companies use not separate people but teams (that is two or more people who work together on certain task) as «building blocks» of the organization. In the case of using Intranet/Internet technologies communication between the team members is considerably simplified.

Intranet networks are also useful in teaching of CFAIS users. The department of the information systems does not have to spend time and money on preparation and direct teaching CFAIS principles to accountants. One educational course and one complete set of documents in electronic form are enough for all users.

An enterprise can connect the Intranet with the Internet without big expenditures. Then some users (for example, workers who are on a business trip or clients) get a possibility of access to an Intranet through Internet. Such combined networks have been called Extranet. The main feature of organization of Extranet networks is that big attention is paid to providing of information confidentiality, and users authentication, as communication with persons which are out of an enterprise is provided in them. An enterprise can limit users' access to the documents allowing every interested person to look through one part of documents and permitting only a certain range of users to open another part. It is also possible to allow the users of a local network to access Internet, which would open them a great deal of information on any topic.

Extranet can also be used for construction of network accounting program systems. For CFAIS development, which is based on the computer communication form of accounting, one should use Java programming language and accepted in Internet TCP/IP protocol of data exchange. In this case accounting information saved in the single journal of transactions of the accounting program is transmitted not only from accountants' workstations which are connected to the local network of an enterprise, but also from the local area networks of separate subdivisions and even from the computers of individual workers (managers, consultants, inspectors) through Internet (fig. 1.10).

Under organization of Intranet server of the main enterprise the accountants of branches, representative offices, employees which work at a home, managers who are on a business trip or use information from accounting programs can work with a database system through the Internet. Thus, the Internet integration with the corporate office and accounting programs is an important direction of development of the information systems of the enterprise.

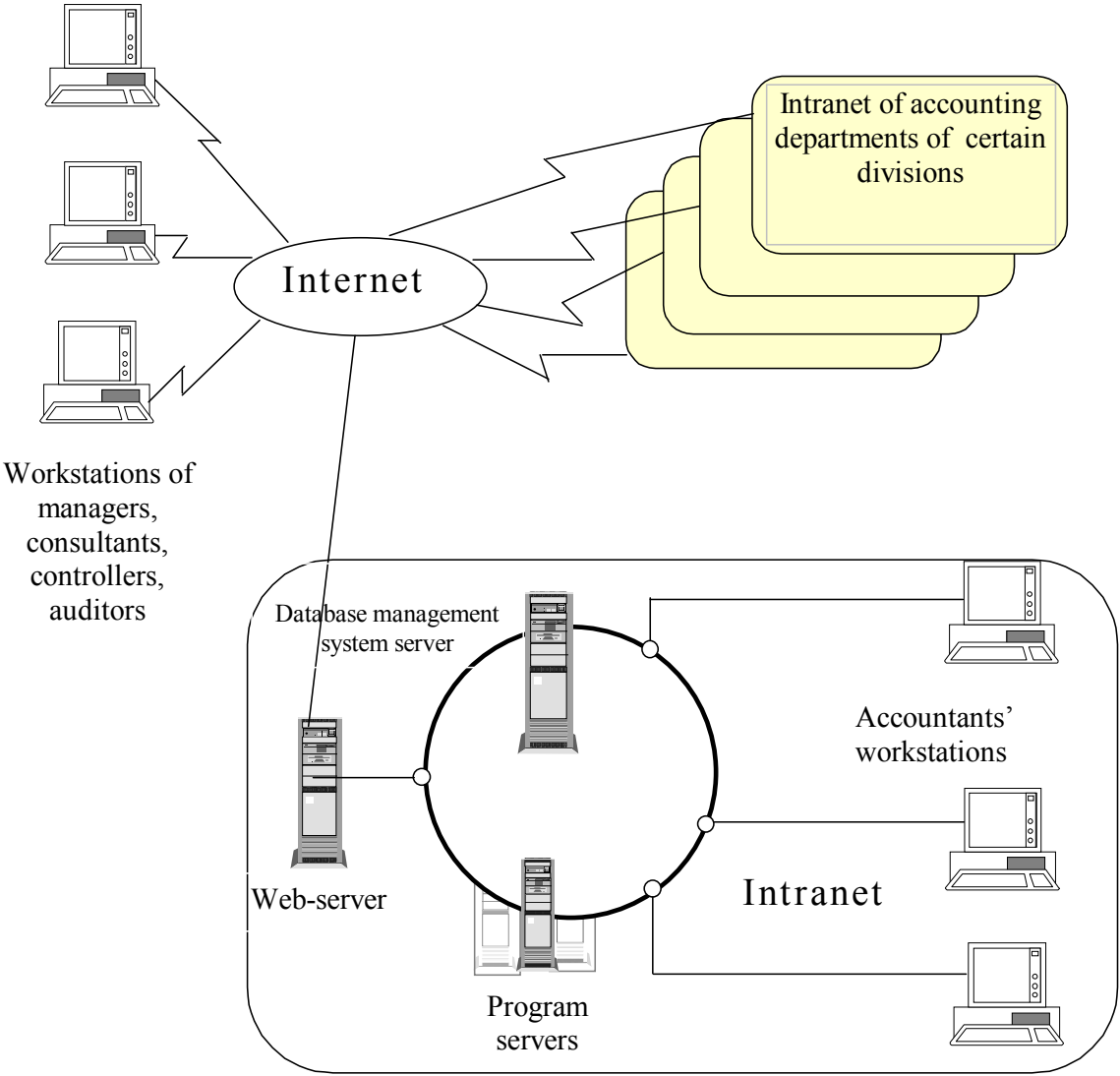


Fig. 1.10. Structure of the distributed CFAIS based on Internet technologies

The further improvement of accounting structure was promoted also by changes in facilities of workstations construction. Modern software products, such as *IS:Buхгалтерия 7.7*, allow to build accounting structure on the basis of «virtual workstations» [91]. Virtual workstation is the realization of record-keeping rules with the help of the program functions and user's rights for access to the database. Both are set up by a specialist in the course of the work without programming. To change the accounting technology it is necessary to reconstruct virtual workstations that are connected with this change or create new ones.

Virtual workstations do not require additional software. That is why expenditures on the process of information technology changing are minimal. The set of the program functions a worker needs that are realized in a virtual workstation can change. For example, if a specialist on accounting of production supplies temporally substitutes a cashier, his/her workstation readjusts to perform additional functions. An accountant gets access to all correspondences on cash account, to the cash reports together with accounts and operations on accounting of materials. Under such work organization one does not have to use simultaneously several workstation from the concrete areas of accounting. The system becomes more flexible.

Electronic commerce and accounting

Today one of the most popular forms of the use of Internet-technologies in business is the so-called *electronic commerce*. Electronic commerce is any form of conduct of business, in which contractors cooperate through electronic facilities.

Acquisition of goods and services in the system of electronic commerce takes place as follows: an enterprise sets a constantly working computer – the server with an access to Internet and the special software (creates the so-called *virtual shop*). On the screen of the computer a potential client sees the advertisement with a few options. The choice of one of them leads to the page with other information in a screen et cetera. A client has a possibility to look a commodity in three projections, to obtain additional information and do the order.

Instruments which can be used by an enterprise for realization of possibilities of electronic trade can be divided into four groups: the specialized software, Internet-shop itself, gateway in system of electronic exchange of data (fig. 1.11).

Compared with an ordinary shop the electronic one has a lot of advantages: increase of volume of sale due to creation of additional sales outlet; expansion of outlet area (today Internet is used by more than 700 million of subscribers (and according to the forecast Internet-audience will make 1 billion by the end of 2005), and most of them are outside Russia); reduction of expenditures on sale (expenditures on transporting and trade of commodities or services through an electronic shop are less than through ordinary one, sales expenses can be lowered); outdoing the competitors, as a process of information transfer about commodities or services to the potential buyers takes a few seconds only, and a salesman has a chance to be the first to sell a commodity; possibility to work in any point of earth, as Internet functions 24 hours per day, 7 days per week, 365 days per year.

As to the *computer data* all information which makes a shop (logotype of the company, information about an enterprise, catalogue of products, etc.) is created on a computer, which belongs to the salesman or organization through which a salesman is connected to Internet, and is saved in it. A computer, on which a shop is stored, is the part of Internet. That is why it is opened for any user of network who desires to visit it and look through data kept there.

As to the *movement of goods and services* and acquaintance of potential buyers (in this case these are buyers with access to Internet) with them electronic shops executes the same

functions as ordinary types of advertising. However, unlike them, an electronic shop operates constantly. It will work offering its services as much time as a salesman will plan, not limiting visitors by time of viewing.

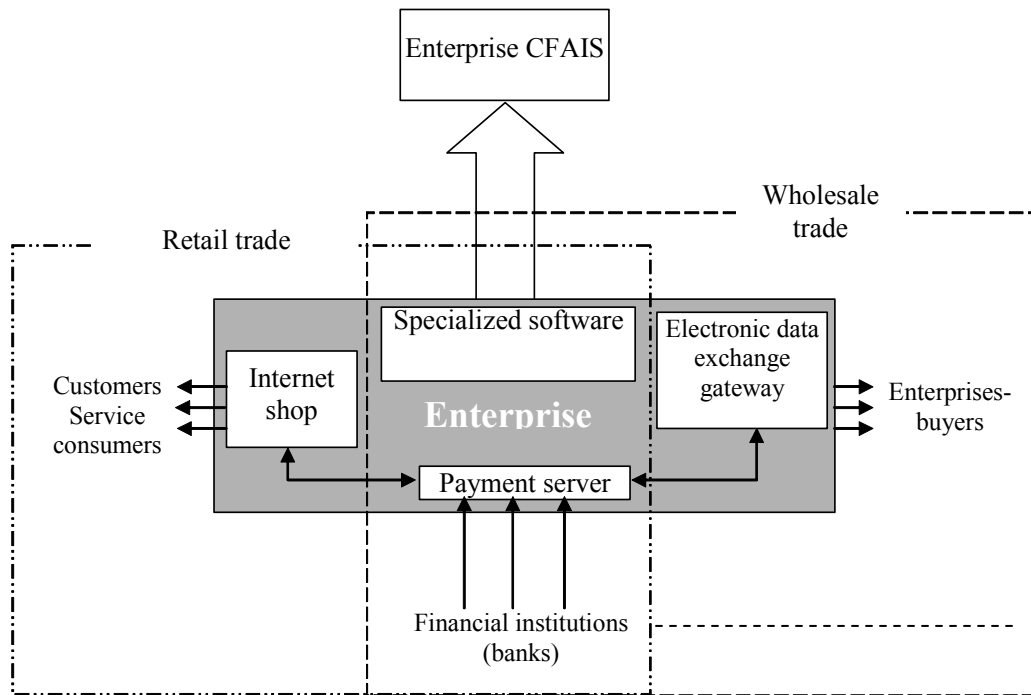


Fig. 1.11 Chart of work of the program module of electronic commerce related to CFAIS

Electronic shops also offer the interactive means of communication with a buyer on the base of multimedia-technologies, including handling of orders.

As to the *accounting*, Internet-shop software unites with the CFAIS of an enterprise by such a method, at which records are formed automatically, for example, at shipping of commodity to the buyer. In this case a client fills in forms of orders in the screen of the computer, and, thus, initiates records on realization of commodities and writing off their cost. The functions of accountant are shifted on a buyer who co-operates with an electronic shop and, mediated, with the CFAIS of the enterprise. In the conditions of electronic commerce records are carried out in real time and records are processed immediately.

Today users need more and more on-line financial information. Therefore the financial accounting got new tasks [95]:

- to check and replace registration procedures by records of electronic commerce;
- to guarantee validity of the obligatory financial reporting for electronic commerce;
- to determine the content of the information exposed in accounting made in the real-time mode to the external and internal users;
- to set terms and forms of the on-line accounting.

Because of the development of information technologies, and in particular, electronic commerce and their application in accounting it is possible to say that the professional accountants transform more and more from "accountants" to internal consultants [7].

Moreover, a role and functions of independent accountants-consultants change (public accountants). Disappearance of paper documents in the conditions of electronic commerce converts the process of traditional paper audit in the "on-line audit", which deals with electronic evidences. An auditor can also evaluate of safety and reliability of the information systems services, make auditing of websites. For example, such services include verification of plenitude of services given by electronic commerce, transparency of economic operations, protection of information services.

Questions to chapter 1

1. What is economic information? What data does belong to it?
2. Name the basic properties and characteristics of economic information.
3. Describe the stages of economic information processing.
4. Characterize the information system.
5. What components does any information system include?
6. Give the definition to the computer information system of enterprise (CIS).
7. Describe the stages of information technologies development and economic tasks which existed on each stage.
8. Analyse the links between the CFAIS and the system of accounting of enterprise.
9. What is the difference between functional and providing parts of CIS?
10. What is information technology? How is information correlated with subject technology?
11. What attributes are the information systems classified by?
12. What parts does CIS consist of at a modern enterprise?
13. What functions do ERP-systems fulfil and what components do they consist of?
14. Characterize modern information systems of enterprise.
15. What network technologies are used in computer accounting?
16. Characterize the scheme of work of enterprise, which applies tools of electronic commerce.

CHAPTER 2. ORGANIZATION OF ACCOUNTING USING COMPUTER INFORMATION SYSTEMS

After studying this chapter you will know about:

- *application of elements of method of accounting while using computer information systems;*
- *computer forms of accounting;*
- *organization of accounting apparatus work with the use of computer facilities.*

2.1. APPLICATION OF ELEMENTS OF METHOD OF ACCOUNTING IN A COMPUTER INFORMATION SYSTEM ENVIRONMENT

Electronic source documents

Document is an initial source of all registration information. Without document no economic transaction can be accepted for accounting. Documents form a base, on which all accounting work is grounded. Quality of all accounting and reporting parameters depends on quality of documents, and documenting as process of recording economic transactions in documents, is one of basic elements of a method of accounting.

Source documents are the confirmation of the performed economic transactions or the written order on the right of their performance. With application of computers in accounting documents began to be called electronic carriers of the primary data.

It is possible to allocate the following obligatory requisites of documents: title of the document; date of creation; title and the address of the enterprise where the document has been created; indication of persons who participated in economic transaction; transaction contents; units of measure and signatures of responsible persons. The character of transactions registered determines other requisites.

Considering a question of computerization of source documenting, it is necessary to say that all screens, screen forms and data submitted on a computer, can be considered as documents. First the information is fixed on a magnetic or optical disk, then it is transformed in format of the computer program and is used in the further activity.

So in computer science electronic document is a set of three components:

- physical registration of the information;
- forms of representation of the information;
- certain activity.

Certain activity transforms information into the document, but the document will vanish if further it isn't processed.

Use of computers provokes significant changes in organization of the accounting documenting. They can be reduced, first, to use of electronic carriers of the source data and, accordingly, to electronic source documents, and second, to automatic forming of source

documents. Forming, registration and recording of source documents in computerized primary accounting is presented on the figure (fig. 2.1).

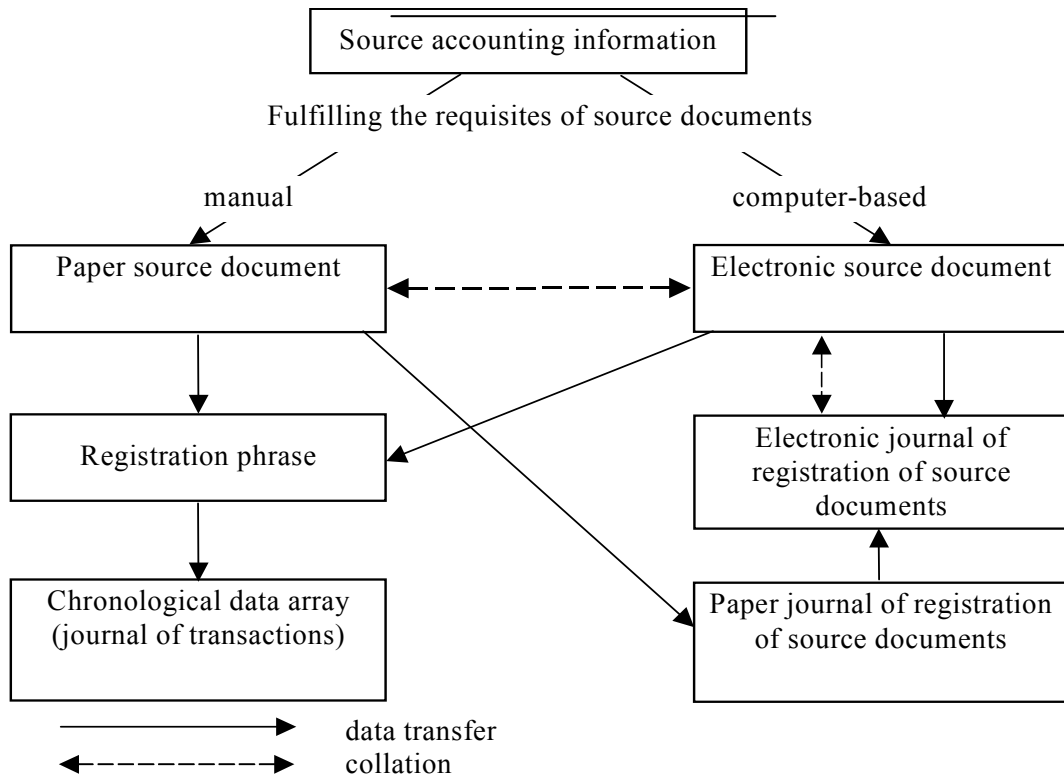


Fig. 2.1. **Operations sequence of computerized documenting**

Source document can be formed manually directly at a place of economic transaction without creating an electronic source document. Then this document is transferred to accounting department for handling. The accountant (operator) creates after this document a *registration phrase* – set of essential elements for preservation in a computer database, including record, which is added to chronological data array – journal of transactions. At the same time this document is registered manually in journal of source documents registration.

In computerized accounting source document can be formed either in accounting department, or at a workplace of accountants – in subdivisions of the enterprise – with the help of the computers connected to local and global computer networks. Documents kept on electronic storage media may have no paper duplicates. The electronic document is registered in computer journal of source documents registration, and records, created according to it, are added to electronic journal of transactions.

Basic features of technology of source documenting in computer registration systems can be the following:

a) accumulation and initial processing of the registration data are executed directly on accountants' PC workstations;

б) processing of the source information is performed according to the principle of combining processes of source document forming and its saving in CIS database;

в) automatic registration of the source information occurs with the help of technological sensors, barcode scanners, cash registers, smart-cards, electronic weighing devices, timers, counters, measuring containers, etc. Nevertheless automatic input of source data does not exempt us from the necessity of valid legal confirmation of performed economic transactions.

Models of documenting in computer financial accounting programs

Model of documenting is an important component of system of representation and interpretation models of the accounting data used in creation of computer financial accounting system (CFAIS) [46]. It determines rules of forming, storing, interpretation and processing of documents.

In contemporary software solutions four basic models of interpretation of source documents are applied (fig. 2.2).

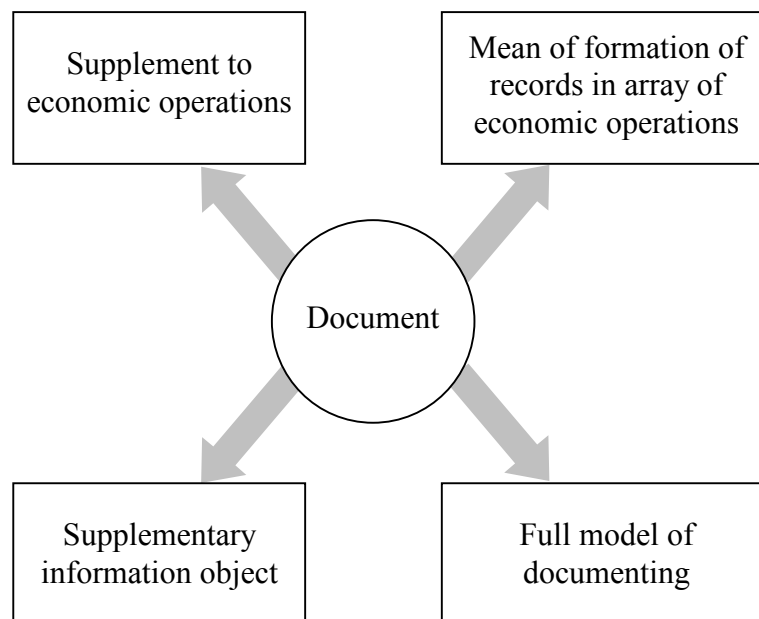


Fig. 2.2. The basic models of interpretation of source documents in computer programs of accounting

In software based on model of *documents as a supplement to economic transactions*, the basic component of database of accounting data processing system is an array of economic information (in the form of economic transactions). It is supposed, while entering the information generated without help of CFAIS and stored in paper source documents into database, that an accountant should transform it manually or with the help of the software tool into records in the array of economic transactions. In software of this type the concept of «economic information» is primary, and documents formed in system are treated as initial

forms constructed automatically or by inquiry after input of data about economic activity. Such interpretation of documents was typical mainly for the early versions of many accounting programs, widely spread today, and some elements of this approach could be found in present versions. E.g. in *Finansy bez problem* program system most documents are interpreted as mentioned; to generate the document in the program it is necessary to enter the data about economic transaction first. If this model is used documents created by the system are not registered separately in database, but are stored attached to the distinct record in economic transactions array without connection to other documents.

This interpretation of source documents in certain degree conflicts with the normal order of accounting process at which transaction is registered in accounting only after drawing up and approving of documents. At use of such model a transaction becomes a reason of formation of the document. Advantage of such approach is in simplicity of work with the data because document is formed and simultaneously registered in accounting. However in this model time lag between forming of the document and registering of the corresponding transactions is not stipulated (a document can be formed but not approved whereas program has already generated corresponding records on accounts).

In software based on model of *documents as means of formation of records in array of economic transactions*, a document in this case is only a formal basis for creation of the record. In the program there is some kind of set of forms that define structure of information input, inherent in this or that document. After the data entered according to this tagging, the program forms records in array of economic transactions corresponding with the document.

This model of document circulation cannot be considered mature enough because it considers document only as a supporting mean for input of records in array of economic transactions, and the sophisticated character of its movement is not taken into account.

The model of *interpretation of documents as supplementary information objects* is used in many systems of computer accounting. E.g. in typical configurations of *IS:Buhgalteria 7.7* software, in programs created by Parus, Intellekt-servis, Avers companies etc. technology of forming accounting records based on both types of source documents: generated internally and received from the outside is supported. In this model, as in previous, there is an ability to form accounting records not only directly but also by putting numbers of debit and credit accounts on documents entered in the system database. As distinct from previous models, in this case the moment of document registration in system database and the moment of its registration in accounting may not coincide. Documents entered without user approval and without formation of records, do not influence the accounts turnover. Documents are stored in separate registers and they can be corrected repeatedly. The accountant at any moment can see necessary document, and print selection from the register, which satisfies to the set of criteria (e.g. list of the documents connected in some way to distinct organization or physical person).

In the most of programs based on this model, there is an interrelation between entered documents and records in array of economic transactions generated on their basis. In case of

change of fields in the document the corresponding records are changed automatically or by inquiry. Obviously, the ties between documents in this case could be observed only indirectly: through possibility of forming one document on the base of another or through the mechanism of chronological relation of records in array of economic transactions, as, for example, in *BEST* program complex or in typical configurations of *IS:Buhgalteria*. It is caused by that this model distinguishes actions on document registration in a database from their transformation into records of array of economic transactions.

In the systems based on *full model of documenting*, the main thing is not the formal principle of interrelation of documents and records of an array of economic transactions, but maintenance of system of ties between documents of different types (*Galactika*, *Abacus Financial*, *Concorde XAL* software etc.).

Some popular software systems also allow construction of the sequence of documents processing on the base of full model of documenting. E.g., similar model is traditionally realized in typical configurations of *IS:Buhgalteria*. However built-in programming tools must provide complete support of inter-documentary ties.

The basic advantage of full model of documenting is that it supports interaction of electronic copies of documents. That is why systems that realize this model most consistently, can be used not only in accounting department, but also in other management services. It allows to receive from documents information about movement of cash assets, production supplies, material resources and state of payments. Basic element of such system is a document with a set of unique ties with other documents that are used in system of management. Accounting records here are secondary information. So accounts and records can be released from technological burden loaded on them in systems with dominating principle of double entry. Thus the fact of reflection or non-reflection of the document in accounting does not affect any other management subsystems so all accounting modules of the system can be used separately from other subsystems. So accounting department has an opportunity to work with documents in a convenient mode.

The full model of documenting consistently solves problems of distribution of the accounting and records management functions with the help of possibility of obtaining any aggregate information outside the accounting system. In other models of document circulation the significant part of such information is kept on accounts. However it is necessary to note, that for the small enterprises the full model of documenting can be technologically disadvantageous.

Automation of inventory procedure

Inventory has always been one of the important parts of accounting work. It allows to bring the registration data into accord with a real state of things at the enterprise.

Feature of inventory practice until now is that actual check of tangible assets is based on manual work. Performance of work on removal of the actual rests from objects of property is

labour-consuming operation because one have to check tens and hundreds of thousand of units of object elements, their quality and price, to evaluate sums of economic transactions and calculation of results in inventory sheets. Sometimes aspiration to reduce terms of inventory in conditions of manual registration and processing may result in its poor quality and delays, and, accordingly, in unrevealing facts of theft and abuse. In this concern a problem of use of computer facilities and software in inventory process appears.

While identification of inventory object elements 95% of time is spent on checking of their completeness, integrity of packing etc. Computer facilities allow to compare actual rests of goods with the accounting data with the help of information in database about registered and actual rests of the goods. During input of such information at the initial stage prices and costs are not included. These parameters are used at the final stage of inventory process – output of inventory results to reveal shortage, surplus, discrepancies, natural loss and final definition of inventory results. Thus it is necessary to use a constant database with list of goods (other values), if each nomenclature number (price-list or article number) or sort of goods has the certain accounting price.

Methods of making the inventory with the help of computer facilities are described with the following figure (fig. 2.3).

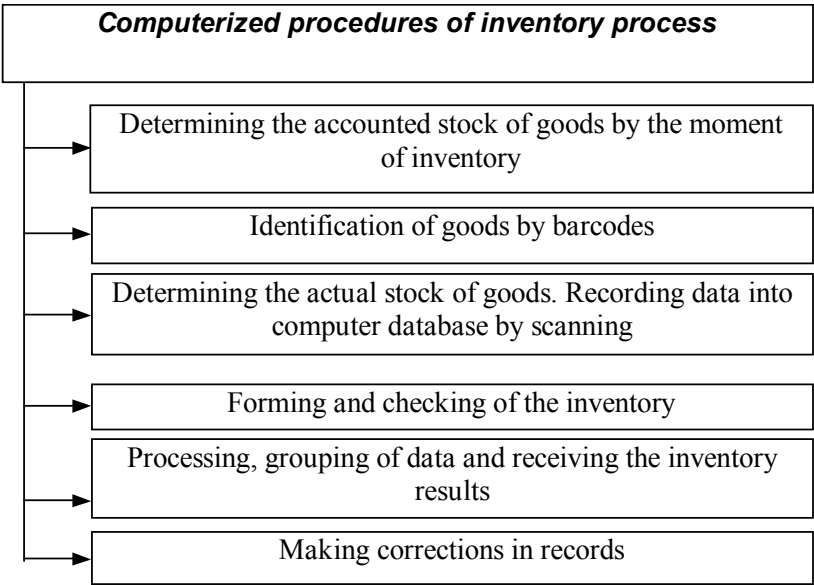


Fig. 2.3. The computerized procedures of inventory process

An opportunity to almost completely computerize the process of inventory of goods is to mark them with bar codes. Such inventory at once solves a set of problems like satisfaction of objectivity and accuracy of results, keeping within terms, reduction of work volume.

Bar code is a special system of coding of information about tangible assets as a sequence of dark and light strips read by automatic digital device.

Bar codes for the first time were applied in the USA. In 1949 Joe Woodland and Bernie Silver have received a patent for the technical device for reading a bar code on the cash

terminal. In 1973 in the USA *Universal Product Code* (UPC) appeared in industry and trade. In Western Europe for identification of consumer goods in 1977 *European Article Number* system (EAN) was implemented. There exist more than 30 kinds of bar codes, most of which have narrow sphere of application.

For commercial enterprises that use electronic systems of managements of commodities and money turnover, for application of bar coding technology it is necessary to buy bar code scanners which will automatically identify goods, and sometimes bar code printers for marking goods.

The following components are necessary for implementation of bar coding:

- hardware that carries out printing and reading of bar codes;
- software that provides effective interaction with hardware for inventory tasks, cash service etc.;
- personnel for work with hardware and software facilities.

Means for work with bar codes are chosen according to tasks of the enterprise. In small shops hand scanners are the most convenient, and in the big stores and supermarkets with common cash desk stationary table scanners are more suitable. In wholesale warehouses it is more rational to use multiplane laser scanners like in conveyor production.

Bar coding can positively affect activities of industrial or commercial enterprise: automated identification of the goods simplifies accounting, accelerates the process of client service etc. Weak point of making inventory by scanning bar codes is that the scanner cannot determine repeat scanning of the same goods.

Traditional methods of inventory such as recounting, weighing, measurement, control measurement preserve their value in conditions of computerization of accounting. They are in use because it is impossible to completely avoid mistakes in finding out actual presence of inventory holdings.

Valuation capacities of record-keeping in accounting software

Correct valuation of stocks, expenses and obligations always was one of key problems in accounting. As a rule, in each distinct case of economic transaction exist more than two variants of measurement of the sum of transaction. For example, valuation of materials by LIFO, FIFO methods etc., valuation of goods by purchasing or selling prices, etc.

In conditions of paper accounting an accountant, while forming accounting record, is compelled to choose only one variant of valuation, consciously limiting the information that could be useful for management needs. In addition an accountant usually chooses the way of measurement not most comprehensible from the point of view of economic feasibility, and the least sophisticated.

In conditions of computerized accounting there is an opportunity to reflect multiple valuations, to investigate different properties of object (if they worth being considered). Actually, modern accounting software provides unique opportunities for realization of

valuation. First of all, there is an opportunity to store for one object of analytical accounting (e.g. article of goods) several essential attributes that give versatile characteristic of the object. Such elements may be, for example, different prices of these goods (tab. 2.1).

Table 2.1.

Fragment of directory "Goods" in 1S:Buhgalteria 7.7

N	Name	Accounting price, UAH	Essential elements			
			Unit of measurement	Sale price, UAH	Term of storage, day	Type of container
1	Wheat flour, extra grade	12,00	kg	12,80	60	bags
2	Buckwheat	1,50	kg	2,00	90	packages

It is interesting, that many programs, e.g. *1S:Buhgalteria 7.7*, *Galactika*, allow to toggle dynamically values of the registration price and other price stored in elements of directory. E.g. during time of debiting goods from supplier the purchasing price is used, and during formation of the shipment waybill for the client the selling price is applied.

In practice accountants use only one method of valuation of write off of all stocks. However one method of measurement is expedient for applying only to those stocks that have identical assignment and conditions of use. Application of computer software allows using the optimal way of measurement separately for each group of stocks, without increasing complexity of accounting.

Software facilities for valuation of goods at commercial enterprises have especially important practical value. Historically the most of software of store and online accounting were created for the needs of wholesale trade. Retail trade has a number of specific features to which in the most of programs not enough attention was given. First of all, the most of trading software is designed for the accounting after costs (prices of purchase) whereas in retail trade the accounting of the goods is performed after selling prices. For retail trade are usual the operations of reassessment and discounting, changing of the selling prices at the whole enterprise, and in each shop separately, calculation of the selling price on the basis of the cost, several selling prices for different sets of the same goods (accounting of separate consignments).

Let's enumerate peculiarities of valuation of goods in the programs that effectively enough automate accounting in retail trade (e.g. *Aspect*, *BEST*, component *1S:Operativnyy uchet (Torgovlya)* of *1S:Predpriyatie* program package):

- accounting of goods is conducted in selling prices. Thus the accounting in buying prices is also possible. All internal transactions (internal movement, write-off of the goods) are performed in selling prices;

- price for the goods depends on time and may depend on a place of storage, set and other features. So, several prices can be established for one article of goods, and any of these prices is distributed to strictly certain amount of goods, not to all goods, as in wholesale trade. In wholesale trade several prices for one article of goods also can be established, but in distinct to retail trade these prices are established on all goods and it is obviously not known, what amount of goods will be sold at one price, and which at another. The program can also show a timeline of price change for the goods;
- the program provides a possibility of carrying out reassessment or discounting of all goods and of any part. At the same time corresponding documents (act of reassessment, act of write-off of the goods) are formed. There is a possibility of carrying out reassessment on the basis of debiting document, definition of the selling price on the basis of the trading margin, "backdating" reassessment.

Automation of calculation

In computerized accounting the accounting of production costs should be regulated. Primary goals of development and inculcation of normative method of accounting are increase of overall level and degree of detailed elaboration of normalization of expenses, calculation of influence of norms change on size of the actual prime cost, revealing the deviations from the norms by reasons, places of occurrence and centres of responsibility. Technically substantiated and maximum differentiated of normalization of expenses by kinds, place of formation of expenses and calculation objects, system of revealing and accounting of norms changes create a necessary and sufficient information base for management of the production cost and other corresponding quality indicators of industrial and financial activity of the enterprise. As prof. V.B. Ivashkevich considers, «... Operational facilities of computers allow without essential increase of complexity make normative, and further – planning and actual cost sheets for the whole range of manufactured goods, on each type of product or kind of use» [76, pp. 128-129]. Thus there is no need to carry out all set of calculations on each product, to perform and store in a database results of such calculations. Calculation of the cost for a type of production can be made by inquiry by selecting, classification and summing of norm costs of details and other included elements.

In conditions of automation of norms calculation and grouping a possibility appears for transition from forming the normative calculations for the beginning of month, quarter and year to their forming for any date of the current month. It becomes possible to refuse monthly recalculation of the rests of work in progress because of changes of norms by the beginning of the month and to calculate more precisely the actual prime cost of production delivery.

In computerized accounting due to the expanded capabilities of analytical accounting it becomes possible to make multilevel sections of articles of expenses for the needs of management, and also to keep accounting of expenses by centres of responsibility. Let's assume, it is necessary to detail expenses by workshops, kinds of production and kinds of

expenses. Multilevel analytics with one section in this case will not help: summing up e.g. by workshops, we shall not be able to obtain results by kinds of production. In contemporary computer systems, e.g. in *IS:Buhgalteria 7.7, Galactika*, this task can be solved as follows:

- for each industrial division a separate subaccount is created;
- types of expenses are set by separate list of "expenses" analytical articles;
- for detailed elaboration by kinds of production the "nomenclature" directory is used.

Such sequence of accounting allows to receive the information: about expenses of the certain kind of resources for unit of an article of goods in distinct division; about expenses by kinds and groups of production; about expenses by divisions; about expenses by kinds of or groups of expenses (in this case different levels of the analytical accounting are used).

Means of organization of the analytical accounting are supplemented with flexible means of formation of transactions that allow, for example, distributing manufacturing overhead costs proportionally to wages in the main manufacturing.

Usage of synthetic and analytical accounts in computer programs

Information model of assets circulation of economic object – an enterprise is based on the system of accounts that are classification attributes of accounting objects. An accounting dynamic information model of the enterprise is represented as a set of accounts, their correspondence and detailing of the data in systems of analytical accounting. This model defines general structure of the registration information while degree of information detailing depends on character of relations in the information database in the form of accounting.

Basic features in work with accounts in computer programs are the following: expansion of capabilities of analytical accounting and simultaneous keeping the accounting in several charts of accounts.

In contemporary accounting programs 3 to 5 sections of analytical accounting for each synthetic account are allowable. It enables to organize keeping the analytical accounting in full conformity with requirements to authorized chart of accounts and to receive all necessary reporting with the necessary level of detail, however it does not deny the development of analytical accounting by deep hierarchical principle. In this case software developers also as a whole follow the concept that implies limitation of use of subaccounts and expansion of the analytical accounts nomenclature that allows keeping analytical accounting not only by organizations, but also by distinct payment documents (contracts, accounts, waybills etc.).

For example, in *Galactika 5.71* analytical accounting is kept with the help of **KAU Classifier** – a code of analytical accounting mechanism. The object of analytical accounting is characterized by name, code under which it is stored in the directory, and a code of the analytical accounting under which this object is brought in the qualifier. Updating of directories leads to automatic creation of new objects of analytical accounting. In *Galactika* three levels of analytical accounting are stipulated, and any aggregation of elements (accounting objects) for all levels is supposed.

In *IS:Buhgalteria 7.7* it is also possible to attach to one account some kinds of subconto – lists of analytical accounts (the maximum quantity of possible sections of analytical accounting is set in the **Configurator** mode for the creation of chart of accounts). Subordination of directories of analytical accounting and different charts of accounts is organized as follows (fig. 2.4).

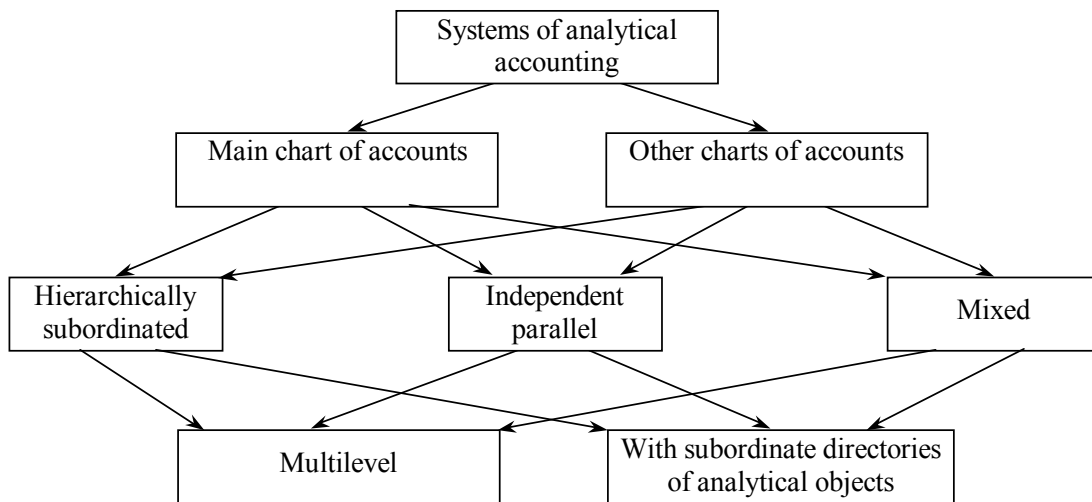


Fig. 2.4. Relations of analytical accounting directories in IS:Buhgalteria 7.7

Mechanisms of realization of analytical accounting differ in different programs. For example, developers of IS have named the directory of analytical objects with the term “*subconto*”, that in translation from Italian means literally “*subaccount*”. It is necessary to note, that such terminology is incorrect from theoretical point of view because in this case analytical accounts are meant.

Many programs, e.g. *Galactika 5.71* and *IS:Buhgalteria 7.7*, allow to enter records simultaneously in several working charts of accounts. It can be useful in the following cases:

- a) two groups of records based on source document are formed simultaneously – one in the domestic chart of accounts, another – in chart of accounts of the foreign partner or the owner;
- б) managerial accounting at the enterprise is performed separately;
- в) accounting in separate divisions of the enterprise is performed separately with further consolidation.

A number, or more exactly, a code of account is a rather large set of symbols within any accounts coding framework is acceptable. In the most advanced program systems a chart of accounts may contain also the description of correspondence of each account so the program simply will not permit to carry out wrong accounting record.

Models of accounting records in accounting computer programs

A review of the basic programs available on Russian & Ukrainian market of computerization of accounting testifies that in practical accounting work at the enterprise computer are used programs which differ from each other by structure, debugging methods, interface, but are based on one model. The essence of this model is data unification and representation in system of double entry. Such model, as a rule, is sophisticated and supplemented with special accessory details necessary for reflection of specificity of transactions in different segments of accounting. Experts sometimes call it a *unified generalized model of the accounting* [97]. Prof. V.P. Zavgorodny also considers, that core of registration-economic models is a principle of double entry, which reflects economic essence of various phenomena [74]. Really, double entry is the universal mechanism, which help to adequately reflect the facts of economic life. Accounting department is the main source and the main consumer of information at the enterprise, so storing of the data in the uniform consolidated register constructed by the principle of double entry, makes sense.

However in distinct software products (*Galactika, LOK-OFFICE, Miracle*) processing and accumulation of the source documents at first are carried out by simple registration, and then accounting records are formed. In this case, if a database is designed correctly, and it enables to establish and process relations between documents and between requisites, it is possible not to form accounting records at the moment of input of the document. From technical point of view, at a big and versatile enterprise which did not stop on computerization of accounting, but have performed the complex automation of economic activities, and where all economic services directly use the data of operative (or, in other words, primary) accounting, it can utilize a significant part of IT resources. More expediently is to form consolidated records in synthetic accounting by the end of the accounting period for drawing up of the financial reporting, and to use special analytical mechanisms for needs of administration.

From this point of view accounting records in computer system are secondary information, a result of applying a set of specific inquiries to a set of source documents stored in a database. Accounts and records as basic information component of CIS accounting contour, can be deprived of unnatural technological burden, which exists in the systems of automation based on dominant of double entry principle.

In conditions of following the model of double entry it is necessary to agree with E.N. Voevodskiy, that at a computerization of accounting first of all it is necessary to formalize the description of economic fact which is an object of double entry. Each economic fact is characterized by a set of features and measures, i.e. it can be presented as $b = \{a_1, a_2, \dots, a_e, \dots, a_n\}$, where $a_1, a_2, \dots, a_e, \dots, a_n$ are attributes and measures of the economic fact [57, p. 62]. Attributes characterize the qualitative sides of the economic fact, and measures describe its quantitative side. They are written down in numbers and can be measured in natural form, cost form or as work expenses. Writing down the economic fact in computer, the user makes a

«registration phrase». The registration phrase consist of the following parts: date of economic transaction, codes of debited and credited accounts (including characteristic in analytical section), sums of distinct records, quantity (natural measures for operations with tangible assets), sum in foreign currency and an exchange rate (for operations with the foreign currency), sum of economic transaction (document), number of the source document; brief contents of economic transaction. Registration phrase may contain few records that reflect the economic fact.

In some programs algorithms of input of registration phrases are called mechanism of group transactions. In the most of accounting computer programs *economic transaction* means usual accounting record or set of records. In the *Korifey 12.4* system more advanced approach is used. There economic transaction is understood *as a macroprocedure* – any actions with the data (including actions concerning entering and authorizations of records), which structure (transaction algorithm) user can evidently describe as a logic tree [85]. The set of interdependent data, received during performing economic transaction, which describes the created or changed object, is called *an object of economic transaction*. Each object has unique number and expiration date, which defines the term of application of business-rules to this object (taxes rates, algorithms of tax calculation etc.).

Many of modern accounting software products, e.g. *IS:Buhgalteria 7.7*, have an interesting opportunity to "disable" accounting records. In this case sum of the distinct record recorded in the journal (or of all records of previous transaction) is no more considered in calculation of accounting results.

Developers of the program *Virtuoz* go further [96]. In this program records based on the documents may be formed preliminary (softly) or completely (rigidly). So the performed transactions may be preliminary or final. Each economic object accordingly has a couple of values of the parameters: preliminary and final. Preliminary forming of records changes preliminary values of parameters. Final changes both preliminary and final values. Preliminary formed records based on the document may be formed completely or rolled one step back.

The main need in preliminary forming of accounting records based on documents appears because the majority of transactions are expanded in time, but should be reflected in accounting before they finish (e.g. for administrative needs). Way of solving this problem is in preliminary forming of records based on the document and the analysis of preliminary parameters with the further final forming of records when transaction ends (typical example is a preparation of payment order, bank statement for which will be received with some delay).

Interaction record keeping and bookkeeping in this case will occur under the following sequence (fig. 2.5).

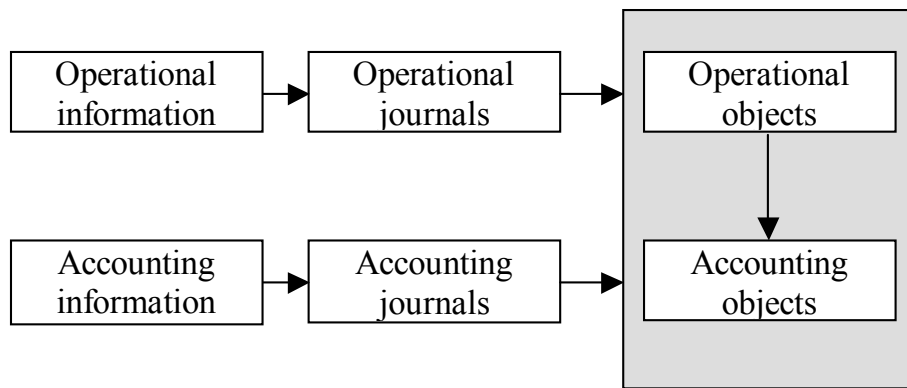


Fig. 2.5. Interaction of record keeping and bookkeeping in Virtuoz program system

Thus, preliminary forming the records based on the documents allows to model and predict operations of the enterprise and perform «if...then» analysis. Putting the records based on source documents changes condition of objects in the system. Records about these changes are fixed in journals of two kinds: journals of transactions reflect changes of parameters of transactional objects (presence of inventory objects, commodity circulation, accounts payable and receivable etc.); and accounting journals reflect changes of parameters of accounting objects (accounts, registers of gross income and expenses, cashbooks). Records based on the documents may be formed completely or partially, i.e. at first so-called operational forming of records are carried out, and then completely put accounting records. Operational forming of records corresponds to movement of transactional objects (inventory objects, clearing), and accounting part of forming the records concerns to movement of accounting objects (construction of records, change of balance of accounts etc.).

The most of documents and corresponding transactions cannot be fulfilled at once with all necessary analytical data, and time for input and forming of records based on these documents can be limited. Delimitation of operational and accounting putting of the records enables to fulfill part of the document and form records on its base operationally. As a result operative information will always be actual, and verification and analysis of accounting parameters can be postponed until the moment when all data become known, they will be entered into the document, and the according records will be put completely. Such situation may occur, for example, on receiving of payment from the client who concerns to several contracts at once. Accordingly, the document has status or completely recorded or operationally recorded (fig. 2.6) [96].

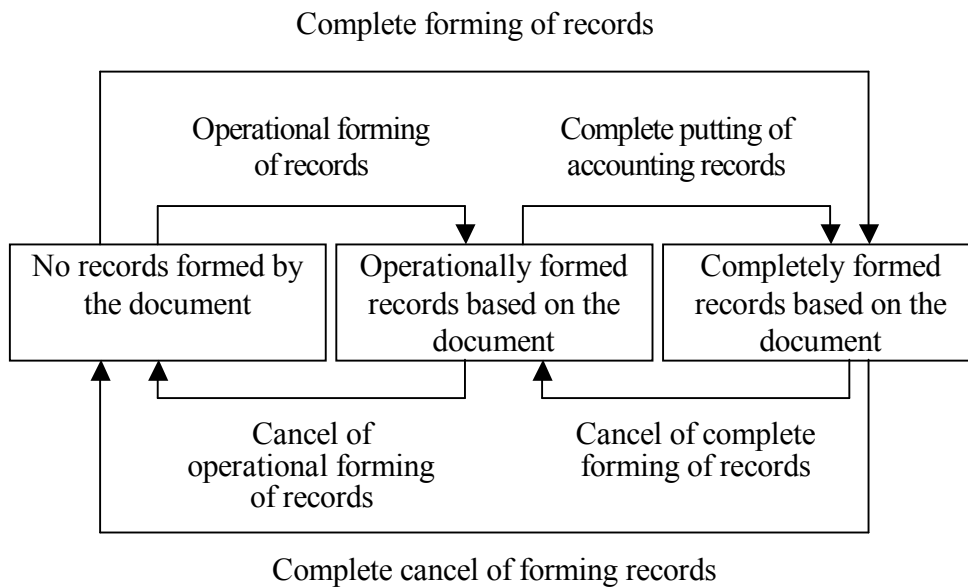


Fig. 2.6. Forming of accounting records based on source documents in Virtuoz program system

Cancel of forming accounting records based on the documents also can be either complete, or partial. One may first perform an accounting cancellation of the document (for the change of accounting data), and then if it is necessary, cancel the operational forming accounting of records (for the modification of administrative data).

Accounting records based on the documents may be formed immediately, or they could be put in a queue (it is possible to perform operational forming of records and postpone accounting forming). In the second case the special component of system consecutively forms of records based on documents at occurrence of the certain event.

Forming of the reporting in accounting computer programs

In conditions of paper accounting drawing up of both obligatory and administrative reporting takes quite a long time; a considerable amount of efforts of accountants is spent on its reception. For this reason chief executives often cannot receive in proper time reports that are the basic storage media for administrative decision-making. Automated accounting has granted to accountants and executives a wide variety of means concerning efficiency and quality of drawing up of the reporting.

All the reporting given to users while using the accounting computer programs can be divided into three classes (fig. 2.7):

- a) internal system reports;
- б) external (regulated) reports;
- в) non-standard reports.

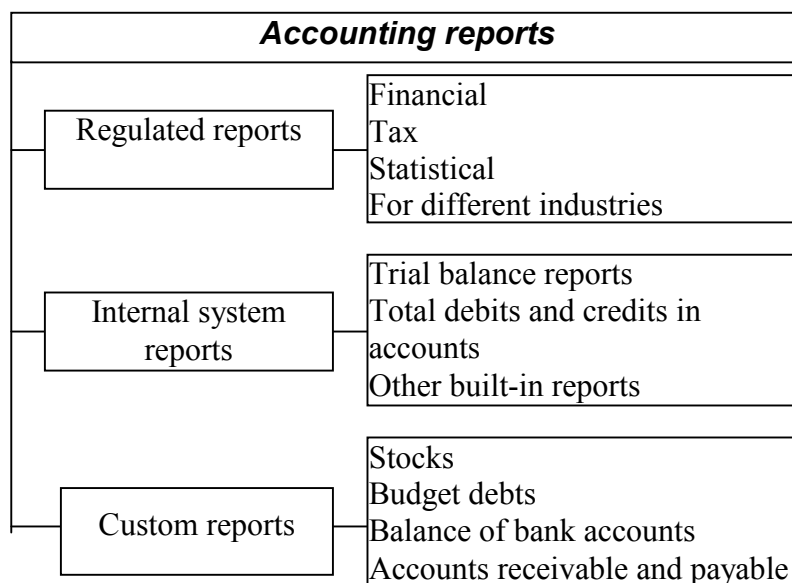


Fig. 2.7. **Reporting in accounting computer programs**

Often accountants use reports that help themselves to check up correctness of bookkeeping, to find probable mistakes; these are so-called *internal system reports*. In system reports developers previously designed both appearance, and the description of algorithms of forming their substantial part. The nomenclature of such reports in standard software configurations may be numbered from ones to tens. They are «Account ledger», «Total debits and credits in accounts», «Trial balance report», «Detailed account report», "General Ledger" etc. They are formed at any variant of the chart of accounts developed by the accountant, and under any internal standards of coding and a registration policy. This peculiarity is caused by the mechanism of formation of such reports, which has rigid rules of introduction of the values. The values are limited by number of parameters on which the program selects the data from the corresponding database. For the database it is previously known, that these parameters exist. E.g. construction of journal of economic transactions in electronic form cannot be in the same program different for different enterprises. There are, for example, such database fields as «Date of transaction», «Number of document», «Content of transaction», "Sum", etc. The information entered by the user in corresponding columns of the database created by this way, is later used to find the answer to a questions asked by the accountant with the use of method, previously defined and mathematically described in the program.

Problems for accountants arise, as a rule, not from little number of reports, but from their too large number. So, for example, firm "Intelligence-service" suggests in its program *BEST-PRO* more than 16 kinds of synthetic and analytical built-in reports. However for checking of correctness of accounting and estimation the condition of enterprise assets two internal system reports are quite enough: «Journal of economic transactions» and «Trial balance report».

External (or regulated) reports are reports obligatory to represent to the state institutions, investors, creditors etc. As them understand an opportunity to automatically

receive from software reports for tax inspection, non-budgetary funds, various inquiries, financial reports.

There are also kinds of reports not included into the basic forms of the accounting reporting and are regulated only for some kinds of enterprises. These are so-called specific reports. To this group it is possible to refer the consolidated reporting (for holding companies that incorporate affiliates) and reporting under GAAP or IAS international standards of accounting (for joint ventures and enterprises with foreign investments). Accounting computer software enables to create effectively such kinds of reports with the help of additional programming.

Custom reports are intended to satisfy the manager's regular need to receive the answers on urgent questions. This group of reports includes reports for the foals of online analysis, e.g. daily report on money receipts and direction of their spending. Developers could not stipulate such report, so it could not be received directly by regular means of the program.

On the market of information technologies leading positions traditionally occupy those accounting programs that satisfy the requirements of users concerning formation of different types of accounting reporting and automatic check of the formed reports. Today the market of accounting programs almost completely satisfies requirements of accountants as to formation of the reporting. It is proven by the conducted research of some widespread accounting programs concerning facilities of drawing up of all kinds of the reporting at the enterprise (tab. 2.2).

Table 2.2.

Computer programs facilities concerning to accounting reporting

№ п/п	Accounting program	Reporting facilities				Peculiarities of the program
		Regulated	Internal system	Custom	Specific	
1	CIS Galactika	+	+	+	+	Separate module for creation of the reporting is present
2	1S:Buhgalteria 7.7 (for small and average enterprises)	+	+	+	Um*	Besides built-in reports the program allows to create own specialized reports with the help of special programming language "1S"
3	Accounting complex Garant-Uchet (for public enterprises)	+	+	+	-	Separate functional package "Consolidated accounting and reporting" which can function independently and together with other functional modules is present; function of control of information input and forming of the reports is realized.

4	Universal'naya buhgalteria Kirilla I Mefodiya 2.0 (for the small and middle-size enterprises)	+	+	+	Um	A report can be formed by list of accounts or currencies; information can be received from databases, considering them from the different points of view, and using both system reports and specialized for the distinct enterprise reports
5	Concorde	+	+	+	Um	Many special managerial reports allow an accountant to set the certain criteria of selection and sorting of the data, and also to provide output the intermediate sums
6	CIS Monopoly (for the average commercial and industrial enterprises)	+	+	+	+	System includes about 100 types of reports; moreover, users familiar with standard means of reports formation can create new types of reports. In reports it is possible to create rather complex inquiries by setting certain restrictions and filters

** Um – user can create and modify reports by himself*

Presence of specific reports in the program depends on type (size) of the enterprises for which the program is intended.

Practically in each accounting program there is a built-in generator of reports. It functions as follows: each form of the report consists, as a rule, of the form of the report and names of variables in its columns. E.g. in the standard external report «Accounting balance» the crossing of line 110 and column 3 locates variable A110, line 110 and column 4 – B110. This forms, and also balance of accounts connected to variables, are simply designed by means of built-in or external report editor. So, any report can be constructed by the description of top and side headers, and sums or quantity indicators on the crossing of top and side header conditions uniquely characterize each cell.

Interesting opportunity is also a presentation of the financial and tax reports to interested users in electronic form – via e-mail, and on Web-pages in Internet (hypertext). Hypertext reports allow to detail aggregated accounting parameters in necessary sections by simple key pressing. The sample structure of such report is as follows (fig. 2.8).

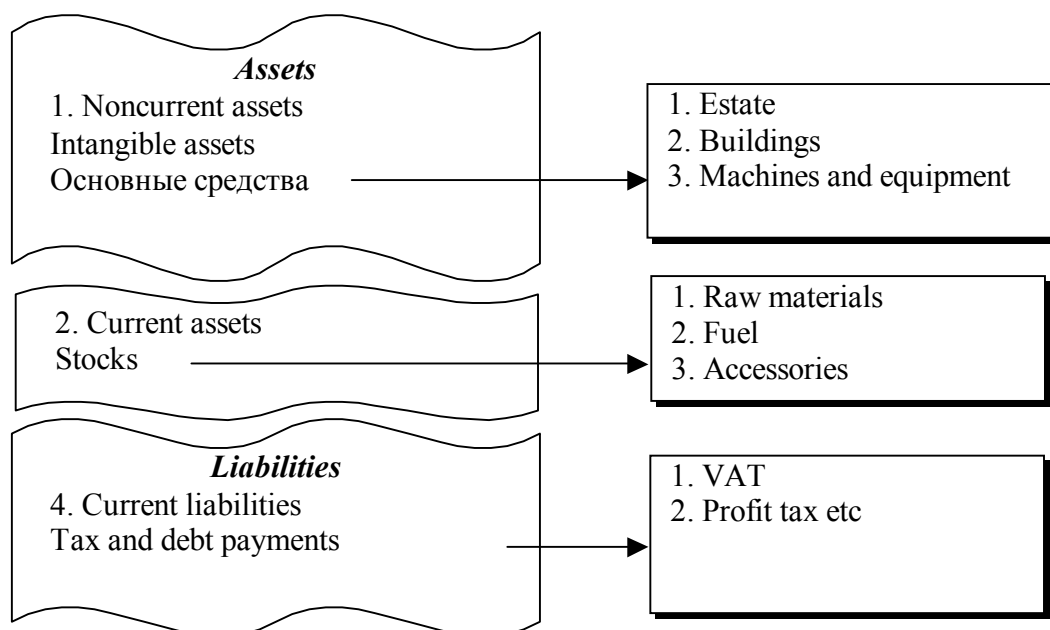


Fig. 2.8. Schema of hypertext report (Balance)

Now in the USA SEC (Securities and Exchange Commission) authorities discuss a question of more active introduction of systems for real-time corporation reporting [40]. Within the framework of such systems analysts and investors would constantly have direct access (via electronic networks) to the information that contains key financial parameters and allow performing the effective financial analysis online. On the one hand, it will turn unnecessary making up of the traditional financial reporting on a periodic quarter or annual basis, in the other hand it makes one feel anxious about availability of confidential information to the competitors.

Moreover, reports located on the Web sites in Internet are pretty vulnerable for unauthorized alterations (as well as any other information in Internet). Paper copy of the report, certified in appropriate way cannot be corrupted that easily.

In future the presentation of reports in Internet will affect auditing techniques and segregation of duties among auditing firms personnel. A perspective direction of applying the Internet technologies in auditing is the creation of network database of samples and models of financial reporting, which an auditor can access in real time (on-line) directly during auditing of the enterprise.

2.2. COMPUTER FORMS OF ACCOUNTING

Concept of the form of accounting

Form of accounting is a set of accounting registers which are used in the certain sequence and interaction for carrying out accounting by of the principle of double entry⁷. The certain combination of the chronological and systematic accounting, ties between accounting registers, ways and techniques of making records – all these things determine a form of keeping accounting. Forms of registers, order and sequence of records in them, as well as accounting facilities may be rather various.

Before more detailed examination of attributes that characterize form of accounting, we shall specify, that the most common definition, which can be applied both to paper forms of accounting, and to forms which intends use of computers, may be considered the one given by prof. Y.V.Sokolov [116] who says that the form of accounting is all that lays between the primary carriers of accounting information source documents and the accounting reports.

The integral part of definition of the form of accounting is the concept of accounting register. The register reflects secondary accounting information (a primary source of the information are source accounting documents) and serves as material means of fixing the data about the facts of economic activities of the enterprise. Accounting registers are aimed to form the certain list of parameters. Increasing or reducing of quantity of parameters results in change of work for all accounting personnel, what require much efforts. For many years only appearance of registers and their construction have been considered the main attributes of the form of accounting.

Construction of paper registers is based on the principle of surplus, by which all possibly required data is formed and fixed in them. Thus accounting registers have multiple purposes. They stored information necessary for functional services for the different purposes such as: performing analysis and finding reserves, fulfilling the forms of the periodic and annual reporting, current and the subsequent control, delivery of an information etc. Registers uniquely characterize any form of accounting. For example, permanent improvement of forms of journal-orders, their modifications for large and small enterprises have not changed the essence of journal-orders and the corresponding form of accounting, in spite of the fact that sometimes this form is imprecisely called "journal".

Nevertheless in conditions of application of computers traditional understanding of *accounting register* has changed. In paper forms of accounting the system of reflection of accounting data in accounting registers is incorporated with system of their consolidation and completely depends on it. If in non-computerized processing of accounting data the accounting registers are called the means of fixing, accumulation, systematisation,

⁷ It's important to notice that in European and American accounting the term "form of accounting" is not used, so scientists speak about registers or a set of registers instead. In former Soviet Union much attention was paid to the "forms of accounting" meaning some kind of paper accounting registers that often were established by state regulatory bodies.

consolidation and reflection of the accounting information, in computerization accounting the stage of reflection of accounting information, i.e. representation of systematized accounting data in a user-friendly style, as a rule, is an independent process which is not connected with the stages of collection, consolidation and systematisation.

Collection, systematisation and consolidation of accounting information in conditions of modern computer technologies are performed automatically. Source accounting information is collected in a computer database, then consolidated and systematized on accounts which are implied by separate cells of computer memory and are ideal carriers of attributes of its grouping from the theoretical point of view. Design of computer databases can be various, and the table principle on which paper registers are constructed, is not the only one usable. Databases could also be hierarchical, network and relational [74, p. 44].

In computerized accounting any material carrier of accounting data from the theoretical point of view can be considered as a register, so any electronic carriers, which help in collection of information, may be considered the accounting registers. Concerning traditional paper accounting registers it is possible to agree with prof. D.V. Chistov, that in computerized accounting their purpose and the contents essentially change: from means of aggregation and a grouping of information they turn to prior analytical forms [124, p. 5].

In computers financial accounting programs an accounting register unites three components:

- a) database with the certain structure for accumulation and preservation of the accounting information on technical carriers;
- b) accounts in form of variables created in memory for systematisation and consolidation of accounting data;
- c) screens and print-outs for reflection of grouped and systematized accounting information (fig. 2.9).

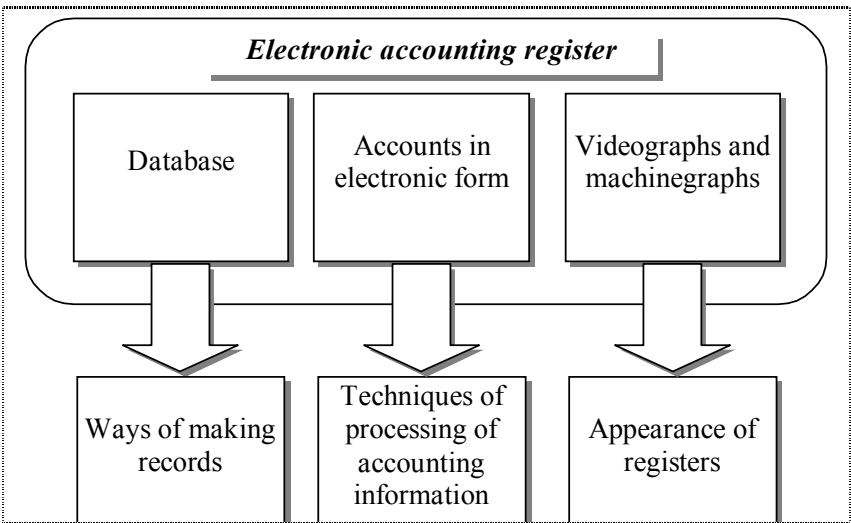


Fig. 2.9. Structure of electronic accounting register

In spite of the fact that in paper forms of accounting the ties between registers are very important, in computerized accounting they do not play such an essential role. E.g. there can be a set of ties between accounting registers and documents, between chronological and systematic record, analytical and synthetic accounts etc. One form differs from another not only by appearance of accounting registers and their interconnection, but also by organization of making records in them.

Technology of processing of accounting information may vary from enterprise to enterprise. Practice shows that it depends on many factors like: structure of assets, qualification and structure of accounting staff etc. So one standard form of computerized accounting is not possible like one unified form of accounting for traditional paper accounting methods cannot exist.

Computer forms of accounting

Automated forms of accounting may vary depending, mainly, on application of corresponding equipment.

In case of paper method of processing of the accounting information we should choose a form of accounting, which mostly suits the needs of enterprise (journal-order, memorial-order etc.), and does not impede further mechanization. In conditions of using computers the order of accumulation, processing, aggregation, control of the information and formation of accounting parameters is set according to the algorithms of processing of primary information. Computer forms of accounting are applied with the help of program algorithms, which form both appearance of registers, and sequence of accounting records. So peculiarity of the computer form of accounting is that it does not exist separately from the distinct computer program.

Forms of accounting, which intend application of computers, allow to meet effectively the requirements of segregation of accounting works, analytical facilities and efficiency.

The first requirement – the segregation of duties – is achieved because modern hardware and software computer systems are often based on distributed data processing. Thanks to software mechanism, which allows several users to work with one database at once, there is an opportunity for several accountants to work simultaneously with one accounting register.

Using of computers allow to solve the problem of the analytical accounting effectively. If in paper forms of accounting increase in levels of detailing of analytical accounting and list of analytics objects require increase the number of accounting personnel, in conditions of using computers we can conduct analytical accounting with any level of detailing and any volume of nomenclature of analytical objects without hiring additional accountants.

The problem of data efficiency is solved automatically when computers are applied. If in paper forms of accounting accumulation of data in accounting registers, calculation of results and transferring of data between registers required big expenses of work and always

cause mistakes, in computer financial accounting these operations are carried out without human interruption.

It is possible to allocate the following three stages in the history of computer forms of accounting depending on used means.

1. *Use of punched machines.* For the first time the order of organization of financial accounting at its complex mechanization has been developed at the end of 1950's in conditions of punched computers; this form of accounting was called *punched cards form of accounting*. It has been developed for the enterprises that used punched machines, and intended transferring the data from each document to the machine carrier – a punched card (see fig. 2.10). For each part of accounting – stock accounting, salaries and wages, finished goods etc. – arrays of punched cards were formed.

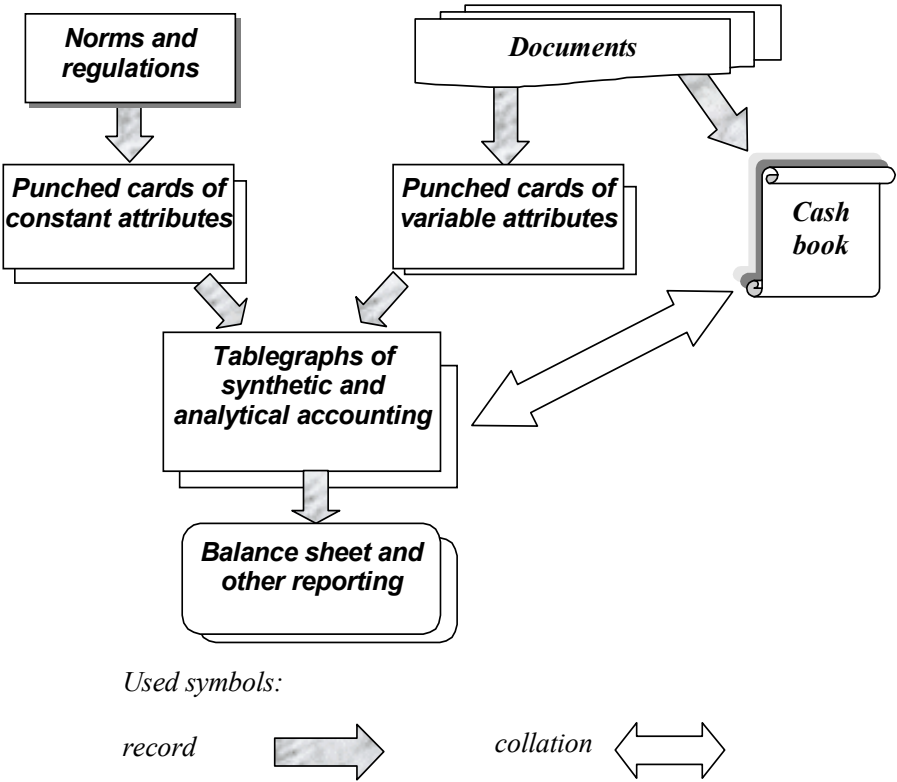


Fig. 2.10. Punched cards form of accounting

Complex mechanization of accounting in punched cards form is based on the principle of continuity of processing of the accounting information and full mechanization of all accounting work. Thus a re-segregation of duties has happened, and the significant part of operations of accounting process was transferred to the personnel of computer centre. Essential feature of this form is that two kinds of the information – variable (operational) and constant (norms and references) – were put on a punched card. Checked up and accepted for processing documents about economic transactions were formed in packs and registered in the special Journal of documents reception and control numbers registration. This Journal was intended for the control of storage of these documents and the check of completeness of

records in tablegraph. Registered documents then were transferred to the puncher for transferring into cards. Prepared punched cards were transmitted to the computers where they were grouped. All the data for the certain period were passed through the corresponding reading device for printing of the information and calculation of test results. At the same time Journal of transactions was printed, which served a control machinegraph as well.

2. Use of third generation computers (midi and mini) and multi-terminal computer systems. Introduction into the practice of accounting computers like Ural, Dnepr, Minsk, ES in the ex-USSR has led to the creation of *table-automated form of accounting* (fig. 2.11.).

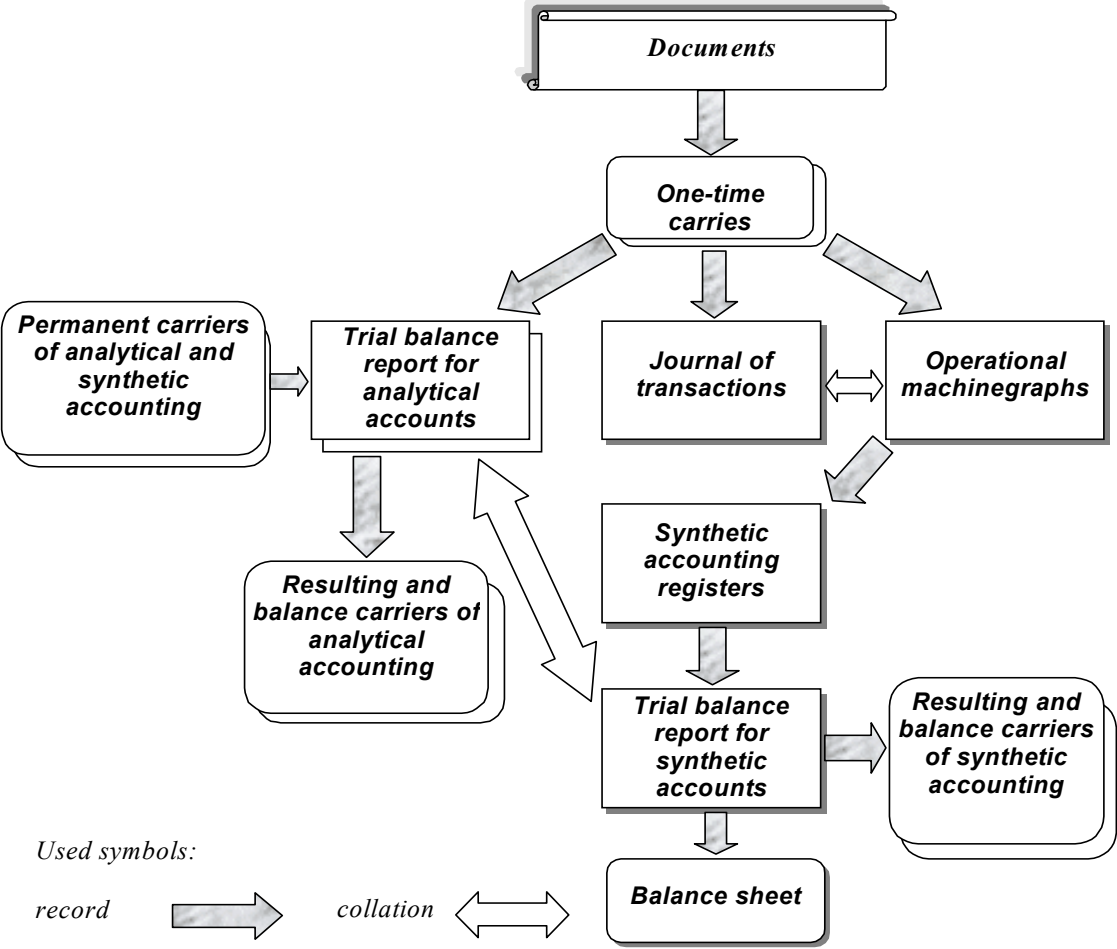


Fig. 2.11. Table-automated form of accounting

In this form source data can be fixed simultaneously on paper and machine carriers that allows to automate collecting of source information. Requirements, standards, operational and reference information are also stored on machine carriers. As far as standards and reference information are reusable objects, they are kept in special databases. Depending on used means and data carriers two ways of input of the accounting information are possible: direct input and input with the use of computer facilities. One of the major principles of this form of

accounting is using of inquiry to obtain reports with necessary parameters. To get the report an accountant should fill-in a standard document, which defines a kind of inquiry.

3. *Use of personal computers and computer networks.* Computer facilities may be used for general purposes of accounting according to common methodological rules, but they also allow to adjust programs for the specific enterprise considering needs of the customer. There are basic elements of computer form of accounting required for establishment of the accounting at the distinct enterprise (see fig. 2.12).

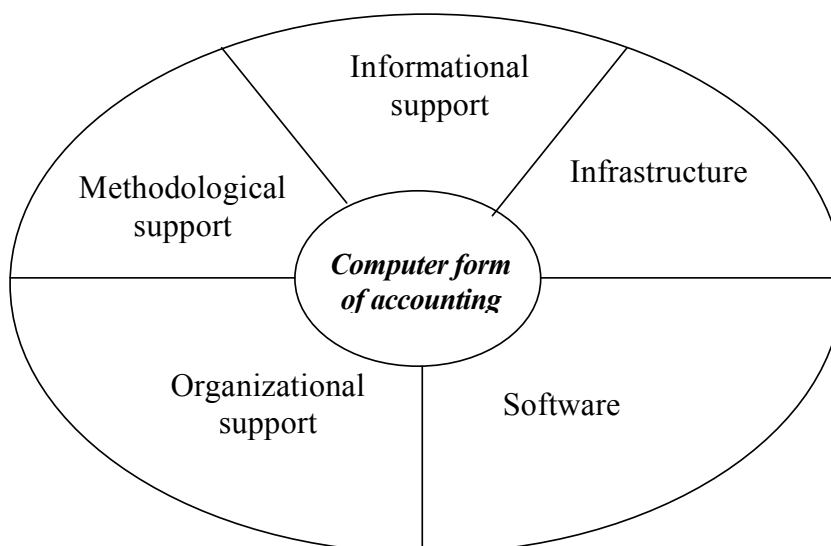


Fig. 2.12. Elements of computer form of accounting

Data processing in the computer form of accounting can be divided into three stages.

The initial stage of accounting process is collecting and registration of the source data for computer processing. At input of the information into CIS a user writes *registration phrases* that form the uniform electronic accounting register – Journal of economic transactions. Though the most of computer financial accounting programs allows to view information in the form of journal-orders, spreadsheets etc.

At the second stage arrays of accounting data on electronic carriers are formed. They are: Journal of economic transactions, structure of synthetic and analytical accounts, directories of analytical objects, constant information. At the same time control of the process is performed, and processing of the information in arrays of the accounting data is made.

The final stage of the process is obtaining the results for the accounting period by the user inquiry. It also may be in the form of synthetic accounting registers, analytical reports, accounts reports or reflection of necessary information on the screen.

The contemporary computer form of accounting is based on computer and communication facilities. Its practical application depends on a set of means and a choice of organizational forms of their use, which may suggest the following variants:

- a) each accountant uses a personal computer;
- b) use of one main computer (server) and terminals (network computers) for data input;

c) connecting personal computers into the network (provides data exchange between different parts of financial accounting);

d) connecting personal computers into the network with one or more main computers (servers). In this case the accountant works at a specialized automated workplace.

If standalone personal computers are used several local Journals are kept, Information arrays are formed on the place of accounting work and are united at the end of the accounting period by the certain principles.

If server with terminals (network computers) are used the single Journal is kept; information array is stored in a single database.

If computer network is present, it's not obligatory to create the single journal. In this case we need to coordinate a set of local information; except for situation when we allocate one of computers as a server.

And finally if the network of automated workplaces with allocated servers is created, use of both single journal and set of journals is acceptable. But in any of cases it is expedient to have a single database of accounting information.

Comparison of technical characteristics of different computer forms of accounting is represented in tab. 2.3.

Table 2.3.

Basic technical characteristics on different computer forms of accounting

Punched cards and table-automated forms of accounting	Computer form of accounting
<i>Incoming information</i>	
On paper carriers; on magnetic carriers	On electronic carriers; on paper carriers; through telecommunication channels
Data input in computing device	<i>Data input in computer</i>
carried out at places of preparation of the data: from paper documents to punched cards with rewriting to machine carriers, simultaneous registration on paper and magnetic carriers; carried out in computer centres: from paper documents to punched cards or directly on magnetic carriers	carried out at workplaces of accounting workers: from paper documents, simultaneous registration to machine and paper carriers, copying from electronic carriers, transfer through telecommunication channels
<i>Control and correcting of the data</i>	
Performed as independent procedures in computer centre, reports of mistakes and copies of erroneous documents are printed, the further correcting is conducted according to messages sent to the computer centre	Performed with the help of program methods during data input by accountants

<i>Storage of the information</i>	
On paper carriers	On electronic and paper carriers
<i>Data processing</i>	
According to the set instructions	According to the algorithms set in programs
<i>Forming of the resulting information</i>	
Regular machinegraphs or machinegraphs by inquiry	Machinegraphs, screens, by user inquiry

Computer networks represent a new stage of using computers at the enterprise. They allow effectively integration computers and communication facilities. A database as a core of information system is frequently disposed on one computer – a server of local network. So it is obvious that use of single database requires communication between all computers and a server. Local computer network provides means for such communication.

Research of the computer form of accounting allows us formulate its basic principles.

1. Computer form of accounting is based on electronic accounting register which includes: a) a database on technical data carriers, intended for accumulation and storage of the accounting information; б) variables temporarily created in memory of computer for systematisation and consolidation of the accounting data; в) videographs and machinegraphs for visual reflection of resulting information.

2. Basic way of documenting the economic transactions is non-documentary collecting of the source data with the help of peripheral devices and its transfer to computers through telecommunication channels.

3. Information about deviations in some economic transactions (e.g. deviation from established norm, scheduled tasks etc.) can be received automatically by inquiry.

4. On the base of incoming source data, one time fixed on electronic data carriers, the integrated processing of the accounting data with necessary level of detailing and efficiency is carried out. At that single information database, which accumulates all necessary accounting information, is used.

5. One time data input. Accounting record turns into the accounting phrase intended for transferring of the data to computer carriers and their processing in computerized system of financial accounting.

6. One journal of chronological record and many registers of systematic record. On registration phrase a uniform electronic accounting register – Journal of economic transactions – is formed. Though the most of computer financial accounting programs allows to view information in the form of journal-orders, spreadsheets etc.

7. One synthetic account and many analytical accounts. The number of analytical accounts depends on the goals of administration, and is not limited anyhow.

8. Reporting information output is performed on certain dates. Operational information (references, managerial reports etc.) could be received by inquiry at any moment – the data

for these documents are received from Journal of transactions with the help defined algorithms.

Technological process and organizational structure of accounting in conditions of computer form of accounting are shown on fig. 2.13.

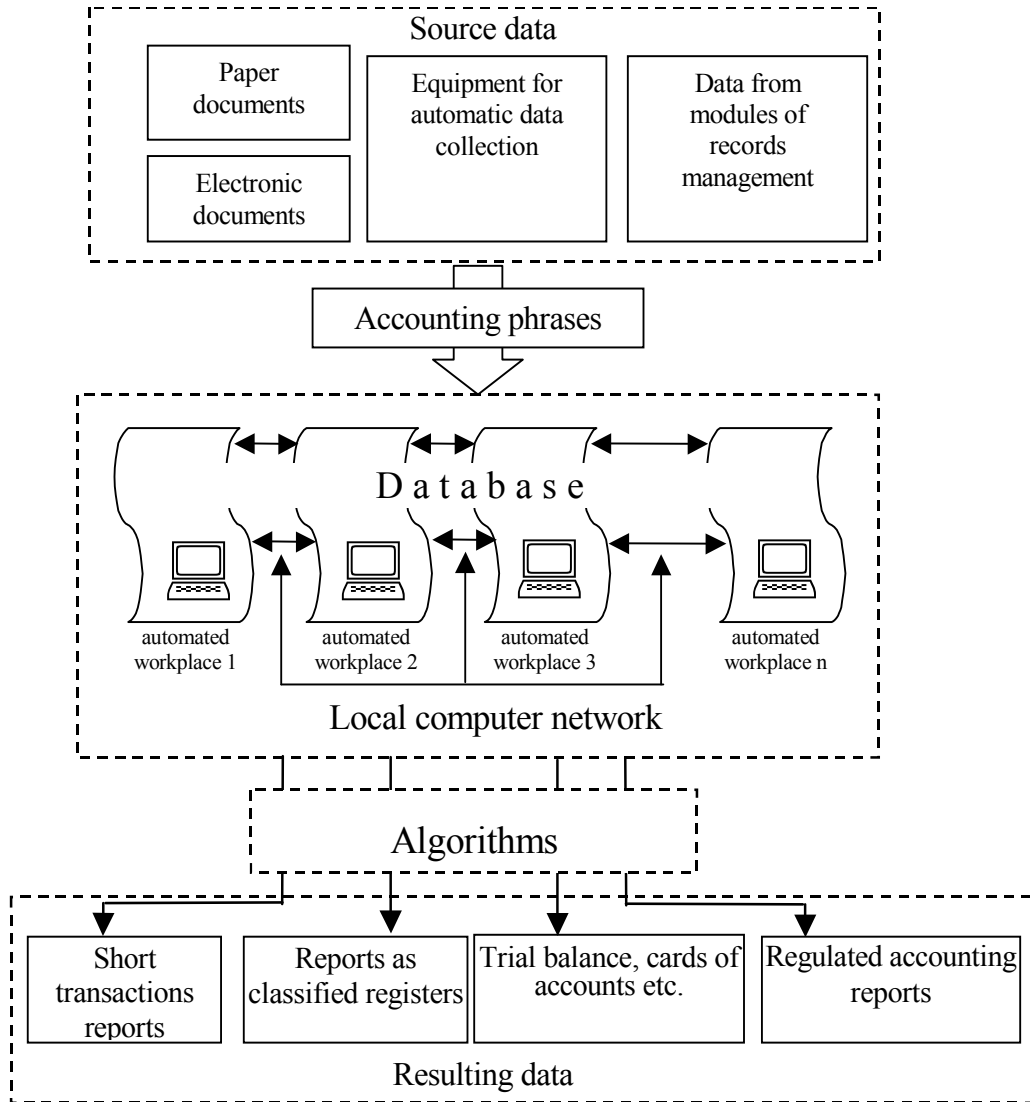


Fig. 2.13. Computer form of accounting

In computer form of accounting software (set of algorithms) for computerization of financial accounting play an essential role. The order of input, techniques and sequence of processing of accounting data by computers, forming of summary accounting parameters completely depend on the used program. Thereby technological process of computerized accounting is determined by common rules of programming and elements of form of accounting find specific incarnation in specialized computer programs.

System of accounting is more wide and substantial concept than form of accounting. It includes not only techniques of performing the accounting, but also methodology of

registration of operations, calculation of parameters, ways of valuation, organization of work of accounting department etc. Form of accounting is an important part of accounting system; but it determines only the order of accounting registration, not the structure of accounting system. In conditions of applying complex CIS a concept of the form of accounting transforms into the concept of computer financial accounting system (CFAIS), which has the following peculiarities:

- a) computer from the supporting mean becomes a key factor of the organization of accountant work;
- b) computerization covers all stages of processing of the accounting information: collection of source data, data accumulation and processing, reporting;
- c) maintenance of immediacy both in transfer of accounting information, and in processing of accounting data;
- d) possibility of modelling on the base of accounting information.

2.3. ORGANIZATION OF ACCOUNTING APPLYING COMPUTER FACILITIES

The use of computer facilities resulted in radically new tendencies in construction of accounting department structure. The use of accountant workstations is the first characteristic difference. In literature workstation is traditionally understood as a professionally oriented firmware complex, which provides the solution of user tasks directly on his workplace [62, 74, 108]. Whereas under non-computerized method of accounting information processing a separate accounting worker is the basic element in the construction of accounting apparatus structure, under application of the computer facilities not only duties and qualification of an accounting worker are taken into consideration, but also the description of the workstation he works on.

Creation of an accountant workstation is based on principles of personification of calculations and self-training of accounting workers, on computerizing of the basic accounting functions, on paperless technology of record-keeping, and on the rational union of the distributed, decentralized and centralized systems of processing of accounting information.

Workstations are classified according to the following basic characteristics (fig. 2.14).

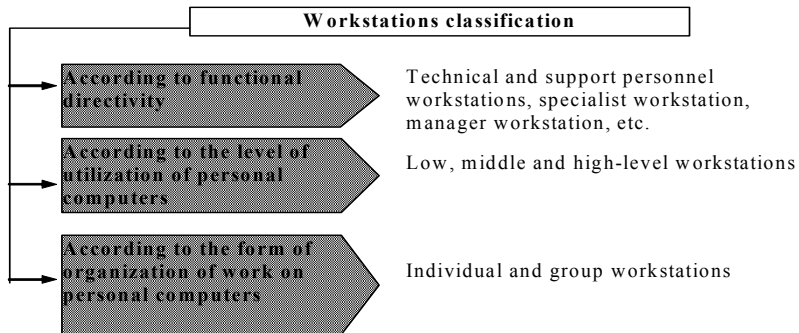


Fig. 2.14. Workstations classification

Numerous publications on the questions of creation of workstations for processing of accounting information [58, 100, 108] enable to classify them according the level of management:

- workstations of top managers (including the chief accountant), and also middle and low level managers;
- workstations of specialists (those of accountant and economist, time-study man, controller, engineer, technologist, etc.);
- workstations of technical personnel (storekeeper, secretary, cashier, salesman, operator, etc.).

It is specific here that accountant workstation needs creation of a technology which intends participation of wide range of enterprise workers — accountants, operators, secretaries, storekeepers, managers and other specialists in processing of accounting information — in data entering, forming of source documents, visual control of data entering, drawing up of resulting documents which are carried out at a workplace by PCs.

Under workstation application accountant functions change as follows:

- the basic duty of an accountant responsible for book-keeping on a concrete area, is processing of local information on a relatively small data base;
- either information arrives as filled source documents with a regulated structure, or an accountant directly fulfils source documents and draws them up on a computer;
- document handling consists in representation of information from documents in accounts registers by entering document entries and forming of records;
- accounting information handling is strictly regulated by both instructional materials and technology of work with such information in the system.

Transformation of accounting department structure construction forms is another characteristic feature of accounting with computer facilities application.

The wide use of the computer facilities at first led to the centralized processing of accounting information, as all computing devices were in one department of an enterprise. The high cost of second and third generations computers, and their exploitation and maintenance complicity necessitated creation of large centralized computer centers with the special staff of operators and programmers and, as a result, required the maximal degree of accounting centralization. On this stage even at large enterprises where accounts stations were saved, accounting decentralization lost its ordinary forms, as accounts stations got the prepared reports from a computer centre. Accounts stations functions were reduced to the control of accuracy of drawing up source documents and received current reports. Exactly this gave prof. A.A. Dodonov [70] grounds to assert that accounting department structure should be centralized under computer facilities application. Only such degree of accounting

centralization provided the complete load of computer centres, contributed to accounting standardization, and to the decrease in record-keeping expenditures. On this stage of hardware development there were such advantages of the centralized approach to CFAIS creation (fig. 2.15).

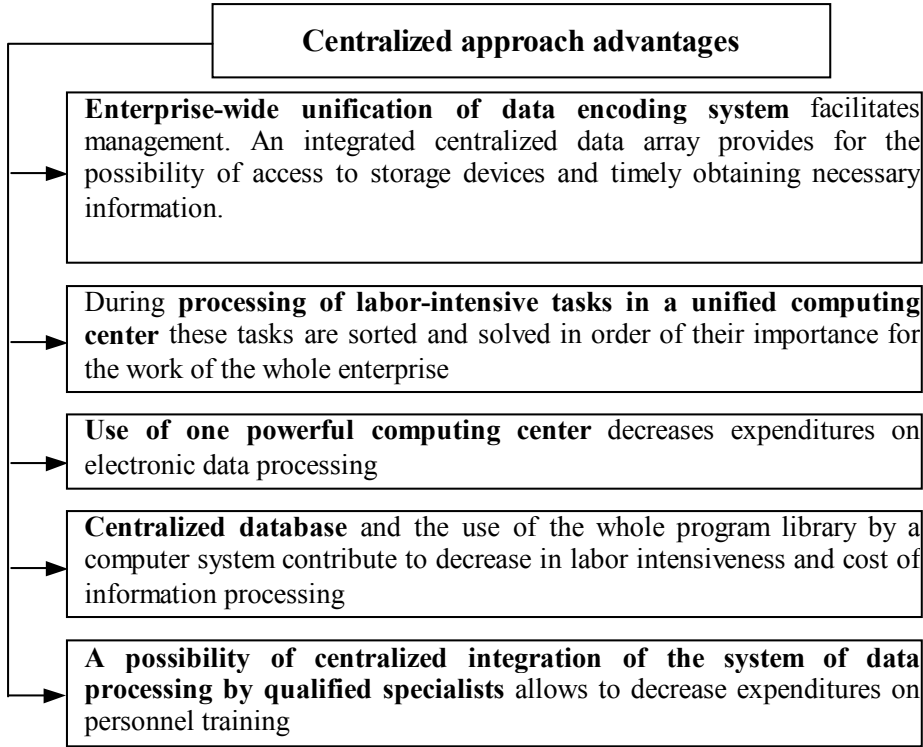


Fig. 2.15. **Advantages of the centralized approach to CFAIS development**

However, maximal accounting centralization had also negative consequences: accounting information processing was isolated from the place of carrying out of economic transactions, duration of documents circulation increased, expenditures on moving of data carriers to the place of their processing rise, etc.

With the development of computers' capabilities and reduction of its price, appearance of personal computers, and creation of accountant workstations it has become possible to decentralize accounting, as now processing of source accounting information and forming of result information can take place directly on accounts personnel's workplaces. A decentralized system of data processing has the following advantages (fig. 2.16).

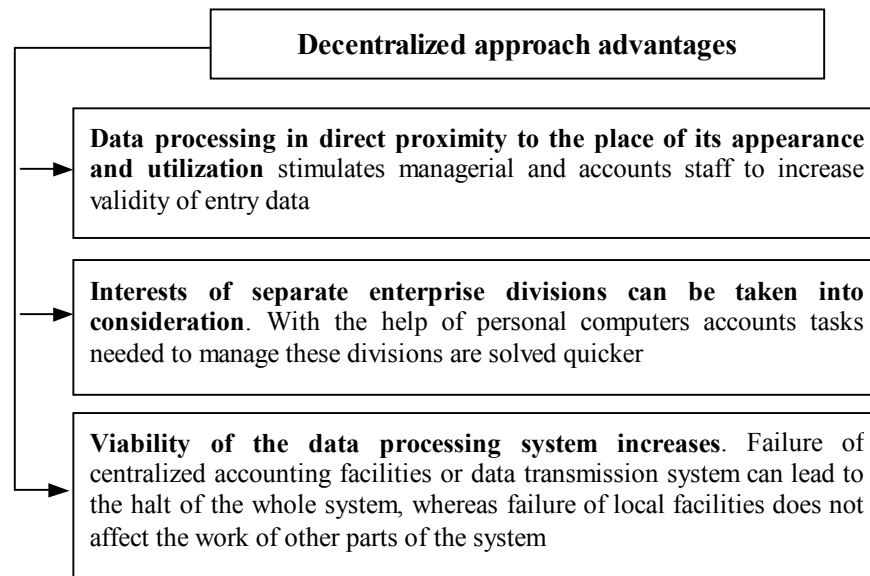


Fig. 2.16. **Advantages of the decentralized approach to the CFAIS development**

When considering definitions of centralization and decentralization concerning automated record-keeping and non-computerized methods of accounting information processing, one should bear in mind that that they are quite relative. Prof. K.N. Naribaev evidently showed relativity of categories of centralization and decentralization both in paper and computer forms of accounting. In his opinion, «...in reality a fully centralized system can not exist, and a fully decentralized system becomes not capable of functioning as well. We can regard the degree of centralization and decentralization as the optimum combination of these processes under certain conditions» [100, p. 97]. Thus, on the contemporary stage of development of computer facilities hardware and communication means there are two competitive tendencies which affect the choice of the scheme of accounting data processing system. The first one is increase in the degree of processing centralization, and the second one is strengthening of its decentralization. These tendencies generated absolutely new features in accounts centralization and decentralization.

Analysis and generalization of Ukrainian and world experience of accounts organization in the conditions of its computerizing gave a possibility to define the basic tendency in centralization and decentralization of accounting functions realization. It consists in accumulation and centralized processing of accounting data in a unified centre, and decentralized input of source information in a database and common use of accounting results. CFAIS unites advantages of centralized data processing with advantages of decentralization. The use of local area networks allows to apply in information management such methods of aggregation and disaggregating of accounting information which conduce to establishment of optimum ratio of centralization and decentralization.

Questions to chapter 2

1. What is electronic source document?
2. What is the sequence of computerized primary record-keeping?
3. What are the characteristic features of computer technology of source documenting?
4. What basic models of interpretation of source documents are used in modern computer record-keeping programs?
5. What are the features of making an inventory with the use of computer facilities?
6. What possibilities do bar codes give in tangible assets accounting?
7. How is valuation of accounting carried out in the computer programs?
8. How does the process of calculation in computer book-keeping change?
9. What can possibility of record-keeping in several charts of accounts be used for?
10. What are the features of analytical accounting in the computer programs?
11. How is double entry principle embodied in computer programs?
12. Give a description of different types of reports in computer record-keeping programs.
13. What integral parts does an accounts register consist of under computers application?
14. Name and describe CFAIS personnel functions.
15. What forms of construction of accounting apparatus do you know?
16. Describe the features of construction of accounting apparatus structure under computer facilities application.

CHAPTER 3. DEVELOPMENT OF COMPUTER ACCOUNTING SYSTEMS

After studying this chapter you will know about:

- *basics of computer accounting systems development;*
- *order of the computer accounting systems development at enterprises*
- *control of accounting records in computer financial accounting information system (CFAIS);*
- *CFAIS software.*

3.1. BASICS OF COMPUTER ACCOUNTING SYSTEMS DEVELOPMENT

Pre-conditions and principles of the computer accounting information systems development

Application of computer technologies in accounting makes the work of accountants much more efficient. But during the organization of accounting on a specific enterprise a question about expedience of modernization of existing CIS (or about the creation of new) appears. This question is very important, as a choice of method of accounting information processing is determining in organization of accounting. On enterprises it is also possible to organize accounting without using the most modern computer systems, but only on condition of the proper organization of enterprise management in general. American author D. Tapskott writes that «...the preference of investments in the improvement of manual operations with documents in distinct economic situation may be more efficient than investments in the refined computer systems» [120, p. 6].

On those enterprises, where organization of management and accounting is unsatisfactory, creation and use of the computer system of accounting can not only accelerate information processing, but also arrange and improve it essentially. Such a possibility exists because the computer method of accounting information processing requires formal and clear specification of registration procedures as algorithms which put in order of work of accounting personnel.

Modern practicing authors name several pre-conditions, specific for organization of computer accounting in particular. S.P. Proskurin considers that a firm is ready for computerization «...when activity of separate elements in its «living system» begins to stabilize: direction of activity is defined, composition of managers is optimal and functionally complete, the indicators of firm performance increase steadily» [106]. And V.N. Davidov uses the term «prepared customer». This is a customer who knows what are computer facilities and not only had set it at the enterprise, but also uses it in production and management [66].

Experience of computerization of accounting of enterprises allows to select two more pre-conditions, inherent for organization of computerized accounting:

a) money assets for investments in development and exploitation of the information system (approximately 80% of failures in computerization of accounting are explained by lack of money);

b) personal interest of director and chief accountant of enterprise in implementation of the information accounting systems.

Information system is developed for a specific entity, in this case — for an enterprise and its accounting. The effective information system considers difference between the levels of management, spheres of activity, and also external circumstances and provides to any level of management only that information which it needs for effective realization of management functions.

The computer financial accounting information system (CFAIS) development is based on the following basic principles (tab. 3.1).

Table 3.1.

Principles of the CFAIS development

№ p/p	Principle	Table of contents of principle
1	Financial viability	The advantages expected from the use of the system must exceed expenditures on planning, installation, training, maintenance
2	Flexibility	System must keep a sufficient reserve of flexibility for reaction on changes of external factors. The basic requirements to flexibility of accounting system are: 1) change (adjustment) of chart of accounts; 2) analytical accounting on arbitrary accounts and attributes; 3) change (adjustment) of templates of typical accounting operations; 4) change (adjustment) of forms of typical reports and adding of new reports which are created by a user
3	Control	Creation of parallel information streams which control each other and provide validity of accounting data
4	Protection and security of data	System must be favourable for protection of enterprise assets from misuse and provide integrity and safety of information in the system. The high-quality computer system of financial accounting must fulfil the following functions of data security: 1) access control to programs and data of the system by authorization of users; 2) data encryption; 3) control of logging-on into the system and keeping a log of working hours; 4) control of creation of back-up copies of data
5	Compatibility	Principle of compatibility requires that system must be designed considering a human factor and organizational peculiarities of enterprise, already present hardware and software. The organizational features of enterprise most often mean the methods of co-operation of separate workers and subdivisions.

6	Universality	<p>The program system must solve not a single task, but to fulfill standard procedures and process a concrete task as a special case of a more general one. This is achieved by two methods: either the operations, which are rarely being fulfilled (not standard), are included in the algorithm, or such operations, are completely excluded from the general cycle of the computerized data processing, and are corrected individually in the process of work.</p> <p>The choice of type of information processing can be made as follows. Registration of economic transactions is carried out by procedures which unite the mass (a) and non-mass (b) operations:</p> $P = ab_1 + ab_2 + \dots + ab_i + \dots + ab_n$ <p>As a result of selection of mass procedures there is a position:</p> $R = a (b_1 + b_2 + \dots + b_i + \dots + b_n)$ <p>where a – economic transactions and computations of mass character;</p> <p>b_i – operations which can not be standardized and will in practice be entered manually.</p>
7	System approach	<p>In the process of elaboration of accounting information systems the analysis of management object is in general and its management system in particular are made. General purposes and criteria of functioning of the entity in the conditions of its automation are also formulated. This principle assumes single data input into the system and its multiple using, single database, complex software</p>
8	Reliability	<p>Characterizes reliability of work of accounting information system which is provided by different methods, e.g. by duplication of components of the system</p>
9	Collective planning	<p>Collective planning is based on the idea of reusable components. The creation of the application system from ready components allows to shorten the time of development considerably. That is why it how the used methods, and information systems which support them, are capable for repeated creation of components, and how easily such components can be applied in other IT projects.</p>

10	Modelling	<p>We may allocate the components of general model of program structure, that describe the basic features of informative-logical structure of accounting data processing system, rules of its functioning and adjustment to the user requirements. These components are:</p> <ol style="list-style-type: none"> 1) methods of construction of chart of accounts; 2) models of organization of documentation; 3) methods of construction of the system of records on accounts; 4) models of the analytical accounting; 5) models of accounting period; 6) methods of presentation and technology of work with source information; 7) models of segregation and consolidation of accounting data; 8) facilities of extension of basic functions.
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Integration and differentiation of types of accounting in CIS

Initial information for the receiving of all reporting data necessary for administrative decisions is contained in source documents that fix changes of parameters of technological operations, from the receiving of materials and production supplies to manufactured goods ready to sale. This information is processed; the results are stored in definite intermediate documents on the basis of which the outgoing documents of operational, accounting and statistical character are drawn up. Processing is carried out in different subdivisions of enterprise according to their specialization. Therefore every functional subdivision of enterprise has its own documentation and processes of its forming.

In the computer data processing there is an integration of processing of different types of primary economic information which is used by distinct functions of management, i.e. by accounting, planning, supervision, manufacturing etc. This is the basis of creation of single database (result of integration of processing), data from which can later be repeatedly used by all enterprise services and subdivisions. If during manual data processing different services creates and processes necessary information, which predetermines inconsistency, in CIS such processing is a simultaneous single technological process, that results in avoidance of parallelism and duplication, in single fixing, and also in unity and standardization (forms of documents, indexes, classification of information, system of encoding etc.) (fig. 3.1).

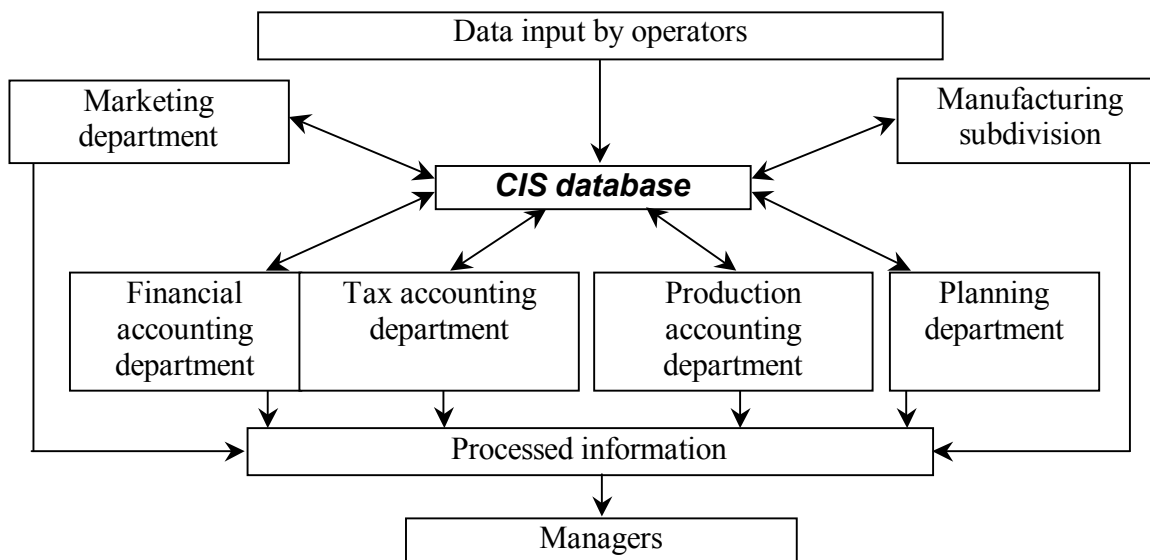


Fig. 3.1. Information streams in CIS

The basic function of accounting personnel is the organization and performing of accounting. But accounting, especially in market conditions, as world experience shows, possesses also control and analytical functions, is responsible for financial and legal questions, economy and even forecasting. This is especially typical for middle-size and small enterprises on which management, excluding director and owners, consists of one or two accountants, who execute all these functions.

Thus, the row of operations of source data processing and creation of its database becomes integrated. Integration of accounting types is the following: all accounting information is centrally accumulated in computer databases and is used for realization of complex of management functions. We speak about integration of data processing of only primary accounting information in a single base, used by all types of accounting. Next stages and phases of consolidation and aggregation of data intend the use of methods and receptions specific for each type of economic activity at the enterprise. Thus double entry, chart of accounts, synthetic and analytical accounting will not disappear, but will transform into one of the methods of getting summary information from the single CIS database of primary data.

Levels of the CFAIS programming

Information technology, which has rather long period of application, is usually a subject of multiple modifications. It is related to the necessity of changes and supplements caused by the changes of external conditions and requirements to business and accounting. The conditions of keeping accounting in Ukraine produce the specific requirements to ability of debugging and to the CFAIS programming. The point is that the imported accounting programs, unlike domestic ones, are intended to work in the conditions of stable financial and tax legislation. That is why in Ukraine it is expediently to use Russian or Ukrainian software products for the CFAIS development.

The best programs that allow to adjust CFAIS and that correspond to principle of flexibility are the ones built according to the three-level principle (fig. 3.2). Besides every level can be created and adjusted by different firms and groups of specialists with the use of different programming languages.

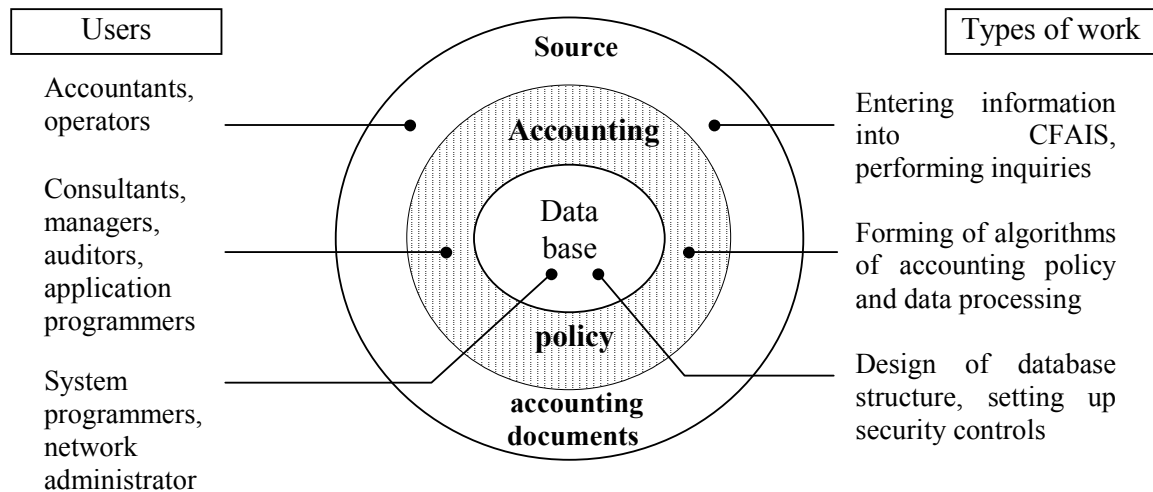


Fig. 3.2. Three-level architecture of CFAIS

There are two basic advantages of such structure of CFAIS. First, it simplifies development and debugging of the programs. Conceptually a developer has the simplified task at one level, as he needn't study the details of work of subjacent level. Second, it advances security and protection. The specific developer of one level cannot control a lower level. Therefore such a structure can increase security of CFAIS.

A big problem in the CFAIS development is absence of standards for built-in programming languages in the accounting programs. For example, for porting of the program created in the *IS:Buhgalteria* system, it is necessary to study the programming language of this system, to translate the program into other programming language, e.g. *Infosoft*, and only then to rewrite the program in other system manually. The developers of the *Tekton*⁸ program system offer an interesting conception of «visual planning», which can considerably soften this problem. Traditional approach assumes obligatory participation of programmers in creating and debugging of accounting tasks at a specific automated workplace in which a user and a business-analyst take part, too (fig. 3.3).

⁸ Тараненко А.Г. Концепция визуального проектирования в инструментальной среде «Тектон». // Компьютер в бухгалтерском учете и аудите. – 1998. – № 3. – С. 149-151.

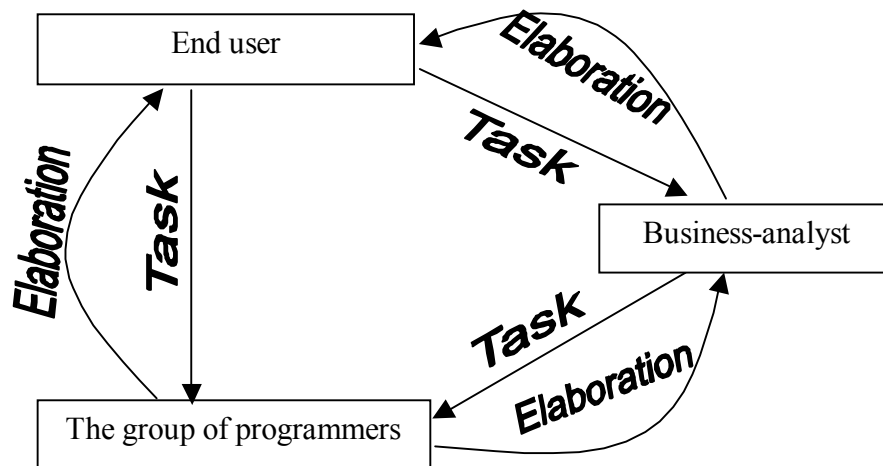


Fig. 3.3. Closed loop of the CFAIS development process

For support of traditional automated workplaces it is necessary either to have the programmers staff at the enterprise, or each time to apply for information to the firm-developer. Conception of the visual planning intends creation of the specialized instrument for realization of decisions, offered by end users, and oriented not to the programmers, but to business-analysts. The conception is based on the following principles:

- creation of the information system of specific enterprise can take place without programmers;
- any changes of forms of source documents, forms of accounting, etc. must not affect ability of the information system to work;
- the user changes or creates templates, procedures, documents and reports, and the program is responsible for the structure of database;
- the system must be provided with a simple user interface, which provides minimum necessary functionality. However during the study of the system more and more functions must be opened to the user.

Starting automation of a concrete application area, a business-analyst gets a task from the end user. Applying *Tekton* as an instrument, he creates a set of routines, reports, templates and procedures, and also executes other necessary actions, forming virtual automated workplace. In other words, business-analyst sets up *Tekton* under a concrete application area, creating during the debugging an instrument for the end user. It is substantial that in the process of such debugging he needn't to involve professional programmers. Practically all work can be done by business-analyst with the use of the ready *Tekton* objects. Certainly, if necessary, the business-analyst can order add-on components by addressing programmers or outside developers. Consequently the cycle of the information system development for automation of additional activity is substantially simplified (fig. 3.4).

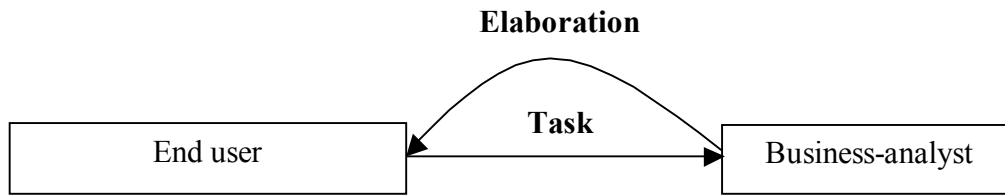


Fig. 3.4. The cycle of development using Tekton concept

Actually all co-operation occurs between end user and business-analyst. They are not programmers, but they know application area. The development of the additional information system is conducted by a business-analyst in terms of application area without using traditional programming languages. As for co-operation of business-analysts with programmers, it is limited by the order of new components for the system. The creation of such components does not require the detailed acquaintance with the application area of work.

Program facilities for the CFAIS development

There are two types of built-in program languages of the computer systems of accounting: high- and low-level languages (fig. 3.5.). Languages that describe computation algorithms in economic terms with the use of the specialized constructions, which consider the features of grouping and interpretation of synthetic accounts and objects of analytical accounting, belong to the first type.

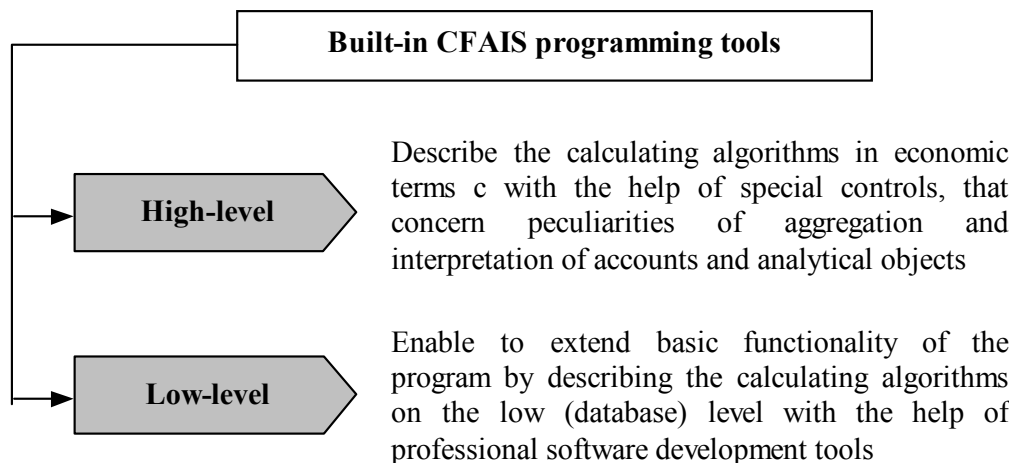


Fig. 3.5. Types of built-in CFAIS programming tools

Those linguistic components, which allow to extend basic functionality of the program by describing computation algorithms in terms of database fields on the basis of professional facilities of program development, belong to the second type. Usually these are facilities for database development and management (*FoxPro, Oracle, Informix*), and query languages (SQL). The border between high- and low-level language means is fuzzy: most often these facilities are used simultaneously.

In most program systems of financial accounting high-level language means are used. Most often the basic elements of computation formulas are identifiers of the balances and turnovers of synthetic and analytical accounts, including turnovers between two arbitrary analytical accounts. The algorithms of computation of values of such identifiers are directly built-in in the code of the system modules. On the basis of these elements together with conditional and cyclic control structures, it is possible to describe practically any computation sequence. Some programs try to advance a high-level language to the natural one. For example, in the program *Glavnyy Buhgalter* by Paritet Soft language constructions, very close to accounting terminology, may be used while describing the rules of computation of reporting indexes [129]. Such high-level mechanisms are present in other systems of automation of accounting, e.g. in *Flagman* by Info-soft, *Abacus Financial* by Omega, programs of Intel Groups, in the *Concorde XAL* system and others.

Concerning to specific character of information objects in the CFAIS languages special construction, oriented to the processing of analytical accounts and lines of documents, are often used. From domestic developments the most complete spectrum of handling constructions of the specialized languages is supported in *IS:Predpriyatie* and *Turbo Buhgalter*.

Only programmers can apply low-level language means. Nevertheless an accountant should not simply reject similar facilities, as this is more powerful mean of expanding of program functionality, than built-in high-level languages, that often have quite a lot of inherent limitations.

In some systems an attempt to divide levels on which the program is changed by programmers and users is made. For example, in *SAP R/3* there is explicit division of program code into application and system layers.

In particular it is interestingly in this connection construction of the *Concorde XAL* system. The basic level of the system (SYS) creates the developer — Damguard Data inc. Distributive level (DIS) is localized for a specific country and includes functions and reports specific for this country. It is developed by companies that possess rights for localization of the system. Rights of creation of a particular branch decisions (BUS) and variants of the system, adjusted for a specific customer (VAR), belong to dealers. Next two levels are the variants of the system with revisions, independently created by the customer enterprise. The first belong settings concerning to all corporation (CUS), and to the second — settings concerning to distinct branches (USR). Thanks to such construction safety of development of the CFAIS is provided. If distributor, dealer or end user changes any component of the system, actually changes only its copy, and the initial version remains untouched.

Methods of the CFAIS implementation

There are different approaches to the CFAIS implementation at enterprises. They differ by the degree of influence on organizational structure and sophistication of decision of accounting tasks (fig. 3.6).

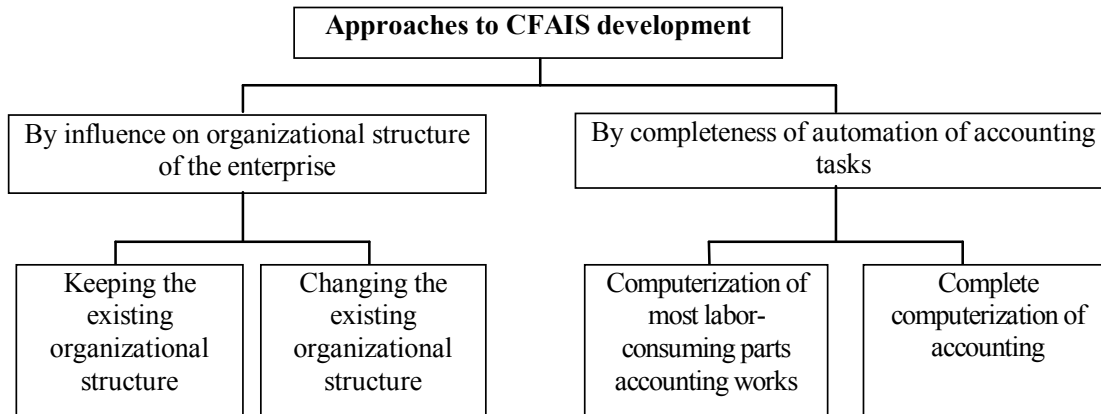


Fig. 3.6. Description of approaches to the CFAIS development

By the *degree of influence an organizational structure* two approaches to the CFAIS implementation are defined. The first is based on adaptation of information technology to the organizational structure of enterprise and accounting department. At such approach CFAIS adapts to the organizational structure in its existent kind and only local modernization of the formed methods of work takes place. Segregation of duties between technical workers (operators) and specialists (accountants, managers) is performed, combining of the functions of data collection and processing (physical docflow) with the functions of decision-making (information flow) is carried out. This method of implementation of a new information technology is oriented on the existent organizational structure of management. A risk degree from introduction of this technology is minimal, as the corresponding expenditures are insignificant, and the organizational structure remains unchanged.

The second approach is more effective. It intends rationalization of organizational structure. The organizational structure is optimised in the way that implementation of information technology will give the most effect. Maximal development of technical communications and creating of new organizational ties, which earlier were economic inexpedient is the basis of such approach. Productivity of organizational structure increases, as data is segregated more rationally, and the volume of information that circulates in system channels reduces.

Strong and weak points of these approaches that differ by influence on the organizational structure of enterprise and accounting department are represented on fig. 3.7.

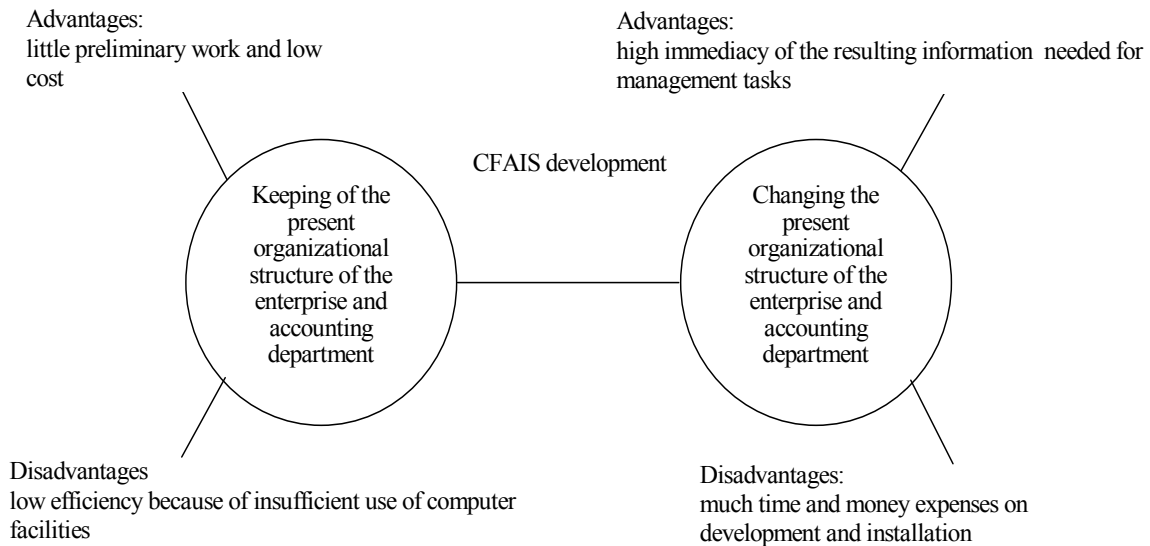


Fig. 3.7. Advantages and disadvantages of different approaches to the CFAIS implementation

By the complexity of decision of accounting tasks two approaches are distinguished: approach which is characterized by the selection of the most labour-consuming tasks and their computerization, and approach which intends the complex automation of accounting tasks. The first approach may accelerate keeping of accounting on the most labour-consuming areas, but, as the sequence of the data processing does not change, we should not expect a substantial rise of efficiency.

During computerization of separate areas an enterprise is equipped by the set of automated workplaces. Each of them is intended for the decision of specific set of accounting tasks. Every automated workplace carries out autonomous processing of information without the use of information from other automated workplaces. Informational links between autonomous automated workplaces are absent, that enables intentional distortions and abuses. Additional control and duplication of information is therefore required. Realization of this approach is characterized by the local changes of methodology of accounting. Accounting system is improved by satisfaction of separate requirements of computerization, e.g. coding, organization of source documents and docflow etc. Such approach may be observed at the enterprises without planning of the complex computerization of accountings.

Accounting is a system. Though its tasks can be accomplished individually, they are tied with communication channels, which ensure completeness of resulting information. Computerization of separate, isolated parts of accounting is a substantial imperfection in computerization of accounting. At such approach for any task a new program is written. Although in this case it is possible the use of common parts in all these tasks, e.g. procedures of data output, individuality of approach to their decision is saved. In total it results in the sharp increase of quantity of variants of realization of accounting tasks (Q) that can be expressed by the formula:

$$Q = s * p * v$$

where s , p , v — accordingly quantity of sectors, different parts of accounting and variants of their program realization.

In addition, separate tasks, sub-tasks and functional modules, have a sophisticated hierarchic structure, input and output communication channels and algorithms of calculations. Thus subsystems and modules within the enterprise badly co-operate with each other, what result in great decrease of efficiency of the installed system.

The second approach intends changes in methodology of accounting, in particular, using of computer form of accounting, and through it — realization of complex computerization of accounting functions. It results in achievement of the most efficiency. Possibility of gradual transition to the system computerization of accounting is not excluded, however complex plan of computerization is needed for this purpose. Accomplishing of IT projects and maintenance of hardware and software facilities may be carried out by external entities that more effectively solve general and specific IT problems. Such approach is called *outsourcing* [81, p. 84]. Outsourcing determines such methodology, when a company delegates creation and maintenance of the system to external organization, and itself only uses information as a result of work of the system.

Generally, from point of view of *accomplishing of works*, to the CFAIS development next approaches are selected.

1. The program is developed by the programmer or specialized subdivision of the enterprise. At the correct task specification the programmers of enterprise can create wholly acceptable software product, which will consider the specificity of the accounting of the enterprise and will be easily improved if needed. But such programs begin to work only in five-six months after their installation. In addition, in their development programmers not always adhere to the standards, so often such programs do not allow to export information in other programs. So, development of the CFAIS by the enterprise programmers often results in large difficulties in installation because of the insufficient experience in this field.

2. The second approach intends development of the program by specialized firm by order. This way is the most expensive. Thus success of installation of the software system depends on the developer, its proficiency, decency and reliability.

3. The third variant intends purchasing of multi-purpose accounting program developed for the bulk selling, which requires only insignificant modification in accordance with the necessities of the specific enterprise. Such program systems are less suited for the specificity of the enterprise, but are cheaper, than developed by the order. The most strong point of such program is that it already installed on a great number of enterprises. Such products usually have been supporting and improving until a developer firm exists. Typical instance of this type of the programs is 1S:Buhgalteria.

Interesting approach is offered by R-Style Trust company [84]. Its software product *RS-Balance* is adjusted for a customer in the developer's office. Specialists of the company actually simulate the accounting process of enterprise by development and testing of control

examples. Thus, at the enterprise not a standard system is installed, but the system with set-up chart of accounts and directories of analytical objects, with described model of accounting records used by the enterprise, with partially formed and fulfilled reference database etc.

3.2. DEVELOPMENT OF COMPUTER FINANCIAL ACCOUNTING SYSTEMS (CFAIS) AT THE ENTERPRISE

Stages of CFAIS development

Stages and iterations of development of information systems are determined by the corresponding Ukrainian state standard (GOST 34.601-90). In this standard the full list of stages and iterations is given. In concrete conditions these stages may be joined or skipped, depending on the features of distinct information system, and also on the agreement between the developer of system and the customer.

The stages given in standards can be united in three basic steps:

- studying of economic activities of the enterprise;
- designing the system and agreement the project;
- implementation and improvement of the system.

At the stage *of studying of economic activities* express inspection of a state of the enterprise is performed and a draft budget of CFAIS development is determined. Also contract with the general contractor is made.

The goal of this stage of CFAIS development is to get actual information about enterprise work and to ground the necessity of creation of CFAIS. At the same time user requirements are formulated.

During inspection the docflow, forms of source and reporting documents, procedures of calculating of selected parameters are found out. The inspection is performed with assistance of the workers of customer enterprise. It may disclose problems, which are possible to solve with the help of computer facilities, and also helps to assess the expediency of CFAIS application.

At the first stage requirements to the system are agreed with the customer. They can include maximum cost of development, deadlines, condition of work of the system, list of system functions etc. At this stage it is necessary to define exactly what information the system will give to consumers (both internal like enterprise and subdivisions managers, and external like shareholders, insurance companies, banks, tax and statistical bodies etc.); the sources of information; sequence of transformation of the information into the form convenient, understandable and suitable for the further use and analysis.

At the stage of studying of the accounting organization at the enterprise the following is defined: requisites of source documents by which processing of the information is carried out;

volume of the reporting information; routes of movement of requisites according to which the source data in electronic accounting registers is formed; interrelation of parameters of these registers; present forms of accounting; system of controls; coding system; available computer facilities.

Work breakdown structure for the first stage of CFAIS development is represented on fig. 3.8.

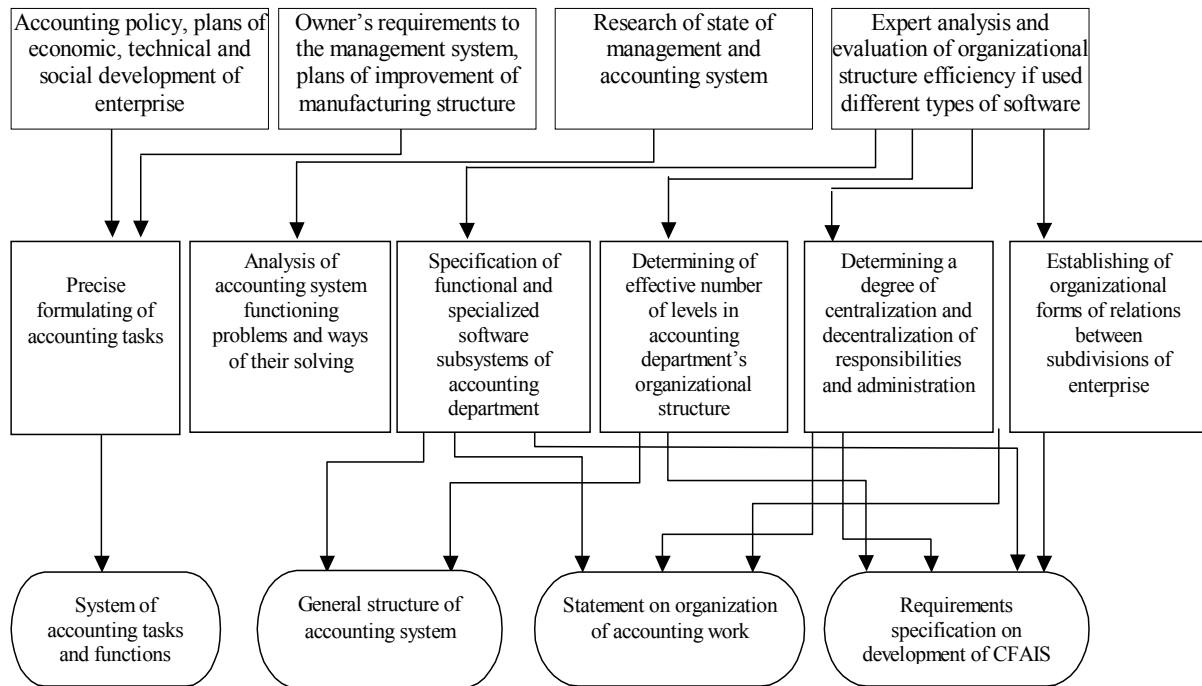


Fig. 3.8. Work breakdown structure for the first stage of CFAIS development

At the stage of designing the system and agreement the project a consulting firm (system integrator) creates a system project of CFAIS. The project usually includes:

- functional and information models of rational business processes;
- circuits of internal and external docflow;
- set of forms of incoming and resulting documents;
- logic structure of the integrated database; structure documents base;
- functional and information specifications of the typical automated workplaces;
- functional and information models of docflow procedures etc.

Then on the base of system project the system integrator with the assistance of specialized division of enterprise performs reengineering of business processes of the enterprise.

Preparation of the enterprise for computerization starts with issuing the statement about changes in enterprise structure, docflow, in segregation of duties between employees, and transition to new technology of accounting data processing. Statement has a custom form, but anyway it must contain the terms of transition to the new technology and the persons responsible for implementation and operation of the information system. This statement also may be included into the statement about organization of accounting at the enterprise.

The principles developed on this stage are so important, that some scientists suggest to issue a separate statement devoted to technical policy. In computerization of accounting «technical policy» extends the organization of accounting and means just choosing one of possible computer forms of accounting.

On the design stage the requirements to CFAIS are formulated. For this purpose we need to ensure cooperation of broad audience of experts — lawyers, programmers, engineers, heads of divisions, and the future users of system who will directly work with CFAIS. During this stage procedures of interaction of accounting personnel and directions of movement of documents in system are defined, forms of reports are coordinated and approved, design of documentation (both user and technical) is made. The software developer analyses technology of accounting department of the customer and structure of accounting system and suggests actions on redistribution of executors between work areas and organization of their interaction.

On the design stage we need to understand that the computerization is a continuous process. Therefore it is necessary to agree with A. Sharova [126] that it's very important to develop a correct requirements specification, which will not be modified on the later stages. However the customer should mention in the contract his right to make certain changes in the specification during the design process.

While designing of CFAIS, it is important for the developer to use his own experience of development of CFAIS at similar enterprises combined with the experience of economic departments of the customer enterprise. In this concern it is important to provide different schemes of business models, which the administration of the customer enterprise will further be able to use (fig. 3.9).

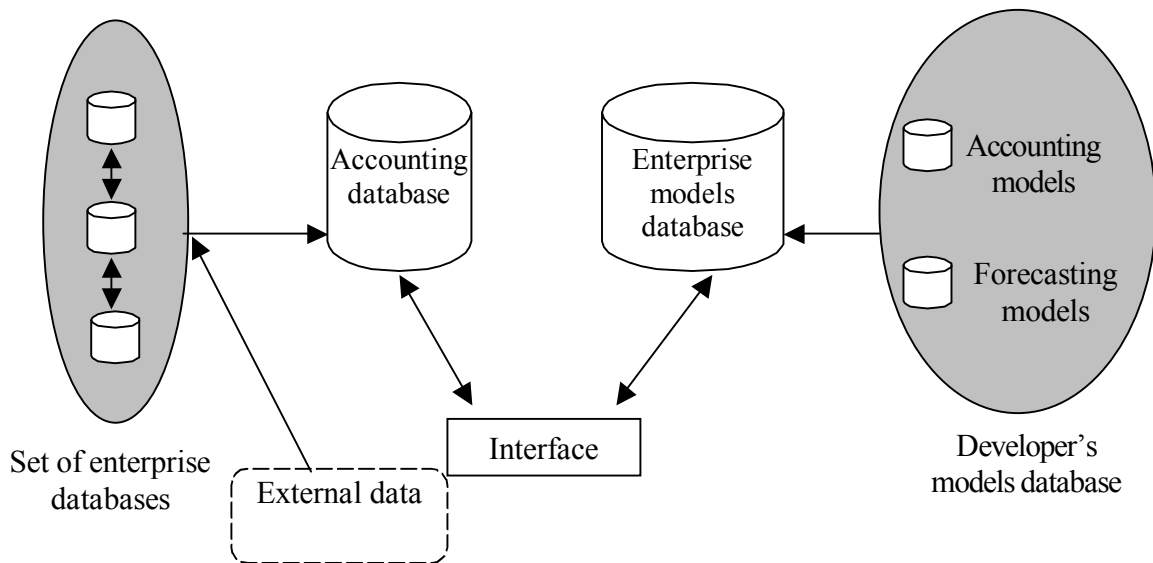


Fig. 3.9. Structure of CFAIS according to principle of modelling

Other important problem on the stage of design of CFAIS is its adaptation to changes in legislation. In spite of the fact that accounting is the most regulated administrative sub-function, it is not just a rigid mechanism which essence is reduced to constant algorithms and programs. At the same time, it is a dynamic system, which is permanently improving and changing. All this means that computer system should have some elasticity for adaptation to the changes caused by improvement of management and shifts in legislation. If we do not consider this aspect of accounting during the designing of CFAIS, it will be quite inconvenient or even useless.

At the stage of *implementation and improvement of the system* agreements are signed and assistant software tools are delivered to the support service of the system. Also training of experts is organized. This stage covers the following activities:

- development of applications;
- creation of telecommunication system of the enterprise;
- seminars and training for experts, middle and top management;
- purchase of equipment for information system of the enterprise
- installation, assembling, starting-up and adjustment of the equipment;
- trial operation of assistant software tools.

When CFAIS project is designed, a necessary condition of its successful inculcation is proper selection and training of the staff for work with information system. It may be organized by the software developers (lectures, seminars, workshops) or with the help of special courses of qualification improvement. During such training each worker should not

only understand the changes in his official duties, but also learn to work with computer facilities. Such training may also intend mastering of the most widespread application packages (e.g. Microsoft Office).

At the same time with preparation of the personnel jobs on installation and adjustment of hardware and software are conducted; places of establishment of computers, means of their protection, persons responsible for storage and support of the software are defined; necessary software packages are installed. In case of need building and assembly jobs connected to cable laying, installation of the equipment, and change of illumination of places in which computers are established are performed. The developer must test the system before installation to check the work of hardware and software and usability of applications.

The main differences between packages of financial accounting programs is in degree of their flexibility and available means of adaptation: chart of accounts and system of their coding; list of program functions; structure of printed forms of documents; segregation of accounting between several divisions; accounting in subdivision placed in different countries (in different languages, currencies and individual charts of accounts); integration of the subdivisions accounting information at the corporation headquarters. All this affects the price of financial accounting program, which may vary from fifty dollars to tens of thousands.

Work breakdown structure for implementation and improvement of CFAIS is given on fig. 3.10.

So, in development of CFAIS as a separate system and especially as a component of CIS we must accomplish the following tasks:

a) reorganization or business-processes of the enterprise (concerning organizational structure, work technologies, management system). For this purpose it is advisable to invite an independent consulting firm and perform business consulting;

б) automation of activity of the enterprise (development and installation of computer information system). This stage is recommended perform by joint efforts of the consulting company, the system integrator and the internal automation division of the enterprise. At this stage consulting is carried out in the field of information technologies (IT-consulting).

Existing variants of life cycle define the order of performance of CFAIS development stages, and also criteria of transition from stage to stage. The most popular are the following two models (fig. 3.11).

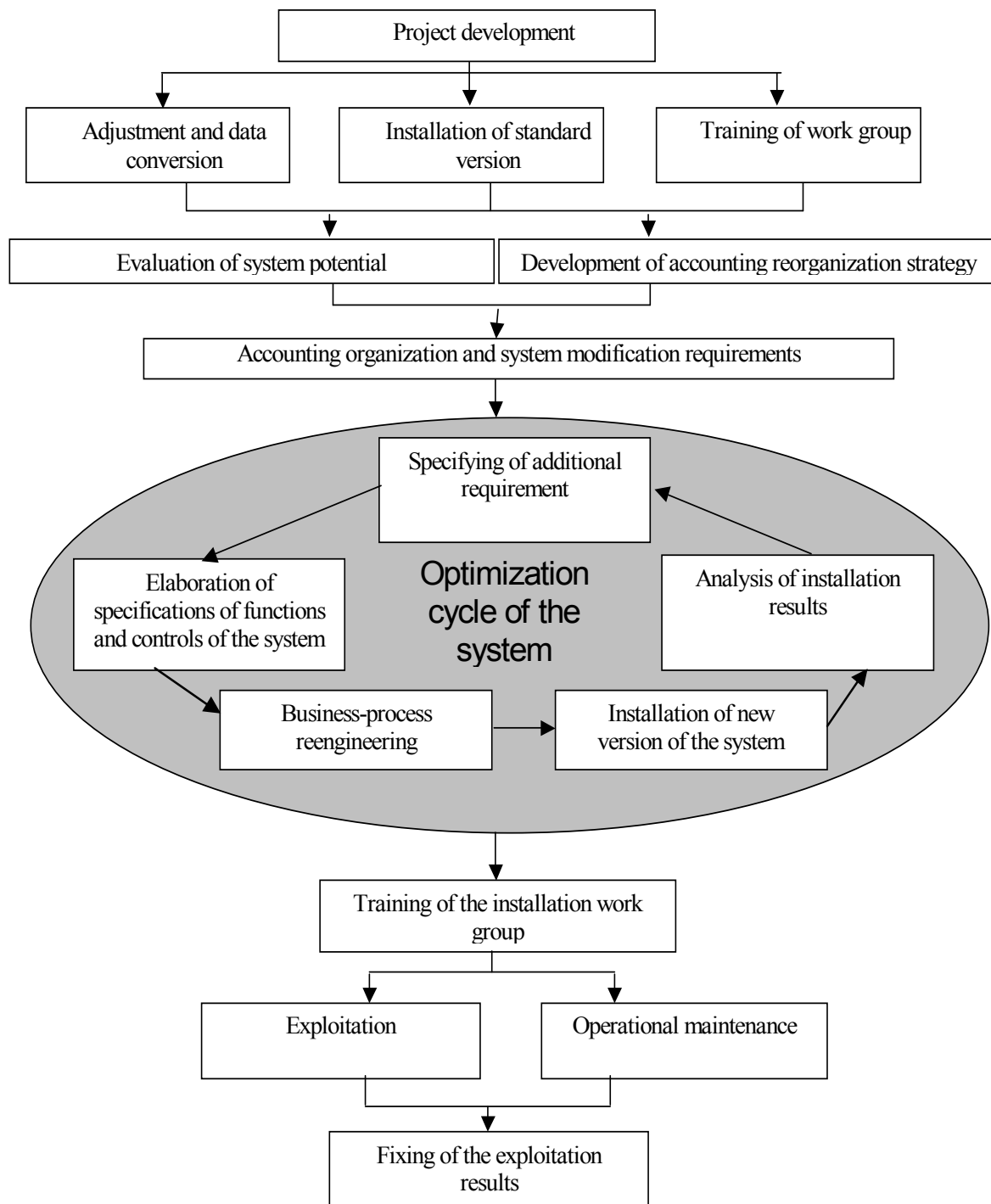


Fig. 3.10. Work breakdown structure for the third stage of creation of CFAIS

Waterfall lifecycle model intends transition to the next stage after full completion of jobs on the previous stage.

The spiral model is based on repeating of life cycle stages: analysis of requirements, elaboration of specifications, preliminary and detailed engineering. Each loop of the spiral is a waterfall lifecycle and results in creation of a module or version of CFAIS. This model is the most perspective for CFAIS development.

Experts in software engineering and design notice the following advantages of spiral model [28, p. 59]: accumulation and a reuse of design solutions, tools, models; orientation on changes and improvement of system and technologies in the design process; analysis of expenses and risks.

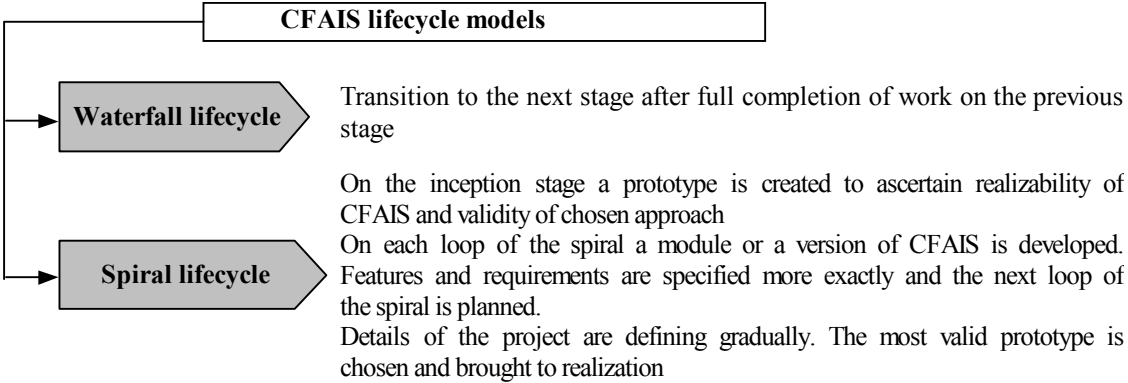


Fig. 3.11. CFAIS lifecycle models

Characteristic of CFAIS personnel

CFAIS personnel consist of experts who create the system (study economic activities of the enterprise, design and install CFAIS), and experts who use it. The list of system users includes: accountants who perform the current tasks on computers, IT-experts, top and middle management, who consume information received from the system. At a small enterprise chief accountant often plays all these roles.

The list of experts taking part in creation of the system is wider. On the stage of studying of economic activities of the enterprise, in addition to consultants who perform the research, it's strongly recommended to involve the staff of accounting department, all heads of divisions and, accordingly, top management. It is very important to engage professional auditors and IT-consultants on this stage.

CFAIS development requires interaction of the following categories of personnel [81]: users, application programmers, system programmers and system integrators (fig. 3.12).

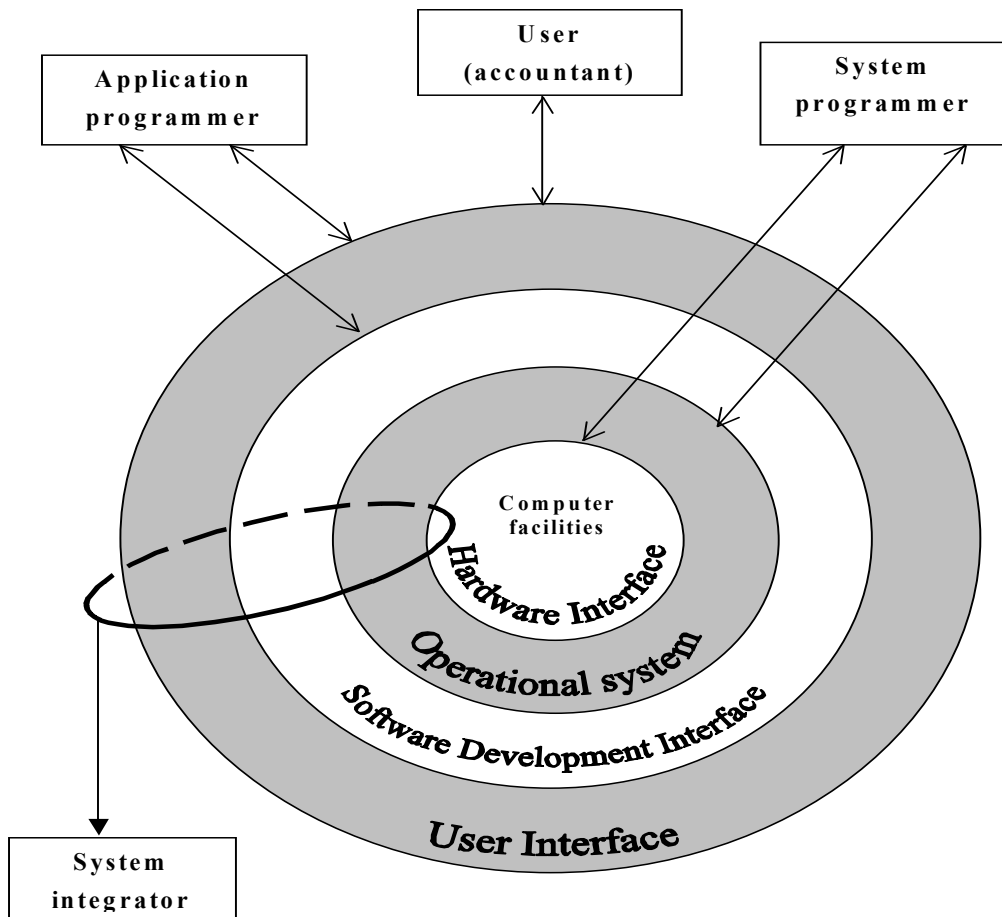


Fig. 3.12. Interaction of experts with a hardware and software while CFAIS development

User (accountant) specifies the accounting tasks. Then he independently or with the help of *applications programmer* chooses an application package that provides the functionality of the formulated tasks. As a rule, one can find several application packages of different complexity. Application programmer also helps to adjust the software to the actual tasks of the user.

System programmer chooses necessary operational system and integrates hardware and software facilities into single system ready for loading of initial data and installation of application packages. System programmer is an expert who understands features of hardware functioning, problems of data transfer in computer networks, has operational systems programming skills and experience.

System integrator accompanies the user during studying of the computer facilities. He estimates complexity of tasks, recommends hardware and software for purchase, helps to assemble hardware modules, chooses and installs the necessary software, trains the user and solves together with him a complex of tasks with use of the predefined data.

Development of accounting system structure

In conditions of non-computerized processing of accounting data the most effective structure of accounting system is centralization. Such structure is the most comprehensible, as it enables performing effective control and segregation of tasks, though it does not allow middle management to use data of operational accounting for the needs of operative administration.

Among lacks of decentralized structures there are complication of segregation of tasks between accountants, increase of the staff and, accordingly, salary expenses, inopportune reporting, impossibility of effective control.

In general the structure of accounting system could be based on the following set of principles:

- definition of one basic function for each structural division;
- submission of no more than 5-8 accountants to one manager;
- segregation of duties according to individual abilities of executors;
- decentralization of operative responsibility by objects of accounting and control.

By the structure of accounting department it is possible to allocate three groups of the enterprises on which work: a) 1 or 2 accountants; б) 3 to 8 accountants; в) more than 8 accountants.

If number of accountants is from 3 to 8 a chief accountant beholds functions of control of data input. If number of accountants is more than 8 it is necessary to divide accounting department into parts of accounting work. There may be parts of control of source information, automated data processing and storage, forming of resulting documents, parts of documentary control, inventory, accounting archive etc. It is necessary to create specialized IT and control parts, and also part of data input (fig. 3.13).

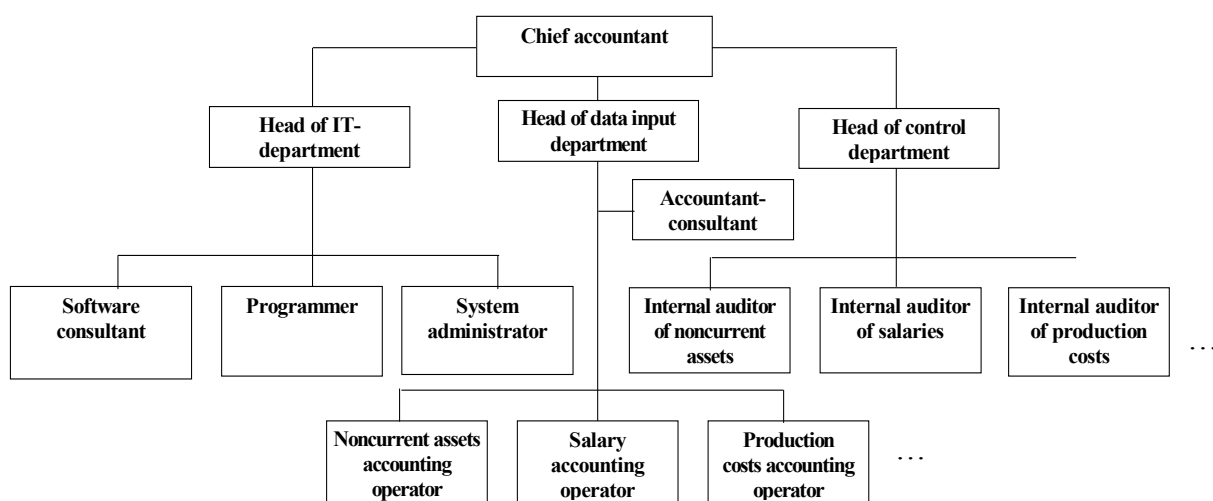


Fig. 3.13. Structure of accounting departments at the large enterprises

Traditionally segregation of tasks of accountants is based on the set of accounting tasks (or parts): accounting of fixed assets, accounting of stocks, accounting of payments, cash accounting, accounting of clearing transaction, accounting of production costs etc. In conditions of computer form of accounting the list of accounting tasks remains constant, but storage and transformation of the data, and formation of the resulting data are performed in single database.

Computer form of accounting allows flexible segregation of the accounting work by different parts of accounting. Structure of accounting tasks remains constant at different volumes of accounting work, however the list of staff essentially varies depending on the size of enterprise and, accordingly, volume of accounting work. As D. Potter says, «at large enterprises a distinct department responds for each functional area (function), and at small one department or even one person embraces several functions» [23, p. 452]. It's convenient to represent the peculiarities of organization of accounting departments of the different sizes with diagram (fig. 3.14)

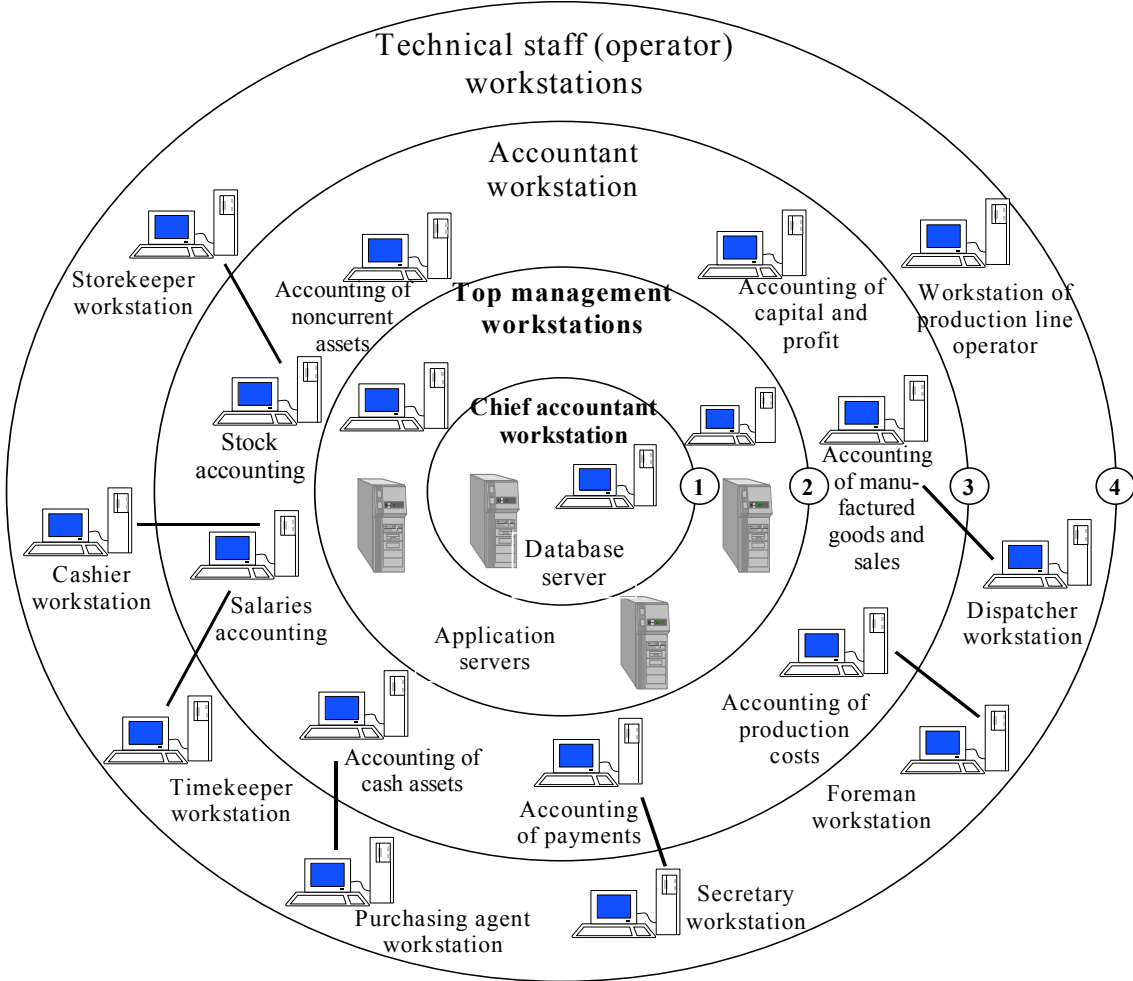


Fig. 3.14. Universal model of accounting system in conditions of computer form of accounting

At a small enterprise a single person (chief accountant) keeps accounting on a single computer (circle 1 on fig. 3.14). If necessary, computers of managers are connected to his computer (circle 2).

With increase in volume of accounting work number of accountants at the enterprise also increases. Accountants' workstations from different parts of accounting are connected into a local area network (circle 3). To improve efficiency of accounting work we should allocate a server on which the database will be stored and to the most part of calculations will be accomplished.

The realization of information technology of accounting on larger enterprise requires application of multilevel computer system, based on automated workplaces of technical workers (primary accounting), functional workers (parts of accounting, circle 4) and managers. Organization of accounting at industrial enterprise based of automated workplaces will include at the lowest level the automated workplaces of primary accounting workers (storekeeper workstation for accounting of stocks, workstations for accounting of production output, good manager workstation for accounting of manufactured goods). Actually, CFAIS at this stage turns into CIS of an enterprise. The information based on the entered data is transferred through communication channels to the accounting department.

The subsequent levels of the system concern to accounting department and contain automated workplaces of the parts of accounting and of distinct synthetic accounts (accounting of fixed assets, stocks, salaries, payments, manufactured goods and their selling, clearing transactions, production costs). Accountants supervise entered data, check its completeness and reliability, fulfil if needed and create an accounting database. It is filled up with information from other automated workplaces and information systems of the enterprise. Also it is possible to organize an automated workplace of the accounting analyst and automated workplace of the auditor. These two types of workstations cover tasks of analysis and control performed by accounting department staff.

Typical schemes of accounting mechanism at industrial and retail enterprises in conditions of computer form of accounting, structured by three levels of automated workplaces, are represented on fig. 3.15, 3.16.

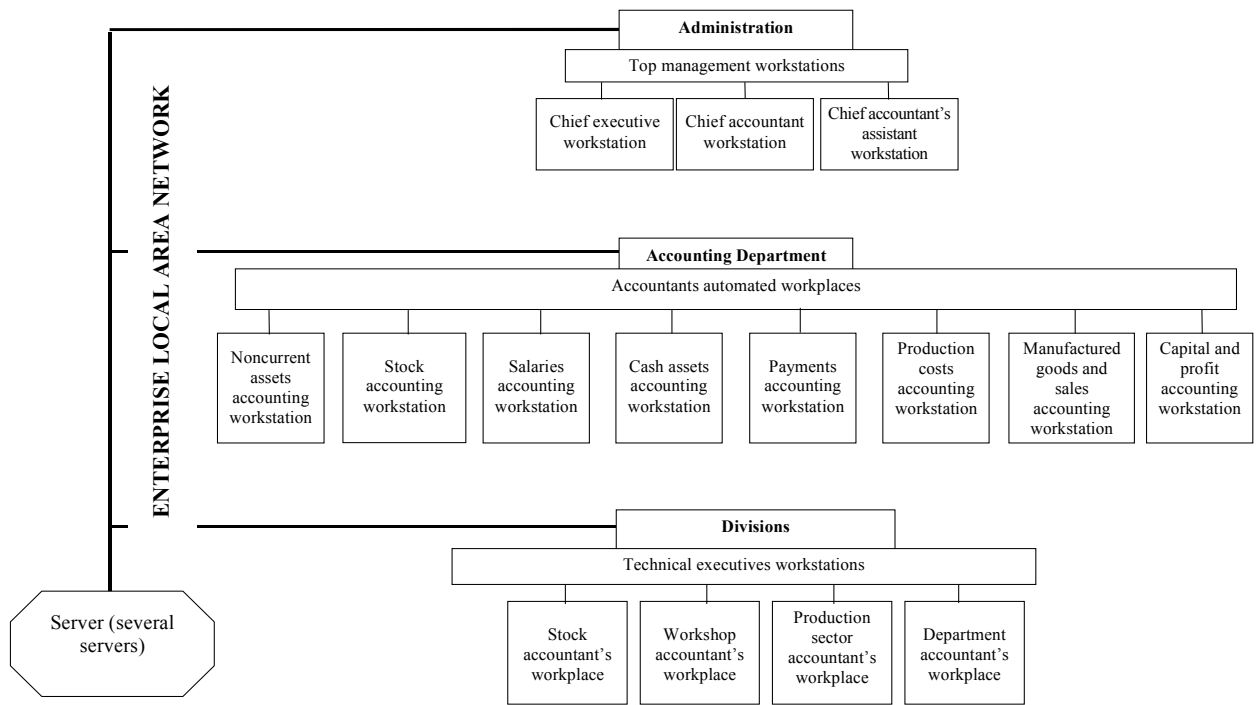


Fig. 3.15. Structure of accounting system and a LAN – industrial enterprise

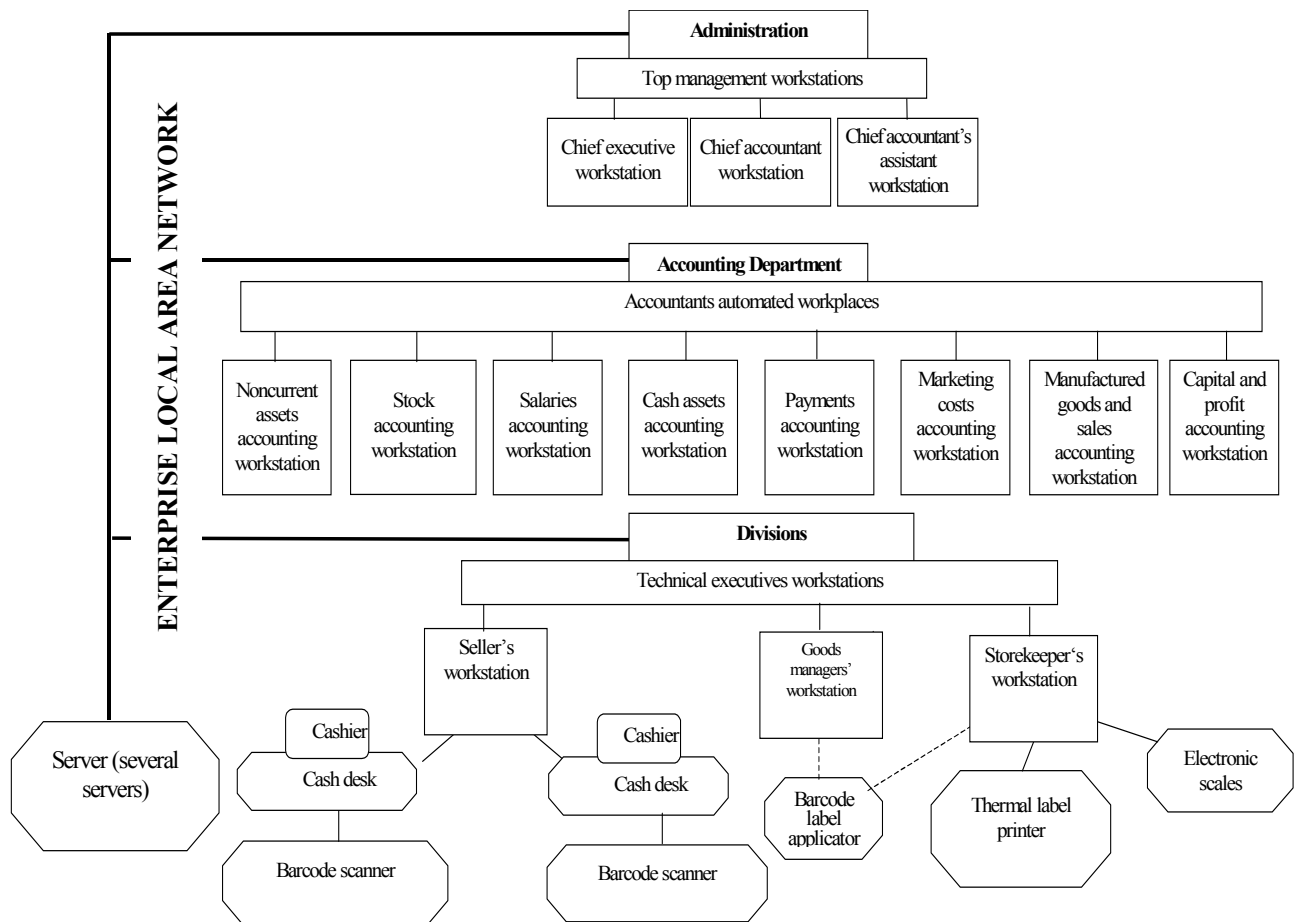


Fig. 3.16. Structure of accounting system and a LAN – retail enterprise

Cost and economic efficiency of CFAIS

When we purchase a computer program of financial accounting it is necessary to know, that the price usually does not include setting up of the program according to requirements of the enterprise. The price per workstation without cost of adjustment in advanced countries usually varies from 300 to 1000, and even up to 2000 dollars. Cheaper systems either are difficult to adjust, or are intended only for distinct sphere of application.

Complex ERP class systems is rather expensive for implementation. E.g. if the price of the program itself is 6-10 thousand dollars, its installation costs are tens of thousand dollars. For more simple programs installation and consulting are cheaper, within 17-20% of the cost of the program. For training of the personnel it is spent from 50 up to 1000 dollars, on consultation of accountants — 900 dollars per day.

According to Ernst and Young, during realization of the project connected with networks in developed countries, 20 % of expenses are spent on equipment and software, and about 80% – on maintenance of the system and training of the personnel [77, p. 27]. Sometimes inculcation costs may exceed the cost of software. There is such parameter, as the relation of inculcation costs of software product to the cost of the product. Numerical value of this parameter changes from 1 to 12 depending on the country. Unfortunately, for the former Soviet states this parameter, according to experts, is 1-3 [84] that indicates a low level of support and insignificant money spent on implementation of software products.

To define more exactly the cost of information technologies a Total Cost of Ownership (TCO) method was developed. It includes not only expenses for purchasing of some equipment, but also cost of its repair, upgrade, accessories, service etc. Total cost of ownership for information technologies includes cost of hardware, software, repairing, upgrade, service, technical support, cable laying for a network, training of experts etc. According to Gartner Group, in the USA the average index of TCO is 10-12 thousand dollars per a network connected PC [90]. It is obvious, that this sum is considerably bigger than a cost of computer.

In calculation of economic efficiency of computerization of accounting a set of parameters is used. The most important of them are given in tab. 3.2.

Table 3.2.

Economic efficiency indexes of financial accounting computerization

N	Index	Order of calculation	Variables
1	Absolute index of economy	$TS = C_m - C_c$	TS – total saving; C_m – cost of manual processing of the accounting information; C_c – cost of computerized processing of the accounting information
2	Index of cash expenses	$I_{ce} = C_c : C_m$	
3	Index increasing/decreasing of cash expenses	$I_{che} = C_m : C_c$ $I_{che} = 1 : I_{ce}$	

4	Cost of CFAIS development	$C = C_0 + C_1 + C_2 + C_3 + C_4$	<p>C_0 – cost of CFAIS designing;</p> <p>C_1 – cost of hardware and software;</p> <p>C_2 – cost of creation of local computer network (LAN);</p> <p>C_3 – cost of development and debugging of the applications within CFAIS framework;</p> <p>C_4 – cost of writing the documentation and training of experts</p>
5	Economic efficiency of CFAIS	$\Delta C = \sum_{ji=1}^n C_{ji}^p - \sum_{ji=1}^n C_{ji}^c$	<p>ΔC – Savings caused by application of computer facilities;</p> <p>$\sum_{ji=1}^n C_{ji}^p$ – Total cost of paper processing of accounting information;</p> <p>$\sum_{ji=1}^n C_{ji}^c$ – Total cost of computerized data processing</p>
6	Efficiency of use of computer facilities	$E_{cf} = L_c : L_m$	<p>L_m – total labour expenses of manual processing of the accounting information;</p> <p>L_c – total labour expenses of computerized data processing</p> <p>L_r – absolute reduction of labour expenses (per month) as a result of computerization of accounting;</p>
7	Reduction of work complexity	$L_r = L_m - L_c$	
8	Number of typical operations which can be additionally executed per time unit	$N_{to} = (L_{tm} - L_{tc}) * N_a$	<p>L_{tm} – labour expenses of typical operation in conditions of manual processing of the information;</p> <p>L_{tc} – labour expenses of typical operation in conditions of computer data processing;</p> <p>N_a - average number of typical operations that are performing at the moment</p>
9	Specific cost per any category of the equipment	$C = \frac{TOC}{E * U * L}$	<p>TOC - total operational costs for the given category of the equipment;</p> <p>E - estimated exploitation period;</p> <p>U – use factor of the equipment;</p> <p>L - ultimate load of the equipment (in load units)</p>
10	Payback time of CFAIS development	$T = \frac{C_d}{P_{avg}}$	<p>C_d - cost of CFAIS development;</p> <p>P_{avg} – average profit received from use of CFAIS per period</p>
11	Number of accountants to be	$N_d = \frac{L_r}{W_m}$	<p>L_r – absolute reduction of labour expenses (per month) as a result of computerization</p>

	dismissed		of accounting; W_m – total working hours of one accountant per month
12	Number of accountants to be dismissed	$N_d = N_c * I_{sh} * L * (N_{sp} * (I_{pl} - 1)) - N_{mw}$	N_c – number of computers of the given kind; I_{sh} – shift index; L – load factor of computers; N_{sp} – number of service personnel per one computer; I_{pl} – norm of increase of labour productivity on the given computers; N_{mw} – number of computer maintenance workers

It is necessary to mention that in taking the decision about use of computers such factors as the increase of company prestige and global tendency of computerization (as specified 40% of British companies [66]) play an important role. Therefore many companies are developing CFAIS without paying attention to uncertain efficiency questions. This may explain an unequal attitude in world practice to the problem of determining CFAIS economic efficiency. Survey of the US 48 large corporations has found out, that only half of them perform accounting of maintenance of equipment that enables calculation of efficiency of electronic data processing [41].

According to the foreign media, installation of contemporary ERP systems at enterprises gives a significant economic effect [123], which in particular appears in:

- increasing of capacity efficiency — up to 20 percent;
- economy of liabilities — 1 to 6 percent from the amount of sales;
- decreasing of spoilt production — up to 35 percent;
- decreasing of stocks in warehouses — up to 40 percent;
- decreasing of transportation and supervising expenses — up to 60 percent;
- reduction of expenses for administrative and management personnel — up to 30 percent, etc.

As practice of Ukrainian and Russian enterprises shows, return of investments into control system is obtained first of all because of [123]:

- reduction of losses directly in workshops by 20-30 percent because of transparent and actual online production planning and accounting of manufacturing;
- decreasing of stocks in warehouses by 20-25 percent (in 5-6 months after start of system);
- avoiding the unaccounted shortages (3-5 percent of all stocks);
- reduction of the unreasonable delivery of materials by 10-15 percent;
- decreasing in expenses of accessories by 20-30 percent;

- reduction of cost of production by 3-5 percent because of reduction of workshop and general expenses;
- decreasing of accounts receivable by tens percent at the expense of their total personified control;
- preventing the unreasonable discounts while shipment of goods (3-5 percent from the sum of shipment).

3.3. CONTROL OF ACCOUNTING RECORDS IN CFAIS

Control of activity of accounting personnel and accounting system intends checks of correctness of use of chart of accounts, accounting registers, conformity of synthetic and analytical data to the data of balance sheet and other reports. Special algorithms implemented in CFAIS allow to supervise all registered documents according to planned tasks, and to maintain verbal orders and tasks of managers.

The control of accounting system maintenance enables to find out the reasons of errors in reporting. Such reasons may be: deliberate distortions of accounting data in source documents or consolidated registers; careless, negligence or ignorance; weaknesses of accounting system which does not consider specificity of the enterprise.

Errors in reporting may also be caused by fraud of the personnel, which can be divided into two groups. Accountants, cashiers and other personnel who possess the right to carry out accounting records belong to the first group. They usually commit frauds by modification of accounting registers. The second group consists of enterprise managers. They may make a fraudulent action by distortion of enterprise reporting, granting of unauthorized discounts on production price, manipulation with valuation of commodities etc.

To prevent the abuse caused by deleting or changing of the records, it is necessary to grant access to records only to that accountant who works with this peculiar part of accounting work. At the end of every working day all operational journals or Journal of economic transactions may be printed out and certified by signatures of two independent employees of the enterprise.

For revealing the abuse made by granting the unreasonable discount from the price of a product or the goods and other unauthorized actions, in computer program search engine must be implemented that will allow to find the accounting records by single criterion or their combination (date of shipment, price, party, amount of goods etc.). For this purpose in the program it is recommended to provide an identification of each accounting record by set of attributes according to which we can supervise specific contracts.

For example, if the enterprise regularly buys raw materials, for internal auditing it is enough to select all records on these raw materials for certain period of time. Then using monthly inflation ratio we find deviation of price from its real value. If such deviation exists and is considerable, it may be an occasion for further investigation.

Computerization essentially changes some of control functions which in the past were performed only manually. The information system provides the continuous control of both forming of documents and current accounting records. It is caused by that information computer system includes built-in algorithms that determine rules of accounting, schema of docflow and set of responsibilities. Practical result is a decreasing probability of casual and deliberate errors.

While controlling of CFAIS maintenance it is necessary to remember that:

- changes in documents can be made not only by authorized accountants, but also by unauthorized personnel with sufficient qualification who have access to software and computers;
- as automation of accounting intends codification of economic transactions, wrong codes of analytical accounts may be used to falsify the accounts. In directories of the constant information (surnames of employees, names of stocks etc.) erroneous data can be intentionally entered with the purpose of subsequent modification of the accounts;
- completely unreliable accounting and reporting data may be used (all accounting registers and the reporting). If the auditor during check does not apply methods of substantive control (inventory etc.), he will not discover corruption of the reporting, and, accordingly, the auditor conclusion about reliability of the enterprise reporting can be used to deceive investors, creditors, shareholders. For revealing the facts of corrupted accounting records in conditions of automated processing of accounting information, it is recommended to pay attention to the following: 1) how the process of delivery of sanctions for economic transactions is conducted and documented; 2) quality of internal data security controls; 3) how the internal controls of information storage is organized.

To decide the problem of accounting records control is possible with creation of parallel information streams that supervise each other and assure reliability of accounting data. Such way of accounting provides duly revealing of deviations after which the accountant works not with all information but only with these deviations. In that case the electronic accounting register (journal of transactions) is not corrected, but is saved incorrect. All errors that appear in the further work, or are corrected by accountant in the register, are fixed in separate journal. During all accounting cycle (month) the data fixed in memory of computer, is not corrected. After the end of month an accountant receives two registers on each part of work – a continuous main register with errors, and correct register with corrections. In this case there is a "trace" which precisely shows all the corrections made. The accountant precisely knows the result and, what is very important, has no opportunity to directly correct initial record.

But if requirements to the control of accounting information are not so strict, it is recommended to unite separate parts of accounting work so that the facts of reception in one

part (e.g. warehouse) and shipment in another (e.g. according contract of supply) will be registered as single operation and opportunity of data discrepancy will be made impossible.

Unfortunately, the developers do not pay appropriate attention to maintenance of control efficiency. In publications of N.V.Komleva [91] , J.Mihaylova [99], S.P.Proskurin [106] it is mentioned that CFAIS should be designed ultimately in that way when any sum is automatically recoded on two accounts without any check. This rejects an important principle of *collation* in computerized accounting [103], which indents cross-control of two information streams.

The most of contemporary financial accounting software is designed for cooperative work of accountants in the network, so they should be based on the principle of responsibility: each accountant is responsible for entering the information of his part of accounting work. It is provided by "executed", "postponed" and "rejected" records. After entering of economic operation balance and turnover change only for those accounts that concern to this sector. For the corresponding account if it does not concern to this part of accounting work, record is "postponed" until the accountant on sector of this corresponding account confirms it.

The second accountant may confirm or reject the record entered in adjoining sector. It provides independence of each executor. Without his consent any record entered on an adjacent sector, will not change turnovers and balance on his account.

With the help of segregation of functions between accountants, we can, on the one hand, improve the quality of their performance, and, on another hand, perform the additional control. E.g. the records entered in one sector, but postponed or rejected in another may contradict each other. Accountant responsible for consolidated accounting receives the full list of inconsistent records and takes a decision. Summary reporting of the enterprise can be generated only when all the records concerning to different parts of accounting work, are confirmed in all sectors.

For example, in the Integrator program system provides the coordinated work of all personnel and one time introduction of information based on principles of responsibility and sovereignty. In network version of the system records from adjoining sectors not confirmed in the current sector, do not change turnover and balance of the account of this sector.

Other mechanism of the control is applied in *IS:Buhgalteria 7.7*. In it for each account we may assign attributes "Active", "Passive", "Active-Passive" used for revealing errors. So, if for the "active" account credit turnover exceeds debit turnover the negative debit balance will signal about error. The system automatically checks correctness of use of off-balance accounts: the correspondence of off-balance accounts with balance accounts is not allowed. On the other hand, a record with off-balance accounts in general may not have the corresponding account at all.

In computer form of accounting the source information is entered into system directly from workstations. Therefore one of the most important factors for choosing the structure is a possibility of control of accounting data reliability and reliability of information ties inside the

accounting department and between the accounting department and subdivisions of the enterprise.

Considering this, perspective is such structure of accounting department in which instead of parts of accounting work two basic departments subordinated to the chief accountant are allocated: the department of information system and the control department (fig. 3.17).

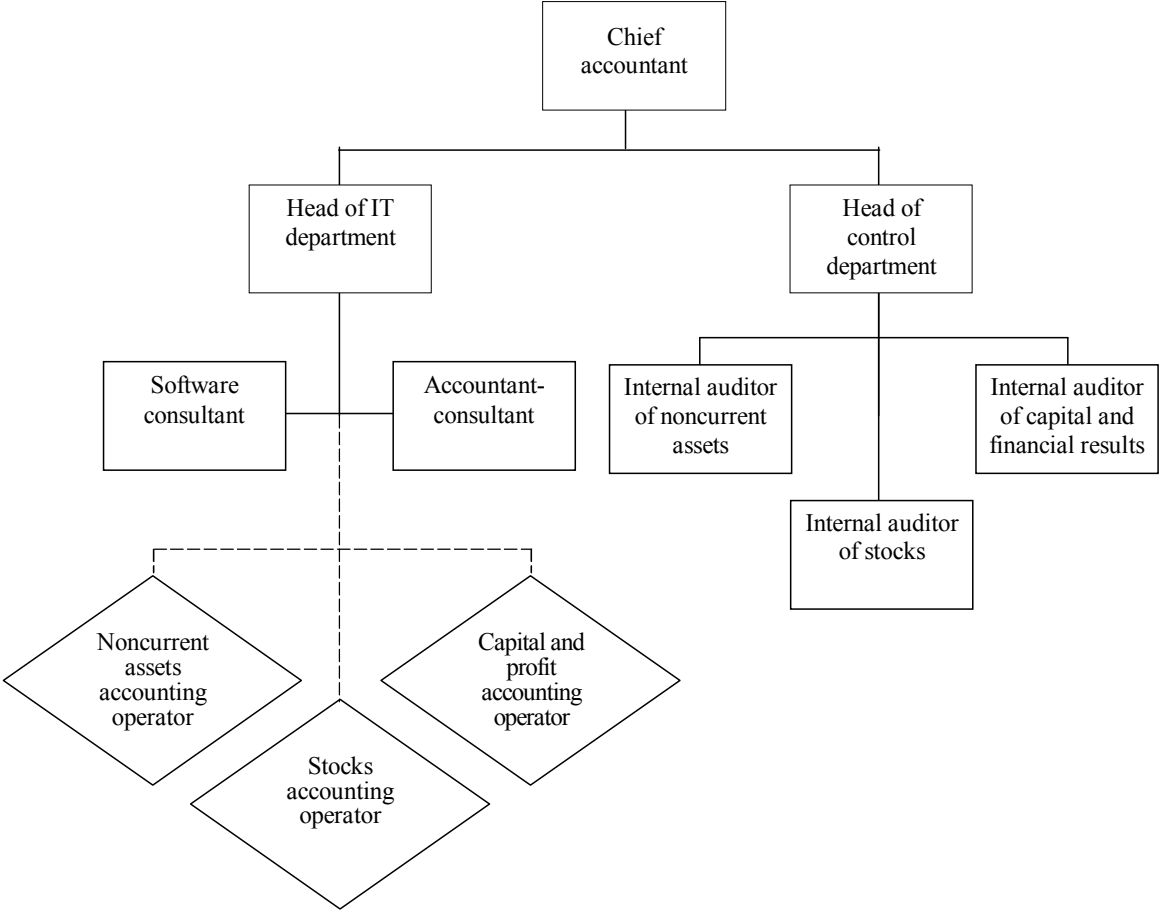


Fig. 3.17. Perspective structure of the accounting system

Information department maintains ties with structural divisions. To this group of personnel belong engineers, programmers and accountants-consultants who help technical workers to enter source information. These employees provide continuous updating of information in database and current debugging of CFAIS.

Control department consists of group of internal auditors who directly do not enter accounting information in database, but control the correctness of its introduction and correct it, if needed. Competence of internal auditors also includes development and check of following of the accounting rules, drawing up the reporting, performing accounts valuation, comparing of norms and the facts and its estimation.

3.4. CFAIS SOFTWARE

Requirements to financial accounting programs

Requirements to financial accounting software products are formed by three different categories of users: accountants — direct users of the system; IT experts — programmers and technicians; administration — managers. Unfortunately, the most part of publications in specialized magazines reflects vision of IT experts who are not capable to characterize all complexity of accounting functions, which a program implements. Often there is no system approach and precise understanding of the problem; moreover many authors mix requirements to accounting functions with such characteristics as speed, number of workplaces, quality of documentation etc. Considering that requirements to financial accounting programs is a complex set of functional, technical, commercial and ergonomic questions, we offer the list of requirements for comparison of computer programs of accounting (tab. 3.3).

Table 3.3.

The characteristic of requirements to the financial accounting software

Kind of requirements	Requirements	The brief characteristic
Functional	Journal of transactions	Ability to fix and accumulate all economic transactions that reflect economic activities of the enterprise
	Analytical accounting	Ability to conduct analytical accounting in segments and with level of detailing required for the needs of management
	Quantitative accounting	Ability of keeping accounting in a natural measuring units
	Accounting in foreign currency	Accounting in currencies different from basic currency
	Flexibility	Ability to adapt the program to features of distinct enterprise and to changes in the legislation
Technical	Acceptable hardware requirements	Ability to work effectively on computers with average technical characteristics
	Documents editor	Built-in means of creating and editing forms of source documents, calculations and reports
	Export-import of the data	Ability of data exchange with other programs and devices (cash registers, technological sensors, barcode scanners)
	Networking facilities	Ability to work simultaneously on several computers with single database in computer network
	Information security	Maintenance of information coding and access control
	Back-up copies of documents	Built-in means of making back-up copies of the data with an possibility of fast restore

Commercial	Price	Price of software and technical support acceptable for the enterprise and
	Support	Training users, online consultations, updating of the software
	Documentation	The qualitative detailed printed documentation to programs
Ergonomic	User interface	Convenient and harmless to health
	Technical support	Software help system which allows to receive an explanation of each function or action in the program

The basic *functional* requirements to programs are: ability to fix and accumulate all economic transactions that reflect economic activities of the enterprise; ability to calculate results for accounts (turnover, balance) for any moment and at any number of entered economic transactions; processing of correspondence of economic transactions with the instruction(indication) of concrete analytical objects and formation of reports in a sector of analytics; quantitative accounting of commodities; accounting in several currencies; ability of quick and painless adjustment chart of accounts, forms of account, records templates, reporting for needs of the specific enterprise (irrespective to organizational form and type of activity), and according to probable changes in legislation.

Technical requirements include, first, quality of programming (algorithms of data processing) which the most of users cannot estimate and, second, presence of some service parameters necessary for effective work of the program. Basic technical requirements are: reasonable hardware requirements — the program must effectively work on computers with average characteristics; ability of editing of documents and reports that allows the user to create any custom form of the report; data exchange with other programs and devices (e.g. cash registers); work in local computer networks; maintenance of information security and access control; means of creating back-ups of data and automatic recovery of the information in case of breakdown.

Commercial requirements include conditions of purchase and maintenance of the program. Basic commercial requirements are: acceptable price of the program (it is necessary to distinguish cost of software product and cost of its implementation and support); support of the software which means training to job with the program and debugging of the program; online consultations on problems which arise during work; updating and quick replacement of old versions of software products; high quality of paper and electronic documentation.

Convenient user interface and advanced software help system belong to *ergonomic* requirements.

Requirements to accounting programs are formed by different groups of users. The more of these requirements are satisfied by the program, the higher is its level. Interesting is that requirements of business to CFAIS differ insignificantly for the enterprises of different fields [23, p. vii]. The size of the enterprise is a uniform attribute that essentially affects the requirements to automated systems.

Before studying a specificity of computer accounting at small, large and middle-size enterprises, it is necessary to specify the term «large enterprises» from accounting point of view. According to methodology of accounting such enterprises are characterized by the big staff of accounting, economic and financial departments, narrow specialization of each employee of the distinct sector, vast diversity of source and reporting documents and precisely adjusted technology of their processing.

Accounting departments of big and middle-size enterprises are appreciably integrated with other both economic and technical departments. Often such enterprises are already equipped with computer facilities that are used not for accounting and financial tasks. Within the framework of branch and structural subordination such enterprises de facto inherit branch and regional standards of granting budget, financial and accounting information. As a rule, big and middle-size enterprises have territorially distributed centres of cost accounting, remote warehouse facilities, and sometimes a trading network.

In defining of big enterprise for accounting purposes there are two key parameters: quantity of processed documents per day and number of accountants. According to this, we may define:

- small enterprise processes less than 100 invoices per day, number of accountants is 2 to 5;
- large enterprise processes more than 500 invoices every day, number of accountants is more 30.

Between these poles there are middle-size enterprises. But under specific circumstances middle-size enterprise may be concerned to different category. E.g. if business requires complicated technologies the enterprise may concern to higher category.

Specificity of accounting of the large enterprise arises the whole complex of requirements to computer system of financial accounting that, in its turn, depend on features of methodology and organization of accounting (fig. 3.18).

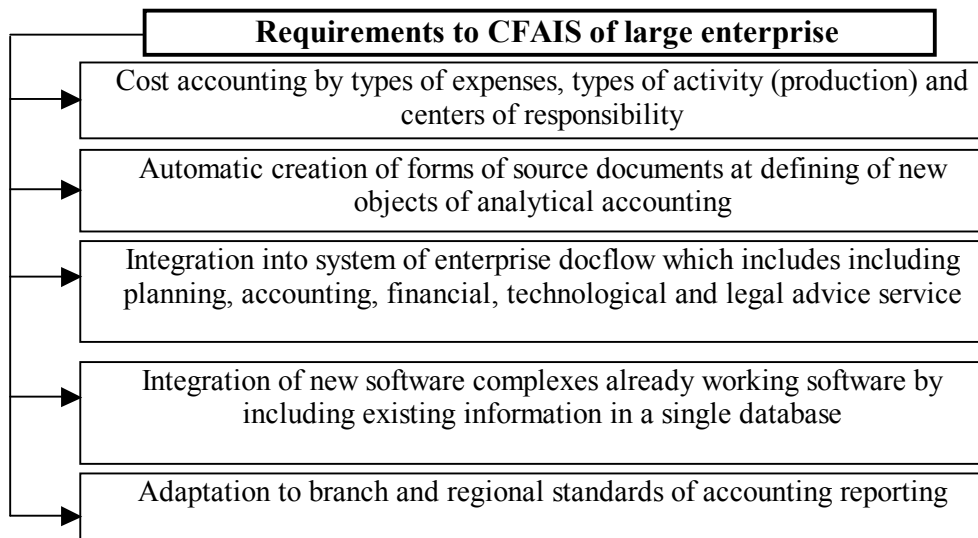


Fig. 3.18. **Requirements to CFAIS of large enterprise**

Financial accounting information system of the large enterprise can provide:

- automated performing of all complex of tasks of accounting, planning, analysis of financial and economic activity of the enterprise, and internal control;
- gathering of the operative information about the current state of affairs at the enterprise. Such mode is important, for example, for big industrial enterprises which try to use the resources more effectively; for big trading firms which profit directly depends on actual information of presence and movement of goods; and also for all entities where there is a permanent movement of great volumes of goods;
- ability of receiving consolidated financial reports. The large enterprises can have remote branches or warehouses. Also enterprises may be owned by group of owners.

Use of computers during creating the financial accounting information systems on small enterprises allows to automate all procedures of processing of the information on single accountant workstation.

At creation of such accounting information systems several approaches to automation of accounting may be used. It is caused by that small enterprises with simple organizational structure do not need separate managerial accounting subsystem.

According to the first approach the only system of financial accounting is created. Usually all accounting work in this system is performed by single person - accountant.

The second approach intends, in addition to financial accounting, partial automation managerial accounting. In this case accounting two workers (accountant and his assistant) keep accounting at one or two workplaces.

Specific criteria of a choosing the CFAIS software for the enterprises of various sizes are shown in tab. 3.4.

Table 3.4.

Specific criteria of a choice of CFAIS software for the enterprises of different sizes

Size of enterprise	Criteria of a choice of CFAIS software
Small	Unified form of data presentation
	Uniform program environment
	Built-in object-oriented tool means
	Work in a network
	Presence of certificated dealers of the software developer in the region
	Ability of simple interaction with standard office software of other manufacturers
Middle	Construction of system as a full-function set of program modules specialized by parts of accounting work
	Ability of development of functions of system with use of professional tools of development
	Work in a network
	Functions of access control
	Opportunity of interaction with software of other manufacturers, including previously installed software
Large	Construction of system as a full-function set of program modules strictly specialized by parts of accounting work
	Ability of development of functions of system at the expense of professional tools of development
	Ability of stable work in mixed networks, independence from hardware, OS and DBMS
	Advanced functions of access control and authorizations of user actions
	Distribution of functions of operational and strategic accounting; interaction with subsystems of planning, analysis, technical and economic preparation of manufacturing
	Opportunity of interaction with the software of other manufacturers, including with the software of own development
	Group of the enterprises
Advanced means of data manipulation for separated divisions	
Means of data consolidation for construction of the consolidated reporting.	
Ability of keeping accounting in different accounting standards	

Classification and choice of financial accounting software products

The organization of accounting in conditions of computerization depends first of all on the software. The choice of software is the crucial moment in creation of CFAIS as it defines a form of accounting at the enterprise.

Not to make the wrong choice, it is necessary to compare software products available on the market. The first step of comparison is their classification. Only then we can formulate requirements to software and compare its functional.

From the software developers' point of view the most complete classification of accounting software is the one developed for software contests. This classification unites criteria for a grouping by destination, way of accounting functions implementation and by the size of enterprises. The extended and specified list of the basic accounting software classes usually applied at contests and exhibitions is the following.

Software for domestic bookkeeping. This class of programs enables accounting of personal incomes and expenses, planning of family budget, drawing up of personal tax declarations.

Mini accounting systems. This class include programs intended for use one or several accountants at the small enterprises. Such programs have no precise specialization by parts of accounting work. They realize functions of keeping synthetic and analytical accounting. Among implemented functions is input of economic transactions, their processing them (sort, search etc.) and forming of narrow set of source documents and reporting forms.

Multi-purpose accounting systems (midi accounting systems). To this class belong software products focused on accounting of small and middle-size enterprises and in simplified variant provide accounting in all sectors. Such systems unite all registration functions, including functions of quantitative accounting and, as a rule, are designed for functioning on one computer. Some programs of this class may work on several computers in local area network.

Local automated workplaces. Such programs are intended to perform separate accounting tasks — accounting of salaries, fixed assets, commodities etc., and cover separate parts of accounting work. An automated workplace is highly specialized and consequently can effectively computerize separate parts of accounting without formation of summary reporting.

Complex of connected automated workplaces. These program systems are focused on use in accounting departments with more than eight accountants with precise distribution of functions between them. The complex consists of set of automated workplace implementing functions of distinct accounting sectors. Each workplace is designed for specific accounting tasks and intended for the personnel with low accounting and computer qualification. As a rule, the automated workplace supports detailed analytical accounting, have a deep specialization and is installed on the separate computer. The complex has means of consolidation of the data from other automated workplaces, necessary for drawing up

consolidated reporting. Aggregation of data is usual is carried out with the help of the specialized module – General Ledger.

Managerial systems. This class includes functionally full systems of organizational management with elements of accounting, planning, office work, and also with modules of decision-making and others. The accounting component of the program in this case is not the main. More important is interrelation of all components of system.

Systems of financial analysis. They are various programs of the financial analysis on the base of accounting data.

Legislative databases. Reference systems that contain picked up legislative acts on taxes, accounting, etc. These systems allow quickly find the necessary documents and operatively trace changes to normative documents. They have rather indirect relation to financial accounting programs. In spite of the fact that this category of the software has been created, first of all, to help lawyers, its significant part is focused on such users, as accountants, financiers, economists.

It is necessary to note, that the resulted list of categories is useful to get impression about basic classes of the financial accounting software represented at contests. However it was developed spontaneously, it does not suggest software classification by certain attributes and is unsuitable for choosing the software for commercial purposes. Precise grouping of the accounting software by certain attributes provides the following taxonomy (fig. 3.19).

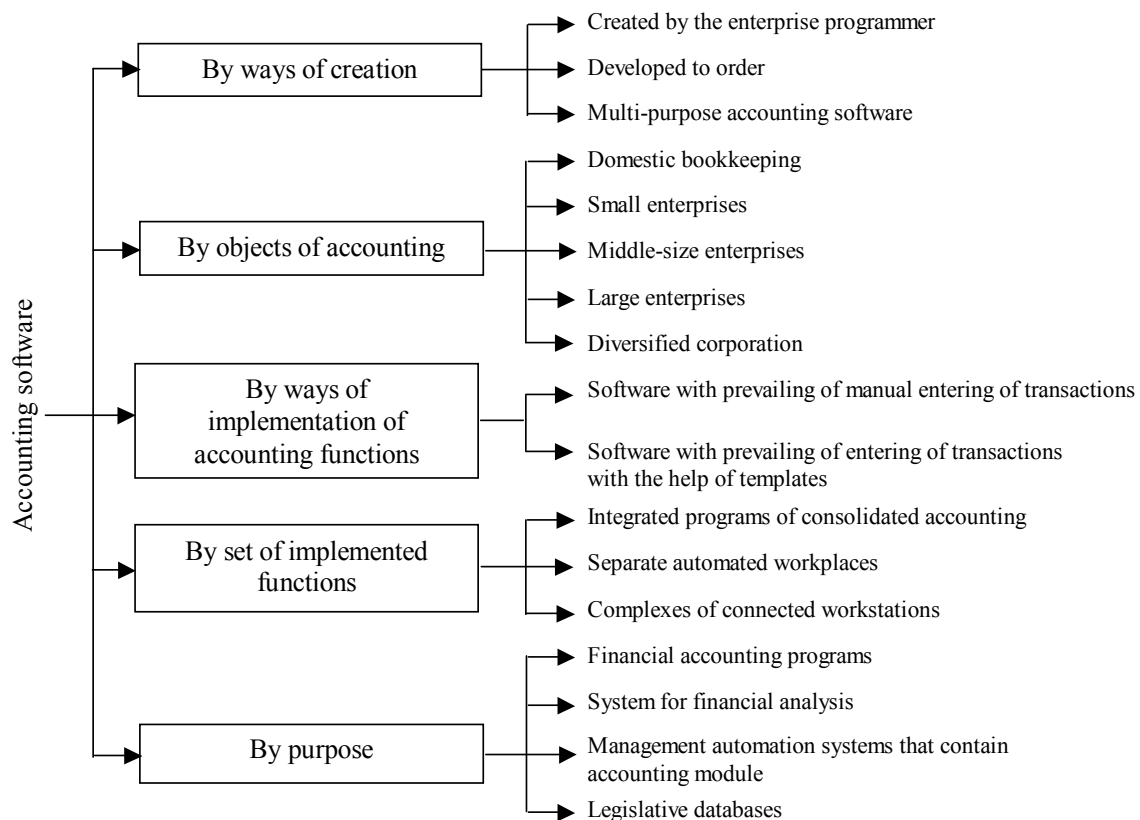


Fig. 3.19. Accounting software taxonomy

The resulted list of classes of financial accounting programs helps to compare their capacities and to choose the most appropriate accounting software. It is necessary to understand precisely that programs of different classes are intended for the enterprises of different sizes (fig. 3.20).

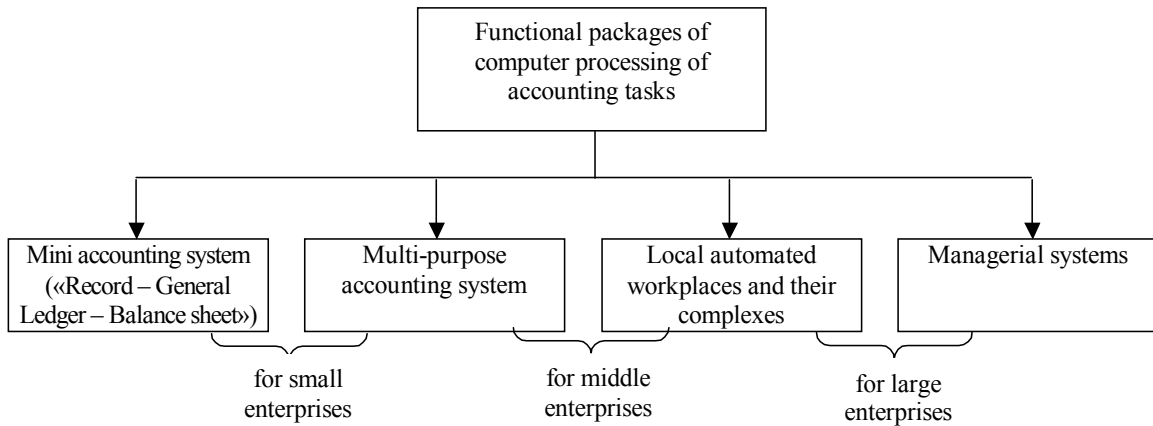


Fig. 3.20. Classification of accounting application packages [45]

The size of the enterprise is the key factor in choosing the program. The choice of accounting software that does not correspond the enterprise sizes will lead to financial losses and, probably, will have poor organizational results. Accounting software differs by categories of users (size of enterprises) and, accordingly, by the price (cost of the software for middle-size enterprises is ten times higher than the cost of accounting software for small and, in its turn, ten or even hundred time cheaper than software for the large enterprises). If the small enterprise will buy the program for middle-size (large) enterprise, it though will bear unjustified financial expenses, and will not be able to organize the computerized accounting. However middle-size or large enterprise is not able to computerize accounting with the help of the software intended for small enterprises.

While choosing accounting software it is important to adhere to the following recommendations. If accounting at the enterprise is kept by 1-2 accountants, and there is no analytical accounting on the most of synthetic accounts, most likely, the program of "mini-accounting" class is suitable for CFAIS creation. If in accounting department work 3-9 accountants; advanced analytical accounting on different groups of accounts is conducted; the operational data, for example, about costs and stocks in divisions are needed then universal financial accounting program is necessary for computerization of accounting. If object of computerization is the large industrial enterprise with 10-30 accountants and more, with pronounced specialization of activity reflected in specificity of accounting we may be sure that any "boxed" universal accounting program will satisfy needs of the enterprise no more than on 10-30 %. In that case the managerial accounting software system is necessary.

Such programs are characterized with high complexity and price. In implementation they require individual debugging and support for each client, and also presence of skilled system administrator. The system can provide continuous work of 50-60 automated workplaces and maintain the powerful database organized with the help of contemporary software. Hardware requirements to separate automated workplaces should be minimal, and the program system should be capable to expand functionalities and list of processed accounting data.

The structure of requirements to the software closely connected with methods of comparison of accounting software products. If, making the list of requirements, we define the ideal software product, then comparing different financial accounting programs we determine how they respond these criteria.

We recommend the following four-point rating scale for comparison of software products for computerization of accounting (tab. 3.4).

Table 3.4.

Scale for comparison of accounting programs

Points	Rating of parameter
0	Opportunities
1	Basically possible
2	Function is implemented
3	Function is implemented well

To compare different programs, we should select the parameters most essential in each case, and then estimate them in points for each program. But mechanical use of the given order of testing is invalid. One should notice, that it is not possible to compare programs from different classes. Also list of requirements should be adjusted depending on what attributes are more important for accounting needs of the enterprise. Technical parameters of programs can be compared only under condition of use of identical soft- and hardware platforms.

On the other hand, classification and choosing of accounting software in today are complicated with the fact, that many software developers who specialized on programs of the certain classes before, in conditions of intense competition begin to develop software versions intended for other classes.

Questions to chapter 3

1. What preconditions of creation of CFAIS can you name?
2. Name and characterize principles of CFAIS development.
3. What are peculiarities of accounting automation at enterprises of different size?
4. Specify the requirements to CFAIS of large enterprise.
5. Characterize different approaches to CFAIS creation.
6. What levels of programming of computer programs of accounting do exist?
7. What types of programming languages are used for development of financial accounting software products?
8. What advantages does CFAIS give to enterprises and how to calculate its economic efficiency?
9. How to organize an effective control of accounting in CFAIS?
10. Specify, how reliability of the information in CFAIS is maintained.
11. What stages does development of computer system of financial accounting at the enterprise include?
12. Describe sequence of works on each stage of CFAIS development.
13. How are software products for accounting classified?
14. Name classes of financial accounting software and give examples of software products of these classes.
15. What requirements should computer programs of accounting satisfy?
16. How to test and to choose the financial accounting software?

CHAPTER 4. INFORMATION TECHNOLOGIES IN AUDITING

After studying this chapter you will know about:

- *the definition of computer audit;*
- *auditing of enterprises in computer information systems environment;*
- *audit software.*

4.1. DEFINITION OF COMPUTER AUDITING

Application of computers affects considerably public accountant procedures. However, one should bear in mind that control functions are the most difficult to automate. Computerizing of accounting itself can not eliminate concealment of thefts and abuses happening due to wrong transference of data indicated in documents to electronic carriers, entering forged documents, etc. Computer estimates a situation or a process always in the same way. Therefore, the probability of errors of control in a computer environment is considerably lower. So, computer programs provide only impartiality and exactness of control.

Unlike manual accounting systems, in which records are done on paper and an auditor considers the possibility of elimination, forgery or replacements of paper documents, during the use of CIS an auditor has to deal with the issues of security and reliability of the computer accounting systems. An auditor checks up a number of purely technical questions that bear no direct relation to accounting but have an immediate influence on the auditor's risk assessment of the control system. When CIS is applied there is mutual penetration of different (according to the sense and subjects) types of control and organizational activity (fig. 4.1).

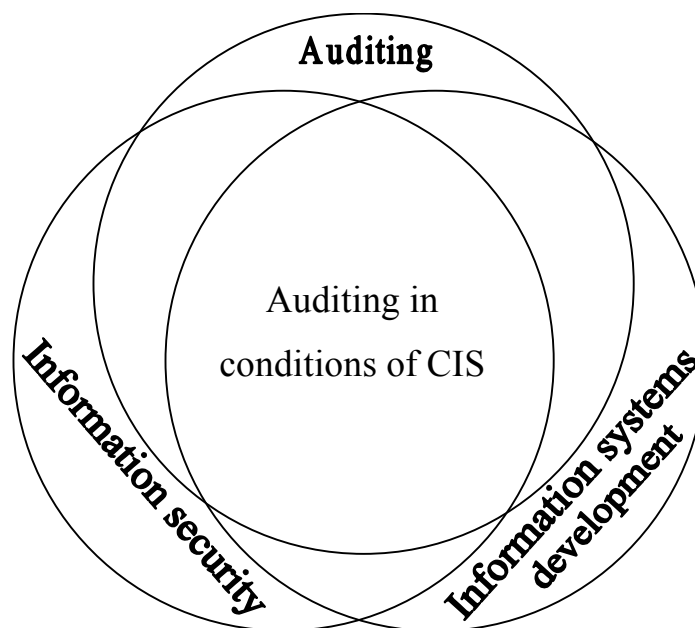


Fig. 4.1. Components of auditing in a CIS environment

Even a special term *computer audit* appeared. *Computer audit* is estimating whether the current state of a computer system is in accordance with some standard or offered requirements [101]. Specialists on general security of computer information systems use this term.

Usually there is a necessity of computer audit if an automated system is intended for processing of confidential information. Computer accounting systems belong to such a type of automated systems. The lower limit of security level of an automated system is determined for every category of information by internal standards of an enterprise. Conducting computer audit is also useful after the installation of an automated system and its security subsystem on the stage of reception into operation. This is done to estimate how a set of requirements is fulfilled.

Basic parameters according to which CIS verification of protection and security of data can be carried out are given in tab. 4.1.

Table 4.1.

Parameters of reliability of program accounting systems

Parameter	Description
Access restriction	Restriction of access by the system of passwords for reading, saving and elimination of information, automatic entering of work protocols
Control of accounting personnel's activities	Verification of correctness of Chart of accounts use, timeliness and correctness of accounting registers conducting, correspondence of synthetic and analytical accounting data to accounting balance data and other forms of reporting
Data backup	Possibility of storing backup copies for a definite period of time (depends on the speed of data renewal in the system)
Presence of work documentation	Chapter "Emergencies" of the program documentation should contain examples of emergency situations and methods of renewal of the system's work ability with minimum labour and time expenditures.

The International auditing practice statements 1008 «Risk assessments and internal control — CIS characteristics and considerations» admitted, in particular, that CIS is characterized by vulnerability of data and programs storage facilities: big amount of data and computer programs used for information processing can be saved on portable or built-in data storage media (magnetic disks and tape). These data storage media can be stolen, lost, intentionally or accidentally deleted.

Computer systems are opened for access to data, therefore rights for access to information must be expressly distributed, and the system must be protected from unsanctioned access.

An auditor is obliged to find out the weak points of the CIS control — to consider both hardware and program controls, organizational measures, e.g. verification of data integrity and absence of computer viruses.

The most actual question that appears because of lack of paper accounting documents in a CIS environment is the development of methods of legal confirmation of authenticity of registered data.

The solution of this question is possible due to development of the computer accounting programs via:

- planning of the special facilities for blocking of entering of data in the case of some missing document entries;
- presence of facilities for authentication of the person which works with a terminal in the program;
- special facilities for data protection.

Thus, in the process of document motion in *Work Expeditor* system of computerizing of docflow a register is formed for recording time, actions and names of users who worked with a document [46, p. 331]. Additional special facilities of protection of information will allow to make alterations or corrections only to the first person to have registered them on an electronic medium.

An auditor also must analyse the control system of preparation of accounting data and check what measures have been taken by a client for prevention of errors and falsifications. One should pay attention to methods of organization of control of completeness and accuracy of entering of primary information in a database, of organization of control of data processing and output, and give estimation of their sufficiency and efficiency. In network systems with many users the control of data communication can be the object of attention.

Basic concepts related to the reliability of the program information systems [61] were first defined in the Orange Book of the USA Department of Defence, published in 1983. A secure information system is determined in it as a «system that manages by the proper facilities the access to information in such a way that only properly authorized persons get a right to read, save, create and destroy information».

An information system which meets certain requirements and in which a complex of protective measures is realized can be considered a secure information system. There is no use making a universal list of requirements to the secure systems because of the variety of the systems and variety of possible threats. Nevertheless, there are a few basic requirements without satisfaction of which a system cannot be considered secure.

The information system is secure if it satisfies the following requirements.

- *Information integrity* corresponds to such state of the system when information is timely, exact, complete and rich in content. Its complete provision is almost impossible, therefore it is often broken up into integrity of information and integrity of the system. The requirement of integrity of information implies that information can be changed only in accordance with an established procedure, and that the system executes the required functions by the indicated method and without intentional or unintentional unauthorized interference.

- *System availability* means that the system works correctly and does not deny an access to an authorized user.
- *System privacy* means absence of access to private or confidential information that is in the system.

Cryptography can provide effective control, confidentiality or protection of important programs and data from the unauthorized access and modification. It is used most frequently when important data are transmitted via communication lines. *Cryptography* is a reversible (i.e. having a reverse one) process of transformation of programs and data into a form unsuitable for processing. Data coding and decoding requires using special programs and enciphering key known only to the users who have a right to access to the programs and information.

Sometimes, *non-repudiation* is added to the three basic requirements. This requirement means that a user cannot repudiate authorship of the sent report or executed action.

Importance of the mentioned requirements is not equal for different information systems. Whilst confidentiality is foremost for the information systems of regime state organizations, and integrity is understood solely as invariability of information, the integrity (actuality) and availability of data and data processing services are most important for business corporations.

The following security facilities are used for provision of the stated requirements to a safe information system.

Accountability (reporting). Purpose of accountability is having at any point time information about the one who is working in the system and what he is doing. In a safe system the following events must be recorded: entrance in the system (successful or not); exit from the system; addressing to a remote system; operations with files (opening, closing, renaming, deleting); changing of privileges or other attributes of security (mode of access, level of reliability of user, etc.). Analysis of registration information must supplement reporting.

Identification and authentication are the key means of accountability.

Identification allows to learn who is the user of the system and define whether he used by the system before. Identification is a facility by which a user gives the information about him to the system.

Authentication is confirmation of identification accuracy. Two types of remote authentication are possible: when a computer authenticates another computer or when a computer executes some operations for a user if he transfers the password.

Violations in the work of a computer system can arise due to the problems with power supply and hardware or software errors.

A hardware failures can be outage of electronic or mechanical part. In order to avoid this danger, it is necessary to duplicate the critical nodes of the system and/or back up data. As a rule, in organizations in relatively short time intervals copies of data arrays are made and

their reliable saving is provided. Such protection is expedient also in the case of fires and submergences. That is why it is reasonable to keep originals and copies in different places.

Software failures also threaten proper work of a system. For example, a program can be incompatible with an operating system or infected by viruses.

4.2. AUDITING OF ENTERPRISES IN COMPUTER INFORMATION SYSTEMS ENVIRONMENT

Characteristics of auditing in CIS environment

The computerization of accounting does not bring basic changes in elements of its method. Only the technology of processing of the accounting information cardinally changes. It reflects in structure of computer forms of accounting.

Automation of accounting and other processes at the enterprise, together with automation of auditing radically change the order of auditing of distinct economic object. Usually auditing enterprise with traditional technology of accounting differs from auditing of enterprise where accounting is kept with use of computers.

Auditing, accordingly, also can be performed with or without use of computers.

In CIS and CFAIS environments traditional organization and methods of auditing does not give necessary result, so they require essential changes. Application of CIS affects:

- procedures which are used by the auditor during reception of sufficient idea about systems of accounting and internal controls of the enterprise;
- process of assessment of inherent risk and *control risk*;
- development and realization of tests of controls and substantive procedures necessary for making the auditor conclusion.

Auditing in computer information system environment is regulated by the International standards corresponding International auditing practice statements which disclose various aspects of auditing in the environment of computer information systems, assess audit risks, and also establish requirements to qualification of auditors concerning computer information systems.

During planning of audit procedures affected by CIS environment, the auditor must consider how CIS environment influences auditing, and estimate *materiality* and *sophistication* of functioning CIS, and availability of CIS data for use in auditing.

"Materiality" is such degree of influence of the automated data processing on the information and *assertions*, contained in the financial reporting, which should be considered.

Application of CIS is considered sophisticated in the case when:

- a volume of transactions is so big that it is hard for users to find and correct errors made during processing;
- the program automatically forms a significant amount of accounting records and automatically transfer them in other applications;

- the system performs complex financial calculations and/or automatically forms operations or records that cannot be checked up separately;
- exchange of transactions with other organizations is conducted in electronic form, and is not checked through by operator.

Further the auditor studies the structure of the client CIS, in particular a degree of concentration or distribution of computer data processing within economic subject, its influence on segregation of duties, and availability of computer data for direct studying. Source documents, computer files and other information, necessary for drawing up audit evidences, may exist only for short period of time or in computer accessible format only. In this case the auditor applies special methods of information research.

On the other hand, since many control accounting procedures in CIS are implemented as a set of algorithms, it is necessary for auditor to have the corresponding qualification for their studying and evaluating. The auditor should understand well contemporary computer means of accounting, control and analysis, know principles of segregation of functions and mutual control of the workers participating in accounting data processing. For auditing in computer environments an auditor must:

- possess additional knowledge of economic data processing systems;
- know about technical, program, mathematical and other kinds of CFAIS providing;
- master terminology in the field of computerization;
- precisely understand features of technology and sequence of procedures of computer processing of the accounting information;
- know the work organization of accounting department in CIS conditions;
- be able to operate a computer and basic office programs;
- have practical experience of work with different accounting, analytical programs, legislative and reference databases, special audit information systems.

Taking into account a variety and complexity of computer technologies, it is desirable for auditor to be a high-class expert in computer accounting. However, if the auditor does not have sufficient knowledge, International standards of auditing oblige him to invite the expert in the field of information technologies (use of services of external experts is regulated by International standard of audit 620 “Using the Work of an Expert”).

The basic directions of interaction of the auditor and the expert concerning systems of computer data processing are the following:

- evaluation of legality of purchase and license cleanliness of accounting software that operates in the system of computer data processing;
- evaluation of reliability of the system of computer data processing in a whole;
- check of correctness and reliability of algorithms of calculations;
- forming on computer registers of analytical accounting and reporting necessary for the auditor.

But also in this case the auditor should know much about computer system of the client to correctly plan, direct and supervise work of the expert. It is necessary to understand, that the expert estimates computer data processing system, and the auditor in his turn — reliability of the information contained in the reporting generated by this system.

Studying and evaluating of CIS

Auditing in CFAIS environment depends on a degree of automation of accounting, control and audit, presence of techniques of automated auditing, availability of accounting data, and sophistication of data processing.

On the beginning of auditing the auditor, first of all, should familiarize with the organizational form of data processing and a level of automation of management tasks, including tasks of accounting. Enterprise usually carries out data processing itself, but seldom an external firm is involved.

As in "traditional" audit, during auditing in CIS environment the auditor fixes all essential moments of audit procedures in the corresponding documents. In this case testing of programs, check of correctness of algorithms etc. may differ. Thus the proper characteristics of data processing system are of great importance as they affect a degree of sophistication of accounting system, type of the internal controls, and accordingly the choice of kind of tests that help to determine character, duration and volume of audit procedures.

As a rule, the degree of automation of accounting, control and auditor tasks and technology of their realization is specified before the beginning of auditing. It allows to create or specify overall audit plan and audit schedule. Thus in evaluation of CFAIS sophistication it is necessary to consider both degree of integration of various information subsystems, and degree of sharing the same databases by different systems.

Special attention is given to check of reliability of internal controls in conditions of computer data processing. Accounting policy focused on CFAIS, must describe internal controls.

In CFAIS environment three types of the control are applied:

- structural (production) control;
- development control;
- procedural (work) control.

Structural control is a common administrative check of structure of segregation of duties and responsibilities in data processing department (accounting department). This check concerns to all works performed by accounting department, and is a part of control that each new accounting procedure passes.

The essence of *development control* is in check of conformity of all new computer accounting subsystems to the standards of their creation. It covers basic stages of design and programming and check the presence of built-in control algorithms and modules. All new

accounting procedures at the enterprise must include control of development as well as structural control.

Procedural (work) control is a check of performing control of accounting procedures both inside and outside of the accounting department. It can be performed by the patterns similar for several procedures.

Ability of various abuses is in most cases caused by absence of the necessary program control. As the system of controls is described in the project of automation of accounting the auditor in any case must check the design documentation. It is checked for presence of program controls in the project — as for maintenance of integrity of information processed in accounting, and for revealing of various abuses. Such check reveals weak places of program controls which do not prevent abuses and misuse.

Often the actual control system does not coincide with its description in the project documentation. Therefore the auditor should check conformity of actual accounting process to the project, and test correctness of data processing. Technological process of data processing in CIS should provide the automatic control of correctness of data processing and correction of errors. Errors revealed on separate stages of accounting process are reflected in corresponding documents. These documents helps auditor to recreate the process of data processing, find out constant errors and their causes.

During the check the auditor should study and evaluate system of docflow of the entity, the order of formation, registration, storage, processing of documents and transformations of source documents into the system of records on accounts. It is necessary to find sources of primary information and degree of automation of its collection and registration. In case of use of specialized automatic means of collection and registration of the information (sensors, counters, barcode scanners etc.) the auditor should be convinced that experts regularly test these devices, and in case of revealing deviations document them properly and take corresponding measures.

First idea about level of automation of source documents formation the auditor may receive during acquaintance with accommodation of automated workplaces at the enterprise. The automated workplaces in sources of primary information (in warehouses, shops), allow to form source documents at the moment of transaction. They fix information on the machine storage media and make the document accessible for the further processing in accounting department. Absence of automated workplaces in manufacturing divisions of the enterprise specifies the manual way of drawing up documents with their subsequent transfer to accounting department. It also may testify that documents are formed in the accounting department (that is typical for enterprises with small volume of documents).

The auditor must recognize if the model of docflow implemented in CIS is rational and effective for the audited enterprise. At large companies that work with software based on model of full docflow, it is important to analyse segregation of functions between operative management services and accounting department, determine information communications of

different divisions with accounting department, to track movement of separate documents and their ties, to understand how ties between documents are maintained, where electronic copies of documents are stored and how accountants can access them.

At the enterprises that automate only accounting, the auditor should pay attention to:

- maintenance of time interval between drawing up of the document, realization of transaction and its registration in accounting;
- ability of storing of documents in the system after their printing;
- connection of documents and generated accounting records.

The auditor is obliged to characterize ways of data input and formations of records about economic transactions. Automated and automatic generation of accounting records with the help of typical transactions and electronic forms of documents often allows to avoid errors, inevitable at manual formation records.

On the other hand, in computer accounting the program can initiate some accounting operations, such as adding on interest, closing of accounts, calculating of financial result. Accordingly, on such operations there are no order or source documents. In that case the auditor is obliged to check up carefully the correctness of algorithms of calculations. An error in the algorithm repeated many times in repeated economic transactions, can significantly deform the result of economic activities. During the check of algorithms of calculation of the sums at input of economic transactions auditor also supervises the correctness of forming of the records.

The auditor should check up algorithm on conformity to the current legislation and accounting policy of the enterprise, and also find out if it is possible to upgrade the algorithm in case of changes in accounting order or tax legislation. As it was mentioned, testing of algorithms requires considerable computer qualification of the auditor. It is strongly recommended for him to understand macro-language of the specific program. It will allow the auditor not only to perform testing of algorithm on the defined data, but also to understand correctness of its tuning.

The auditor should also check up algorithms of calculation of parameters of the reporting according to the current legislation and to estimate an opportunity of their updating in case of changes in legislation. This concerns to forms of reporting as well. Many developers, e.g. 1S, operatively deliver new forms of documents to the users.

The auditor must evaluate the system's capacities concerning to:

- creation of new forms of the internal or external reporting, not contained in the program;
- work with source information, abilities of its decoding and fast revealing and correction of errors;
- testing of processing results to find out, for example, incorrectly calculated balance of accounts;

- testing of transferring accounting data into reporting, especially if parameters of the reporting are filled "manually" by transferring from the standard automatically generated reports (accounting registers).

Modern CFAIS suppose decentralized use of computers directly on workplaces of the accounting personnel. The degree of centralization of data processing and storing can be different and depends on number of accounting personnel, segregation of accounting duties etc. At small enterprises where one accountant performs data processing, CFAIS software and database are disposed on one computer. However when accounting personnel is more numerous we should speak about multi-user systems that support the work of several users with accounting database. Such systems use one of the following technologies:

- local functioning of workplaces;
- data processing by "file-server" technology;
- data processing by "client-server" technology;
- completely centralized data processing.

Any of these technologies supposes its own forms of use of computers, organization and maintenance of accounting database and accounting data consolidation for drawing up the reporting. As a rule, at middle-size and big enterprises advantage is given to the last three technologies. Today at big enterprises "client-server" technology is applied more and more often.

The auditor should understand the basic difference between these technologies as it affects audit procedures and audit risk. The auditor is obliged to estimate, if the program used at the specific enterprise is expedient and effective. However auditor has no right to force the client to implement system familiar to him. He may only help to computerize the client's accounting, and recommend the firm and the program.

International auditing practice statements in past clearly described peculiarities of auditor work with different types of computer accounting systems while auditing. These were statements 1001 «IT Environments — Stand-alone Computers», 1002 «IT Environments — Online Computer Systems», 1003 «IT Environments — Database Systems»⁹.

International auditing practice statement 1001 «IT Environments — Stand-alone Computers» regulated peculiarities of auditing at the enterprises that use standalone PCs. Feature of such system is that it may be impossible or is cost ineffective to use controls necessary for reducing *detection risk* (risk of non-detection of errors) in it. Therefore the auditor often might assume, that in such systems control risk is high.

⁹ All these International auditing practice statements were withdrawn in 2004 for audits starting from 2005 period. It was surprising, because there were a lot of detailed recommendations. However, those issues had an indirect connection to the auditing of financial statements itself so International Federation of Accountants (IFAC) decided to withdraw them. Probably, specialized computer auditing standards will be released in the future.

In general, CFAIS with standalone PCs are less sophisticated, than network CFAIS. In the first case even users with basic skills of data processing can create accounting applications (e.g. Excel spreadsheets for simple accounting). In this case control of development (e.g. adequate documentation) and operations (e.g. access to control procedures), essential for effective control in large-scale computer environment, will not be cost effective. Nevertheless, as the data have been processed by computer, the users may treat this accounting data as reliable with no reasons. But accuracy and reliability of the prepared financial information depends on internal controls established by the management and accepted by the user. For example, if users operate computer without appropriate control, programs and the data of one user stored on built-in data storage media, may become objects of unauthorized use, change or abuse by other users.

International auditing practice statement 1002 «IT Environments — Online Computer Systems» regulated peculiarities of auditing at the enterprises that use CIS with modules of real time accounting of economic transactions. This may be required in bank operations, mobile telecommunication, electronic commerce etc. Usually in such systems aggregated accounting data from modules of the records management periodically are transferred into CFAIS by defined algorithms.

Peculiarity of such systems is the presence of advanced *program controls* of economic transactions. At interactive data input, as a rule it is immediately checked. Invalid data will not be accepted, and the user will receive the message that helps him to correct the data or to enter it again.

The audit procedures conducted simultaneously with interactive processing, may intend check of "built-in" controls of interactive applications. For example, it can be made with the help of entering test operations through the terminal or with the help of the special auditing software. The auditor can use such tests to check up understanding of computer accounting system or for check of such controls as passwords and access controls.

G. Bodnar and W. Hopwood notice the following problem moments concerning to real time systems which may significantly complicate evaluation of control procedures [10]:

- entered data usually is not grouped, so the program must perceive unordered data of various types;
- only fast check of documents is performed on computer. E.g. information from technological module may be transferred directly to CFAIS without any documenting;
- real time systems complicate ties of systems modules;
- high efficiency of real time systems considerably increases speed of data processing that complicates the control process .

Features of interactive computer systems cause high efficiency of performing the analysis of new interactive accounting applications before beginning of their exploitation, not after. Such preliminary analysis allows the auditor, for example, to study the detailed description of program functions or to test program facilities. It also gives auditor enough time for development and testing of audit procedures before their conducting.

International auditing practice statement 1003 «IT Environments — Database Systems» was devoted to features of CIS based on single database (*data warehouse* or *data repository*) data from which is used by various services of the enterprise.

Database systems usually consist of two basic components — database itself and database management system (DBMS). Databases interacts with others facilities and programs of CIS.

Database is a data set used by many users for accomplishing of various tasks. Database systems have two important characteristics: common use and independence of data. A separate user may not know about all data stored in the database, and about all ways of its use for fulfilling of various tasks. Individual users know only about data with which they operate with, and can consider this data as files used in their applications.

As the infrastructure of security of the enterprise plays an important role in maintenance of integrity of stored information, it is necessary for auditor to consider this infrastructure before checking of program controls. In general, internal controls system requires the effective database, DBMS and applications controls.

Audit risk in a CIS environment

Computer processing of the economic data affects, first of all, process of studying by the auditor of accounting system and the internal controls of the audited entity. According to the requirements of International standard 315 “Understanding the Entity and Its Environment and Assessing the Risks of Material Misstatement”, the auditor should assess *inherent risk* and *control risk* at the enterprise.

The auditor must consider influence of risks of CIS usage for optimising control procedure execution and decreasing probability of making wrong conclusions and recommendations. Types of risks and characteristics of internal controls in a CIS environment are reduced to the following.

Lack of visible transaction trail — an ambiguity of ways of transformation of entering data from source accounting documents to resulting figures. Complete transaction trail that is useful for audit purposes might exist for only a short period of time or only in computer readable form. Where a complex application system performs a large number of processing steps, there may not be a complete trail. Accordingly, errors embedded in an application's program logic

may be difficult to detect on a timely basis by manual (user) procedures without use of specialized software.

Uniform processing of transactions. Computer processing uniformly processes like transactions with the same processing instructions. Thus, the clerical errors ordinarily associated with manual processing are virtually eliminated. Conversely, programming errors (or other systematic errors in hardware or software) will ordinarily result in all transactions being processed incorrectly. In addition, decreased human involvement in handling transactions processed by CIS can reduce the potential for observing errors and irregularities. Errors or irregularities occurring during the design or modification of application programs or systems software can remain undetected for long periods of time.

Lack of segregation of functions. Many control procedures that would ordinarily be performed by separate individuals in manual systems may be concentrated in CIS. Thus, an individual who has access to computer programs, processing or data may be in a position to perform incompatible functions.

Some procedures of management can be concentrated in hands of one employee whereas at manual systems they would be segregated between several individuals. Thus, this employee, influencing all parts of accounting, may «supervise himself».

Potential for errors and irregularities. The potential for human error in the development, maintenance and execution of CIS may be greater than in manual systems, partially because of the level of detail inherent in these activities. Also, the potential for individuals to gain unauthorized access to data or to alter data without visible evidence may be greater in CIS than in manual systems.

The risk of the internal control over CIS environment can arise because of discrepancies in development of the program, technical support of software, transactions, of system security and access controls. The risk can grow because of errors or irregularities both in program modules, and in databases. Some systems may contain errors because of operator fault, and others because of intentional corruption of entering data.

Initiation or execution of transactions. CIS may include the capability to initiate or cause the execution of certain types of transactions, automatically. The authorization of these transactions or procedures may not be documented in the same way as those in a manual system, and management's authorization of these transactions may be implicit in its acceptance of the design of the CIS and subsequent modification.

Potential for increased management supervision. CIS may offer management a number of analytical tools that may be used to review and supervise the operations of the entity. The availability of these additional controls, if used, may serve to enhance the entire internal control structure.

Possible errors in accounting information in CIS environment are shown in tab. 4.2.

Table 4.2.

Examples of errors in accounting information in CIS environment

N	Name	Examples
1.	Decreased human involvement	Raising probability of errors and irregularities occurrence because of inability of accounting personnel or auditor to directly supervise the source information (but only results of data processing)
2	Uniform processing of information	Increasing of ability of system errors and irregularities occurrence because of cumulative effect of the errors in simple and sometimes in sophisticated CFAIS
3	Unauthorized access	Possible data outflow or non-authorized alteration of program, data (including confidential), material losses (theft of equipment, commodities) as a result of computer-based fraudulent activities
4	Loss of data	Increasing of risk of corruption or loss of data fragments in large-scale database as a result of concentration of accounting and analytical information. Possible essential breaks in continuity of accounting data processing needed for emergency recovery

Usage of computer system data processing brings additional audit risks. These risks are connected with the following factors:

- technical aspects;
- program system of data processing;
- organization of accounting and control in a CIS environment;
- qualification of the auditor.

Technical aspects concern to the risks caused by hardware malfunction, use of unauthorized software, improper combination of hardware and software characteristics, inconsistent maintenance and control. The audit risk raises, if computer system is decentralized and computer devices are geographically distributed.

Authorized owner of accounting software may receive technical support from the developer. Developers carefully trace all changes in legislation, so they make operatively make updates and patches to the program, and deliver them to the users for free or for little charge. This increases the stability of work with such program, and reduces audit risk. Use of illegal software raises audit risk because:

- such programs often are outdated or even beta-versions;
- algorithms of calculations, forms of the documents and reporting are not corrected in time;
- user has no documentation and cannot properly use program facilities.

For this reason the auditor should estimate legality and license cleanliness of the accounting and system software. Also one of audit tasks is to check the client's obedience to the law, concerning to copyrights protection of software products as well.

Risks concerning to program system of data processing may be caused by errors in system design, little number of its installations, misuse. Widespread programs as a rule have fewer errors as they have been revealed and corrected during implementation on hundreds of enterprises and in different conditions. The audit risk in this case is reduced. On the contrary, in purpose-written programs created by the programmer with no economic education, most likely, there are many errors. Naturally, it raises the audit risk. Sometimes programs obviously not intended for accounting may be applied. The auditor's task is to reveal whether the system is used properly.

Risks concerning to organization of accounting and control in conditions of CIS may be caused by insufficient personnel preparation for the work with CFAIS, imprecise segregation of duties and responsibility of the personnel, the unsatisfactory organization of internal controls, weak controls the unauthorized access to database, loss of data.

Risks concerning to qualification of the auditor may be caused by errors in evaluation of CFAIS, incorrectness of tests, erroneous interpretation of the results.

While assessing risks in conditions of CIS, it is necessary to remember that an improperly trained personnel is the most vulnerable part of system of data processing. The auditor should estimate qualification of accounting personnel in field of computers, information technologies and specific accounting system. It is necessary to pay attention to the personnel attitude to system, a degree of trust to it. An accountant, who considers that he will do the work faster without any program, obviously poorly knows its facilities and, probably, makes a lot of errors in data processing on a computer.

Techniques of CIS testing

The most exact method of testing the accounting software internal controls is either direct studying of program algorithms by the auditor, or studying of the algorithms with use of the special audit software. It always needs much time and efforts, and sometimes is even impossible because neither the auditor nor the expert know peculiarities of the programming language of specific software system.

In this case auditors use various software-testing facilities. Some methods were given in International Auditing Practice Statement 1009 "Computer Assisted Audit Techniques". It says that methods of test data may be used during audit by entering data (e.g. a set of economic transactions) in the computer system of the enterprise and comparing the received results with previously known. The auditor may use testing data with the following purposes:

- testing of specific software controls, such as the interactive password and the data access control;

- testing of the economic transactions selected from the processed transactions, or formulated by the auditor for check characteristics of the specific process of client's CIS;
- testing of economic transactions used in the integrated test subsystems with the fake module (e.g. a department or an official) through which they pass in a usual operation cycle.

In audit practice the following approaches to testing CIS are used.

1. *Imitation of accounting data.* With the help of the client's software, the auditor enters into CIS a set of testing data often specially containing some "suspicious" transactions. By comparison of the received accounting reporting with previously received "standards" the auditor checks correctness of CIS calculations and received results. He prepares testing data concerning to specificity of branch and characteristics of economic activity of the entity. Usually it includes certain imaginary economic transactions, part of which is incorrect. Thus the auditor knows, which result the program should generate.

There are some approaches to testing of the software. The most simple of them assigns the following sequence of actions with testing data (fig. 4.2).

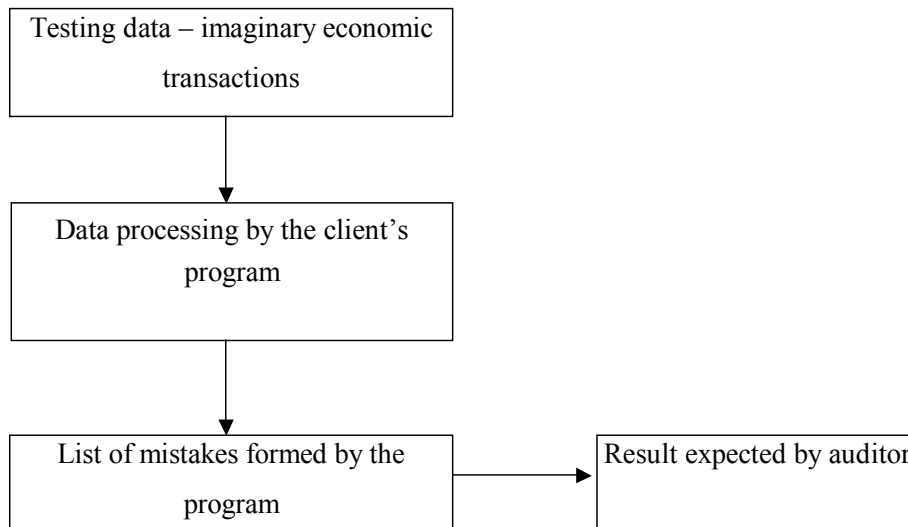


Fig. 4.2. **Common approach to testing the software**

Integrated test facility approach (ITF) includes both use of testing transactions, and creation of the certain imaginary objects of analytical accounting (debtors, creditors, workers, stocks etc.) [10, p. 581]. Usually data containing both real and imaginary records is entered into the program. The sequence of such testing is shown on fig. 4.3.

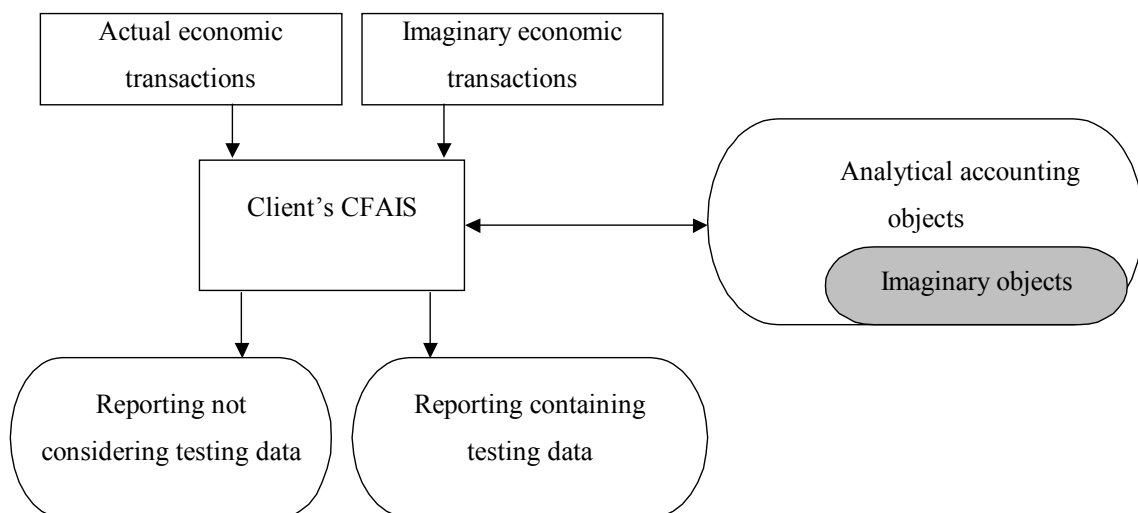


Fig. 4.3. **Sequence of CFAIS Integrated test facility approach**

The auditor may apply specially developed examples of testing of algorithms of computer data processing. E.g. for checking the correctness of charge of income tax the auditor may enter the certain sum of wages into the client's system and assure correctness of the received results.

2. Check with the help of specialized auditor software developed by audit firm. This check is performed by modelling and program auditing of all possible parameters of accounting process. On their base the auditor imitates processing of data by actual software. The received data is compared to the real data. By results of the comparison deviations are found out and fixed in the check report. Together with deviations the violated methodological or legal acts are determined with the help of knowledge base.

Check, modelling and the analysis of the accounting data are made with the help of special software with the purpose to define their completeness, quality, legitimacy and reliability. For this purpose comparison of the simulated accounting data with actual CIS data is carried out. Also testing of calculations and recalculations, aggregation, recurrent ordering and formation of accounting data, and its comparison with the real data is made. The control of correctness of data recovery is performed.

Technique of testing intends use of only the actual data processed simultaneously in the client's CFAIS and in the auditor software. It is called *parallel simulation* (fig. 4.4.) [25, p. 582].

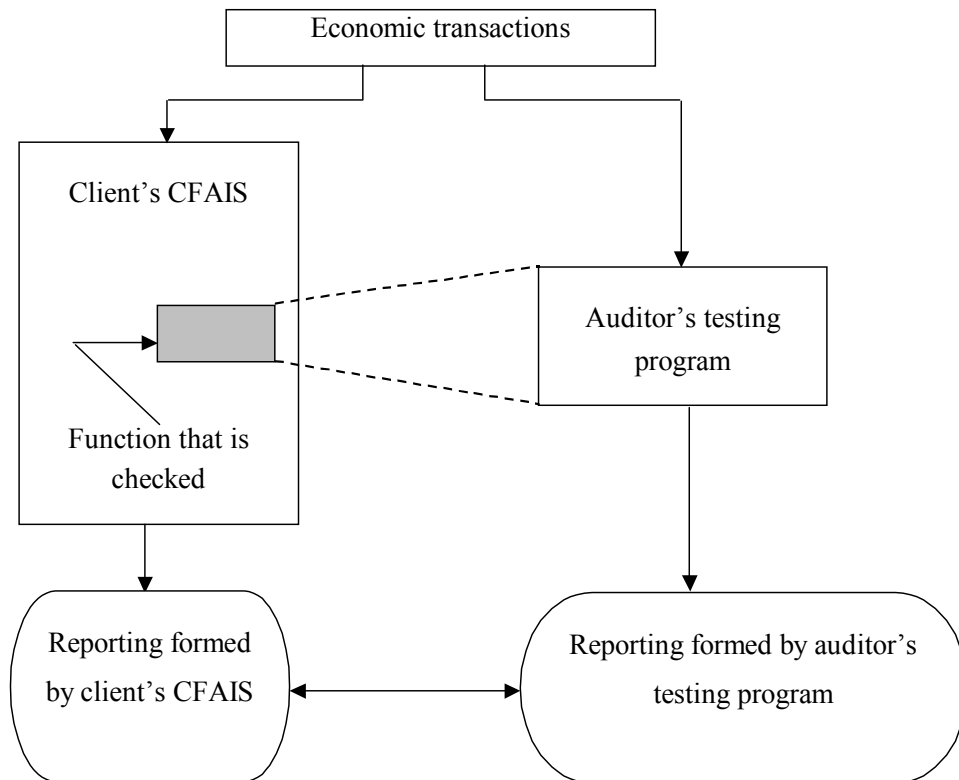


Fig. 4.4. **Parallel simulation of accounting data**

3. If enterprise has long-term relations with audit firm, special embedded audit routines are sometimes being built into an entity's computer system to provide data for later use by the auditor. They allow supervising of certain parameters of accounting process. With the help of these routines operations interesting for permanent audit check are selected. The selected data is grouped by transactions in a special auditor database for the further processing (fig. 4.5). Software may implement the following kinds of data control:

- regular control when accounting data is tested by all basic criteria (range, comparison to the norms etc.);
- selective control performed on some selection from total data (by certain transactions, specific tasks etc.).

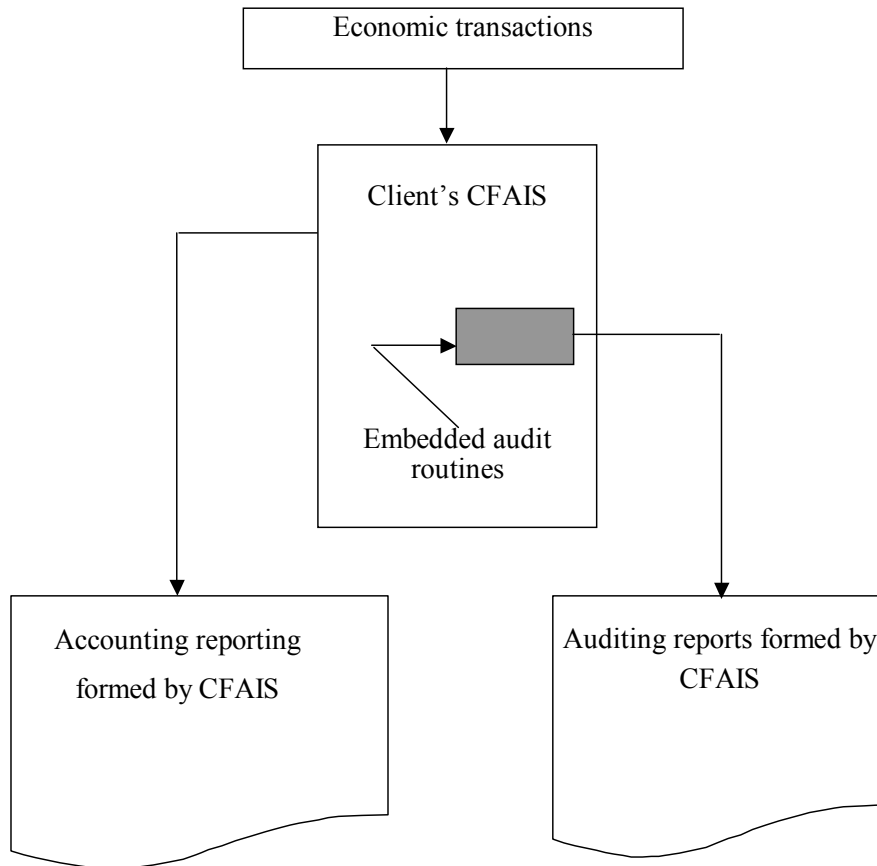


Fig. 4.5. Gathering of audit information by built-in control module

In any case audit procedures should be conducted not with original files, but with copies, as any alterations made by the auditor or possible damage should not influence real CIS data. In case when testing data is processed within usual process of the enterprise data processing, the auditor must assure that testing economic transactions are withdrawn from financial accounting of the enterprise.

4.3. AUDIT SOFTWARE

Computerization of accounting essentially affects auditing. However a computer may be the tool of auditor. It may reduce time and cost of auditing, and also enable to make more detailed and qualitative audit conclusions and give recommendations on strategy, directions and means of improvement of financial and economic state of the enterprise.

Auditing Practice Statement 1009 "Computer Assisted Audit Techniques" described methods of audit with assistance of computers (fig. 4.6).

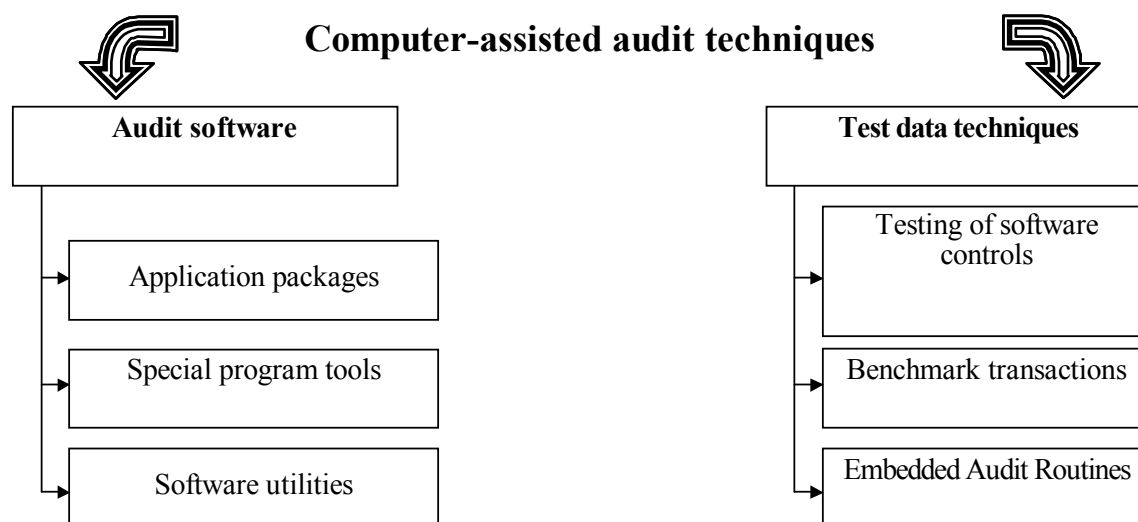


Fig. 4.6. **Methods of audit with application of computers**

Methods of CFAIS testing have been considered in paragraph 4.2. We shall consider types and goals of audit software.

Problem of automation of audit and control is based on approaches to formalization of this process. The formalization determined in standards of audit unfortunately is not suitable for conducting of professional audit tests. Now it is impossible to completely formalize auditing to receive algorithms of computer tests of acceptable quality.

There are the following requirements to audit software.

1. Presence of the advanced *internal control of transactions*. The control can be preformed not only at the moment of registration of document or transaction but any time when needed.

2. *Flexibility*. As auditor works with different enterprises, accounting policies and forms of reporting and even charts of accounts the program should be adjusted quickly on specificity of the enterprise. Computer audit programs should consider both the general requirements and features of accounting of client firms.

3. *Ergonomics*. The program should have means for convenient representation of large volumes of data, operational and common reporting. The program should be designed not for the programmer, but for the auditor with average computer skills. The audit software should be simple in mastering, quick and have a professional technical support of developers.

4. *Interchange with accounting programs on database layer*. Supplementary tools for input and output of data submitted in different formats are necessary.

Process of using special audit software can be divided into the following stages.

On *the first stage* the auditor determines tasks for audit with the help of special software.

On *the second stage* the auditor makes tasks schedule and estimate ability of applying audit software. For this purpose form and methods of accounting at the enterprise are

analysed, volume of the accounting information and amount of time necessary for auditing are determined. At this stage the required capacity of computer facilities is defined, and the detailed schedule of audit tasks is made. Also executors for audit task are assigned and the structure of auditor conclusion is pre-defined.

On *the third stage* standard software is set up for actual accounting data, and new tools necessary for this audit are developed.

On *the fourth stage* integrity of the data on electronic storage media is checked. Then the auditor estimate the state of enterprise, test and analyse the received information, valuate it with the help of knowledge base and make a conclusion on audit positions.

There are two main strategies in creation of audit programs:

- minimization of expenses for input of source data;
- minimization of risk of missing errors in financial statements.

First strategy intends using "yes-no" format of data input with the help of tests, or partially truncation of accounting information of the client. This may lead to increasing of control risk.

The second strategy requires significant expenses for input of source data. For reduction of these expenses it is possible to use the client's primary accounting in which all financial and economic transactions are registered. With this purpose it is possible to convert data from accounting system to audit program, or adapt the audit program to structure of the client database.

Domestic market of special audit information systems is only starting its development. In the world market there is audit software of three types:

- specialized computer audit software;
- support tools for audit procedures;
- multipurpose and specialized application packages.

The first type of programs — *specialized computer audit software* — is intended for auditing of client CIS by its various testing. Result is the conclusion about efficiency of control procedures and data security in the system. It allows to estimate risk of inefficiency of control and to determine the ability of using the client's database in audit process.

The second type of programs — *audit procedures supporting programs*— provides the work with large data arrays during audit procedures (e.g. check and analysis of records, comparison of data from different files, marking and printing of selections, generation of reports etc.).

Audit procedures supporting programs supposes performance of the certain tests of data. Such software allow to conduct auditing and analysis of records using the certain criteria and to define quality, integrity and correctness of the data. For this purpose also the knowledge base is used which helps to determine discrepancies and to make necessary decisions. Such software allows to execute testing of calculations, to perform necessary

recalculations and to compare the received results with the normative, budget, preliminary data.

Model of such audit program has the following structure according to the literature on computerization of auditing [109] (fig. 4.7).

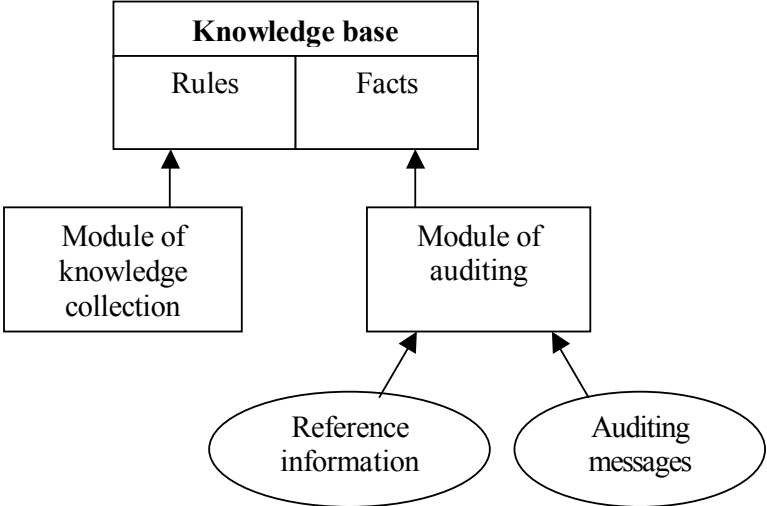


Fig. 4.7. Structure of auditor system

Module of knowledge collection is responsible for formation of the knowledge base. The knowledge base consists of two parts: base of rules and base of facts. The base of rules contains procedural knowledge in the form:

IF <condition>, THEN <reaction>.

For example, if attribute "Volume of work" in "Contract" coincides with an attribute "Volume of executed works" in "Acceptance report", we may process the next rule.

Facts database is a semantic network with many predicates. It reflects typical description of accounting documentation and its ties.

Module of auditing is intended for initialisation of work of the system, and formation of auditor conclusions.

The program system *Pomoshchink auditora* by Goldberg-audit is an attempt to create audit system intended for the decision of tasks of audit on all its stages, and which really works [64]. The structure of the automated audit system consists of four modules, which functions correspond to four stages of performing audit.

Module of preliminary stage contains a questionnaire for audited enterprise, and templates of letters that auditor send to the client before signing up the contract. At this stage data on the client is collected and the received information is entered into the system for further use in other modules.

Planning module contains mathematical models and algorithms of calculations of auditor risk, a materiality level, and selections. With the help of calculation templates initial

data is entered complying with the type of the audited enterprise. Data input can be made both manually and automatically from accounting database. The second variant prevails, because calculations of materiality and selection for distinct procedures are based on final balance, debit and credit turnover of specific accounts.

As a result of calculations the program defines all values necessary for planning. Overall audit plan and auditing schedule are also developed.

Module of audit procedures is the most significant in the program. It includes the following elements:

- working audit programs on sections;
- procedure templates for each unit of audit;
- test templates for different sections of audit;
- conclusions on sections of audit.

Strategy of optimisation of volume of the input information while minimizing the risk of auditor mistakes is realized in this module. It is the most complicated part of automation of the system, intended for recognition of connections between entered information, calculated values of materiality and selection, and the auditor conclusion about the specific unit.

Reference and help means may essentially help the auditor on this stage. To them we can assign:

- work with legislative database;
- short reference about legal acts;
- list of typical mistakes for the specific procedure;
- techniques of performing of the procedure etc.

The primary goal of the module of procedures is to prepare materials for that part of auditor conclusion, which contain description of audit procedures. The module also is responsible for the form of written information that the auditor will provide to management of economic subject.

Other similar program is *Abacus Professional*, which covers practically all stages of performing audit [115]. At the first acquaintance with the client the auditor with the help of the program can carry out express auditing of the financial accounting reporting. For simplification of this procedure we can import data into the program from other accounting programs in Btrieve, Clarion, Clipper, Foxpro and other database formats. Use of these receptions helps to find out operatively parts of accounting of the client where the risk of errors occurrence is the biggest, and to make the decision on performing or not performing an audit. A computer revealed mistake might be both mathematical and logical discrepancy. Express audit allows estimating volumes of selection, terms of performing audit and sum of auditor fee.

On a stage of correctness check of registration of documents and corresponding records, registers and reports the auditor may use tracing by any attribute, for example by "suspicious" sums or "suspicious" contractors. *Audit trial* is a procedure during which the auditor checks

some source documents and their reflection in synthetic and analytical accounting registers. The corresponding final balance rigidly tied to these documents in the program, allows to draw a conclusion about correct (or incorrect) reflections of this economic transaction in accounting.

In the program there is special designer of documents and reports – *Abacus Designer* – for forming the reports of any form. With its help the developers adjust reports themselves concerning to requirement specifications of auditors. On base of *Abacus Designer* it is possible to prepare also acts of collation of calculations, special reports in which information may be presented in different sections, with different depth of analytics.

One of the most sophisticated directions in auditing is optimisation of accounting policy of the enterprise. *Abacus Professional* supports work with several databases, so auditor can simulate the situation of change of accounting policy of the client firm on the base of real data. So he can prove, what profits or losses change of accounting policy will bring to the firm, and give well-grounded recommendations for strategic planning.

One more example is *ExpressAudit:PROF* intended for the decision of a full cycle of problems of auditing of financial and economic activity of the commercial enterprise from the stage of preparation and planning of audit up to the stage of drawing the auditor conclusion.

ExpressAudit:PROF consists of two parts. The first part is «Uniform centre of planning and performing of audit». Its functions include:

- preparation and planning of audit;
- development of audit plan;
- assignment of audit entities to executors;
- uploading personal tasks to executors on removable data storage media for performing remote audit;
- gathering, ordering and processing of results of audit;
- forming of the accounting documentation in Microsoft Word format;
- storage of the results of audit.

The next module – «Auditor mobile workplace» is intended for the decision of the following problems:

- loading of the personalized program for check of the assigned audit entities;
- performing audit and gathering of audit evidences on the assigned audit entities according to the personal audit plan;
- ordering and processing of audit results within the framework of the selected audit entities;
- storage of audit results;
- transfer of results of accomplished audit to the module of planning and performing of audit.

In *ExpressAudit:PROF* the stage of planning of audit is the initial stage of auditing, and allows to solve problems of development of overall plan and schedule of audit, including segregation of work between members of audit group.

At the stage of planning of audit the audit administrator break auditing into separate audit entities according to the following criteria:

- amount of audit works;
- level of competence of experts;
- territorial disposition, etc.

For each audit entity the audit administrator forms an individual audit schedule and assigns it to executives from the audit group formed on the stage of audit preparation. Set of all individual audit programs of the selected audit entities makes the final program of audit on the basis of which overall audit plan and audit schedule are formed.

In *ExpressAudit:PROF* program complex the initial data necessary for the beginning of auditing is entered on the preliminary stage. Further on the stage of preparation the audit administrator enters the following data:

- enterprise requisites;
- term of audit;
- volume of work necessary for auditing;
- estimated audit risk;
- estimated materiality level;
- list of source documents to check;
- audit group staff.

Further estimated audit risk and estimated materiality level are entered in system, and also source documents obligatory to check are defined, documents, forms of the financial and tax accounting reporting that you're planning to check during the audit. At forming of audit group it's important to indicate expert's position and to specify a number of certificate (for auditors).

«Audit Entity Creation Wizard» is implemented in *ExpressAudit:PROF* for automation of creation of individual programs of audit. User calls it any time when a new audit entity is required to define.

In *ExpressAudit:PROF* two variants of performing the audit of the generated audit entities are implemented: full and brief procedure. Depending on the chosen variant the system forms full or brief list of questions. If the brief procedure is required we should specify the "Express audit" variant of audit in "Audit Entity Creation Wizard".

Each element of typical audit entity has an attached list of questions obligatory for control on the stage of performing audit. Thus, forming of audit schedule consists of consecutive selection of required elements of typical objects from total list. The final step of creating a new audit entity within the framework of current audit is choosing of the responsible executives from audit group determined on the stage of audit preparation.

The result of work of the program on this stage of audit planning is a completely generated and ready-to-perform overall audit plan and audit schedule.

At this stage the experts participating in audit with the help of built-in program routines can:

- familiarize in detail with full volume of works;
- obtain list of questions obligatory for auditing and extracts from normative documents needed for auditing of the entities;
- generate personal questionnaires;
- upload individual plan of audit on the removable data storage media for remote work.

All methodical part of system is implemented as a full-text database containing the list of questions (more than 1500 questions) that covers accounting and the taxation of financial and economic activity of the enterprise.

During auditing the program consistently offers the auditor the questions that require the obligatory control according to the personal audit program for audit entities of his responsibility. If in the process of check of financial and economic activity of the enterprise question by question, the auditor reveals discrepancy or incomplete conformity to requirements of the legislation, he can make a mark about it in a corresponding window of the program. This helps to the systematize gathering of audit evidences and form work materials of auditing.

At a stage of drawing up results of audit *ExpressAudit:PROF* allows to generate automatically final documents according to results of auditing on the base of document templates from the library of system.

Thus, audit firms can use *ExpressAudit:PROF* for:

- development of overall audit plan and auditing schedule;
- creation of work documentation;
- studying and valuation of accounting system and internal controls of the enterprise;
- gathering of audit evidences about reliability of accounting reporting;
- getting the idea about observing the requirements of statutory acts by the enterprise;
- organizations of internal quality assurance of audit;
- conducting of primary auditing of initial and comparative parameters of financial accounting reporting;
- preparations of auditor reports and auditor conclusion by audit results.

The program may assist auditor on each stage of auditing from registration of the contract on providing audit services to audit itself.

Interesting feature of *Audit-master* (developed by DASO Audit Inform) is an adjustable module in which user can create own system of sections and subsections of audit, and attach

to each of them any set of procedures¹. For each procedure it is possible to set two elements: introduction and the test. Introduction is a certain text, which must be written in the summary of procedure. The test means user-defined list of "yes-no" questions, and text, which will be written in the summary in case of positive or negative answers. The program also provides keeping a card-file of audit subjects, to calculate an materiality level, and other functions similar to *ExpressAudit:PROF*.

Program *AuditNET Professional* (developed by Open Company Novyye Effectivnyye Tehnologii) differs from the mentioned software products by technology of development. All programs considered above are compiled by separate auditors or audit firms and consequently are "fastened" to an author's technique (except *Audit-Master*). In case of *AuditNET* developers intentionally did not implement a distinct technique, involving auditors from different companies into development. So *AuditNET* provides auditors with a set of facilities for implementation of their own methodology. If the methodology is stored in electronic form, e.g. in Word or Excel documents, they can be transferred into the program, setting ties of between fields of each document and objects in a database. Thus, we get a template by which we may create any working papers, and they will automatically be fulfilled with the data from "addresses" specified in template. The program allows to create templates for any documents, and practically from zero build a precise personal system of auditing, practically with no help of programmers.

In the program it is possible to standardize audit procedures, their order and documenting, but also terms and order of works. program automates not only auditing, but also the activity of the audit company: relations with clients (accounting of contracts, clients database), personnel administration (accounting of working hours of auditors, segregation of duties), docflow in the company, rendering of additional audit services, quality assurance. (Actually, this program can be considered to «*Programs of automation of management functions*» group) Modules "Clients", "Contracts", "Company" and "Management" allow to maintain detailed clients database of custom structure. The database of contracts is maintained similarly; in addition contracts can be broken down into stages, terms and cost of each stage. The auditor may trace performance and payments by contracts, form packages of necessary documentation. Automation of administration of personnel includes keeping cards of employees, accounting of working hours. "Management" module allows receiving financial reports by contracts and audits (with indication of profitability and costs detailed up to a particular executor), to calculate efficiency of the company activity. Unique feature of the program is the planning of expenditures (on salaries, business trips, etc.) and income (based on estimated time and cost of man-hour) per audit.

Multi-purpose and specialized application packages. This group covers a wide range of "box" programs of general use with which an auditor should be able to work. By purpose and application in audit they can be divided into the following groups:

¹ See: Светин Д. "Заводной" аудит (Обзор аудиторских программ) // Двойная запись, №8/2004.

- text processors;
- table processors;
- legislative databases and reference systems;
- accounting programs and their separate modules;
- specialized statistical multi-purpose packages;
- programs of financial analysis and their separate modules;
- programs of electronic docflow;
- programs of automation of management functions.

Text processors are used at all stages of auditing for creation and design of audit documents. They are applied while drawing up audit plans, contracts, various references and queries, audit work papers and drafts; for correspondence with clients; for preparation of auditor conclusions and recommendations etc. Mostly audit firms use *Microsoft Word* by Microsoft Corporation.

Table processors that include powerful calculating facilities, business graphics, text processing and database management, are widely used in auditing. They are used for:

- drawing up various analytical tables;
- implementation of analytical procedures connected to evaluating of actual parameters of the financial accounting reporting and analysis of financial state of the entity;
- representation of the received information in graphics;
- drawing up of alternative balance reports;
- creation of various working spreadsheet documents etc.

Built-in financial and statistical functions, facilities for solving «what-if» tasks made table processors popular among auditors. The most widespread is *Microsoft Excel* table processor from *Microsoft Office* application package.

Legislative databases and reference systems provide consulting service of auditors in the process of checks. That allows them with sufficient level of assurance make a conclusion about conformity of accounting at the enterprise to documents and standard acts that regulate the accounting.

Example of such reference system is *Assistent auditora* (developed by Service-Audit). It is a database of legal acts in the field of audit that contains audit techniques, patterns of audit working documents, help information on accounting and taxation. *Assistent auditora* works in runtime environment of *Codeks* legislative database that allows to use its search tools. *Codeks* search engine allows to find easily the needed documents, to store them in user folders, and to mark fragments of texts with bookmarks for fast access.

Information in *Assistent Auditora* is grouped in several sections by themes. In "Audit Planning and Preparation" section there are document templates necessary for registration of relations with clients, reference and methodical materials on carrying out pre-check actions, assessment of audit risk and materiality level, examples of audit plans etc.

In "Methodology of Audit" module various audit techniques created by the program developers are collected. In "Auditor Adviser" legal basis and practical aspects of audit company activities are explained, from registration to winding-up, and. Also the help information containing norms, rates, indexes, references on financial and tax accounting and financial analysis is gathered.

Programs of electronic docflow allow to accumulate, save, consolidate, search and access the documents in electronic archives. Also they support group work with one document. For example, some offices of audit firm Ernst and Young use *DOCS Open* system by PC DOCS Inc.. If auditor comes across such systems at client enterprise, he may assess correctness of their application. Besides if the system of electronic docflow functions at the client enterprise, it simplifies and accelerates performing of audit because of quick access and reception of the needed documents.

Auditors use *specialized statistical multipurpose packages* for carrying out complex calculations. They possess the following features:

- implemented set of various statistical methods;
- data exchange with the most popular DBMS;
- capabilities of graphic representation of the data;
- user-friendly interface.

Most popular of such problems are *Mathematics, Statistics, Quick, Statgraphics*.

Programs of financial analysis and their separate modules. For analysis of financial and economic activities of economic subjects together with table processors audit firms use special programs of financial analysis. They are focused on the analysis of financial state of the enterprise, and making of strategic and tactical decisions in business administration. Programs of analysis allow to perform audit of financial, tax and other reporting with the help of mechanism of verification of interdependent parameters. They contain different techniques of financial analysis, may calculate a big number of economic parameters and allow creating and analyzing of business plans. Some programs bring the financial reporting into conformance with GAAP and IAS international standards (e.g. *Audit Expert, Project Expert* by Pro-Invest Consulting). Today means of the financial analysis are often integrated into systems of accounting and management (e.g. in programs by Galactica, Infosoftware, Intelligence-service, R-Style Software Lab etc.).

Programs of automation of management functions are used for automation of administrative procedures in audit firms. These programs allow:

- in sphere of planning —
 - to calculate the cost price of the performed work on the basis of hourly payment,
 - to keep accounting of works accomplished,
 - form invoices for the finished work,
 - to make calculation and the analysis of accounts receivable;

- in sphere of docflow — to form
 - glossaries,
 - texts of contracts,
 - acceptance reports on finished work;
- in sphere of HR management — to keep accounting of the current expenses of workers by kinds of works in section of clients and other works;
- in analytical sphere — to keep detailed directories of clients, structural divisions of the company and its employees, types of jobs and hourly wages;
- in sphere of statistical analysis —
 - to carry out selection of data by any criteria,
 - to form statistical reporting.

In the international audit practice for accomplishing business-diagnostics, privatisation, market research, business estimation etc., systems of decision-making support are used as well, as expert systems for monitoring of clients, planning of audit, making selections, preparation of financial reporting etc.

Today audit firms use special programs of own development focused on internal regulation of auditing with application of internal firm standards.

Let's consider structure and functions of audit programs on example of the *Deloitte and Touche Audit program/2 (AS/2)*. It is intended to simplify preparation of the working papers and reporting, and to perform consolidation, and includes means of text and table processors and programs for drawing up trial balance reports. The structure of the program is shown on the fig. 4.8.

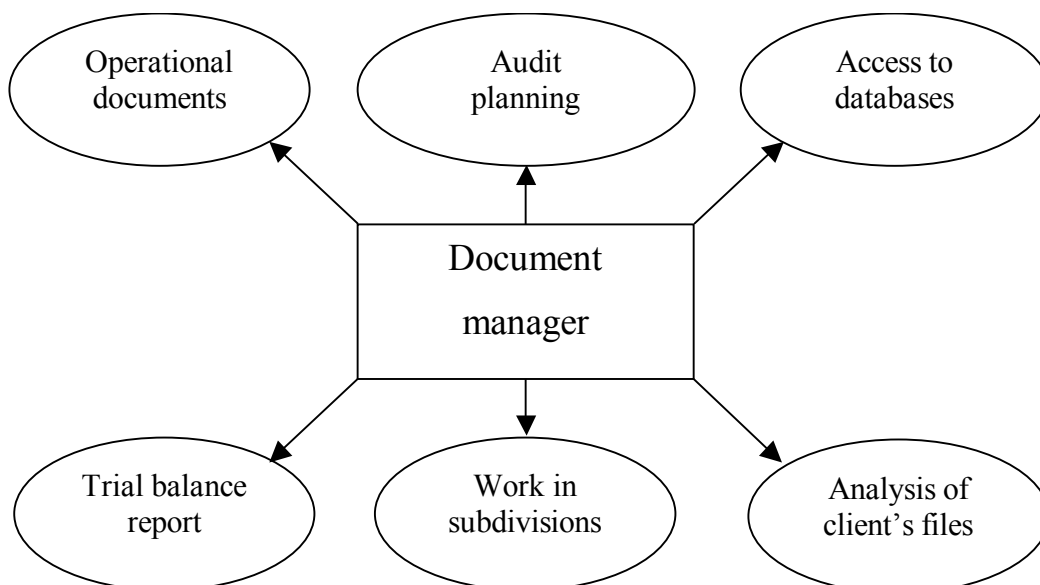


Fig. 4.8. Structure of Deloitte and Touche Audit program/2

Document manager maintains system of folders that allows to organize information which is usually kept in auditor files, — working papers, audit plans, software and control tables, trial balances, financial reporting, audit reports and customer databases. The system also simplifies process of information interchange between members of group, enabling them to work simultaneously in one document with a high degree of safety and accuracy.

Functions of *AS/2*TM trial balance report contain multilevel consolidation, converting of foreign currencies, correction log and means for making plans of analytical reviews and financial reports. Close integration with Excel table processor allows to analyse and prepare templates of trial balance reports. Convenient import procedure enables transferring the client's trial balance report in electronic form directly into the program.

Questions to chapter 4

1. What aspects of audit does computer information systems at the enterprise affect?
2. What are requirements to qualification of the auditor while auditing in a CIS environment?
3. What is the sequence of auditing of CIS functioning?
4. What is the difference of auditing in various environments of data processing (standalone PCs, on-line computer systems and database systems).
5. What is computer audit? How is it related to audit of financial reporting?
6. What is included in risks and characteristics of internal control in a CIS environment?
7. What techniques are used in testing of CFAIS?
8. Name the list of prominent features of auditing of automated accounting.
9. Draw a diagram that shows the organization of auditing in computer environment.
10. Explain, how the auditor receives information about the entity in conditions of automated accounting.
11. Specify how the auditor assesses control risk in the computer environment.
12. Define what is called audit software.
13. What types of software can the auditor use in his work?
14. Specify, on what stages of auditing the auditor can use specialized software.
15. What are key parameters of CIS auditing concerning to data security and integrity?

AFTERWORD

Two factors affect the organization and running of business. The first one is the appearance and strengthening of global economy; the second is transformation of industrial economy into the service economy, oriented to knowledge and information. Today information is an important production resource, without which administrative activity is impossible. So, the methods of processing and use of economic information and hardware, due to which transformation of data in an information resource became possible, become very important.

Accounting information, which is distinguished by a big amount and variety, logical sophistication and relative simplicity of arithmetic processing, is the core of economic information of enterprise. With the application of computers the processing of economic information is carried out by CIS – computer information system of enterprise. The computer system of accounting (CFAIS), in which data related to accounting, control, planning and analysis is accumulated and processed systematically and chronologically, is the central link of CIS.

The computer accounting must provide the complex decision of three types of tasks: a) traditional accounting tasks; b) accounting of current results of economic activity (by the way, every current index is compared with the normative or planned one, the deviation and estimation of these deviations is given); c) “accounting of managerial decisions results“, which allows to estimate the accepted decisions. Consequently, the main objective of functioning of the accounting computer system as a component of CIS on an enterprise is to provide the management of enterprise with financial information to take grounded decisions while choosing alternatives of the use of limited resources.

The automated accounting opened the possibility for accountants and leaders to register more operatively and at a radically new level. The computer method of the data processing allows to form accounting both in the regulation mode, and in the mode of database inquiries, but not to make accounting once per long time interval.

The greatest changes in the theory of accounting during its computerizing take place in the form of accounting and in accounting registers. An electronic accounting register is the union of computer database with the definite structure intended for accumulation and saving of accounting information on technical storage media; variables, temporally created in computer memory for systematisation and generalization of accounting data – business accounts, and the screen and printing forms intended for the reflection of the grouped and systematized accounting information.

The application of complex CIS makes the definition of accounting form turn into the definition of the computer system of accounting (CFAIS), which has the following basic characteristics:

a) computer turns from an auxiliary mean into the determinative of labour organization of accountant;

b) computerization involves all the stages of accounting information processing: gathering of primary information, accumulation and processing of data, forming of accounting;

c) the efficiency is provided, both at the accounting information transfer, and at the accounting data processing;

d) possibility of modelling on the basis of accounting data.

CFAIS application gives a possibility to strengthen the function of legality control and financial viability of economic transactions without increasing labour intensity of accounting. The information system provides the continuous control of forming documents and current accounting records. It is caused by the fact that the computer system of accounting has its own inner structure and built-in algorithms, determines the rules of accounting and scheme of documents circulation. Practical result for an enterprise is the reduction of probability of random and intentional errors of accountant.

After the disappearance of the hardest and the most monotonous processes of information collection and processing the accountant's work becomes creative and more effective. This enables him to concentrate on the previous and current control and economic analysis. An accountant is no longer a mechanical performer of manual operations, but the main link in the technological process of accounting; he controls and regulates it.

The stated above also concerns to auditors who must understand the features of functioning of computer accounting, as otherwise it is impossible to check up quality of accounting control and to give consultations on improving of the system of accounting at the enterprise.

TESTS

"True-Lie" tests

Choose the correct answer. If necessary explain it, or specify, in what cases both variants may be correct.

1. The information technology can separately exist from the technical and program environment.

- a) true b) lie

2. The "information technology" concept has appeared in 20th century during establishing of computer science.

- a) true b) lie

3. Information system of the enterprise is a part of computer information system of the enterprise.

- a) true b) lie

4. ERP concept is a development of MRPII concept

- a) true b) lie

5. Ways of processing of the accounting data are divided into automated and non-computerized.

- a) true b) lie

6. Term "Internet" consists of two parts meaning "between" and "network".

- a) true b) lie

7. Universal programs for viewing information in Internet are called Web-browsers.

- a) true b) lie

8. There are three classes of e-commerce subjects: financial institutions, business-organizations and clients.

- a) true b) lie

9. The basic principle of development of accounting information systems is the principle of system approach.

- a) true b) lie

10. Software that allows to find and to see quickly the necessary legal document on accounting and taxation consists of legal databases, programs of analysis of the financial and economic activity, specialized programs.

- a) true b) lie

11. Audit programs should be set up quickly for the enterprises with various specificity of accounting.

- a) true b) lie

12. For auditing of each part of accounting in conditions of CIS is applied the techniques that includes: studying of basic normative documents, list of source documents by parts of accounting work, registers of the synthetic and analytical accounting.

- a) true b) lie

13. While auditing it is necessary to consider the following features: level of automation of accounting, presence of auditing techniques at the enterprise, availability of accounting data.

- a) true b) lie

14. Accounting software products to destination divide into: domestic accounting, accounting for small, average and large enterprises, diversified corporations.

- a) true b) lie

15. Automatic input of the source data releases from necessity to make out legally valid confirmation of the carried out economic transactions.

- a) true b) lie

16. For accounting of personal and family finance programs of "mini-accounting" class are intended.

- a) true b) lie

17. The price, support and the documentation belong to commercial requirements which should satisfy the accounting software:

- a) true b) lie

18. Technical requirements to the accounting software include convenience of the user interface and the advanced system of program help.

- a) true b) lie

19. Application of rules of keeping accounting with the help of program functions and restriction of user access to database is called " Virtual automated workplace ".

- a) true b) lie

20. Complex of means built on the base of PC, is a functional part of automated workplace.

- a) true b) lie

Multiple choice tests

1. During processing of economic information after data collection comes a stage of:

- a) storage;
b) delivery of results of processing;
c) transferring.

2. Feature of accounting information which says that the one should not waste time on the accounting of insignificant factors, is called:

- a) continuity;
b) mass character;
c) materiality.

3. The term "Internet" consists of two parts:

- a) "Between" and "network";
b) "International" and "network";
c) "Global" and "network".

4. Computer information system of the enterprise has the following structure:

- a) Program, information and technical providing;
b) Functional subsystems, functional tasks, models and algorithms;
c) Functional components, components of data processing system, organizational components.

5. Local-area computer network is:

- a) a complex of devices which provide processing of the information by the set algorithms;
b) a complex of interconnected facilities intended for automated collecting, accumulation, processing, transfer, exchange and display of the accounting information;
c) group of computers, printers, other technical facilities, incorporated by a communication facilities.

6. Global computer network is:

- a) A single network with steady structure which is served by only one group of the experts responsible for its functioning;
- b) The closed corporate network based on Internet standards and technologies;
- c) The form of running the business in which interaction between sides occurs with the help of electronic means.

7. To the accounting reporting in automated systems of financial accounting belong:

- a) system, internal, external and custom reports;
- b) financial, tax and statistical reports;
- c) no correct answer.

8. The primary goals of the auditor in a CIS environment are:

- a) evaluating of influence of CIS on organizational structure, estimation of availability of data, defining of influence of accounting automation on assessment of internal controls and character of risks;
- b) collecting of such number of audit evidences which would allow to draw necessary conclusions on the basis of which the auditor conclusion will be prepared;
- c) evaluating of influence of CIS on availability of the intermediate and primary data.

9. Program application of distinct functions of the accounting worker with the use of different information and applied technologies is called:

- a) functional software;
- b) operational system;
- c) system software.

10. Global system of interconnected computer networks that includes email and world wide web is called:

- a) Intranet;
- b) Internet;
- c) web-browser.

11. Association of two components: computer data and electronic arrangement of this data, with the purpose to run business in Internet, is called:

- a) Intranet;
- b) electronic shop;
- c) web-browser.

12. Reports in CFAIS, necessary for accountants for checking up the correctness of keeping the accounting, and also for search of probable errors, are called:

- a) custom reports;
- b) internal system reports;
- c) regulated reports.

13. A principle of CFAIS development, which says, that advantages expected from use of the system must exceed expenses for its development, implementation, training and support is called a principle of:

- a) system approach;
- b) economic expediency;
- c) compatibility.

14. Entering, alteration, correction of computer data or programs, other interventions in process of data processing which influence the end results, result in financial and property losses or to reception of the illegal profit are called:

- a) computer fraud;
- b) computer sabotage;
- c) non-authorized access.

15. Creation of CFAIS at the enterprises consists of the following main stages:

- a) 1) studying of features of economic activities of the enterprise; 2) development of system and coordination of the project; 3) installation and improvement of the system;
- b) Stages of introduction of CFAIS depend on the sizes of the enterprise;
- c) 1) development of the system and coordination of the project; 2) studying of features of economic activities of the enterprise; 3) installation and improvement of the system.

16. The model of cycle of CFAIS development which provides transition to the following stage after complete finishing of works on the previous stage, is called:

- a) stage-by-stage model with intermediate control;
- b) cascade;
- c) spiral.

17. Programs intended for performing distinct accounting (accounting of work and wages, fixed assets etc.) which cover separate parts of accounting work and, as a rule, are not connected with each other, are called:

- a) mini-accounting systems;
- b) local automated workplaces;
- c) managerial systems.

18. Keeping Journal of transactions in the program, an ability of conducting analytical, quantitative, currency accounting concern to:

- a) ergonomic requirements;
- b) functional requirements;
- c) technical requirements.

19. Such criteria of choosing the CFAIS software, as uniform program environment, built-in programming tools and unified form of data presentation, are applied for:

- a) small enterprises;
- b) middle-size enterprises;
- c) big enterprises.

20. Application of rules of keeping the accounting with the help of functions and restriction of user access to database is called:

- a) functional part of automated workplace;
- b) Intranet;
- a) virtual automated workplace.

21. The following ways of processing of accounting information are distinguished:

- a) paper and mechanized;
- b) paper and automated;
- c) computer and non-computerized

22. Convenience of user interface concerns to:

- a) technical requirements
- b) commercial requirements
- c) functional requirements
- r) ergonomic requirements

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APPENDIXES

Appendix A. Information systems used at enterprises in developed countries

<i>N</i>	<i>Abbreviation</i>	<i>Term</i>	<i>Description</i>
1	AIS	Accounting information system	Software products that provide entering economic transactions in a database with the subsequent forming of balance sheet and other reporting
2	APS	Advanced Planning and Scheduling	Products that support flexible management of productions schedules and manufacturing tasks. The task of requirements planning is solved in conditions of limited capacities
3	CRM	Customer Relationship Management	Apply technology of management of relations and interactions with clients of the enterprise. Usually include forecasting of contracts, their control, support of ordering and selling processes, after-sale service
4	CSRP	Customer Synchronized Resource Planning	Assumes ability of management of external elements of production chain. The goal of falling outside of the enterprise limits is to manage full lifecycle of production from designing to after-sale service
5	DSS	Decision Support System	Systems that allow to simulate consequences of administrative decisions
6	ERP	Enterprise Resource Planning (Enterprise-wide Resource Planning)	Provide carrying out accounting and control functions, not only for homogeneous and locally disposed entities, but also for versatile enterprises and corporations with branches and divisions in different cities and countries
7	MES	Manufacturing Execution System	Systems contain real-time data of movement of details on the conveyor, and also information about quality and operation assurance. Using barcodes or other similar means allow enterprises to avoid manual registration of technological operations
8	MIS	Management Information System	Systems of providing information to the top executives for taking operational decisions
9	MRP	Material Requirements Planning	Planning of purchasing or manufacturing of all components of the end product. Valuation of stocks considering work in progress, forecasts for selling and ability of new orders
10	MRP II	Manufacturing Resource Planning	In addition to functions of materials requirements planning MRPII-systems include a number of other functions (computer-aided design, control of manufacturing execution, simulation etc.)
11	SCM	Supply Chain Management	Logistics control systems which unite buyers and suppliers within uniform structure of data processing
12	SEM	Strategic Enterprise Management	Systems for decision-making support for top management

Appendix B. Basic classes of accounting software

<i>N</i>	<i>Class</i>	<i>Users</i>	<i>Description</i>	<i>Software products</i>
1	Software for domestic bookkeeping	Physical persons	Accounting of personal and family cash	Учет доходов и расходов v2.0, Cash - Личные финансы, Домашняя бухгалтерия, Личные финансы v1.3, CashFly v2.03, AceMoney v2.1.4, 1С:Деньги (1С), Quicken (Intuit Corp.), MS Money (Microsoft), ОЛИС-Копилка (СОФТИКО)
2	Mini accounting systems	Accounting at small enterprise with 1-3 accountants	Entering and processing of accounting records. Printing of source documents and reporting	Инфин-бухгалтерия (Бухгалтерия-мини) (Инфин), Соло для бухгалтера с компьютером (Баланс-центр), Сводный учет финансов (Логос), Ажур (Терцет)
3	Multi-purpose accounting systems (midi accounting systems)	Small (no more than 8-10) number of accountants. All parts of accounting work are covered	Powerful analytical accounting. The quantitative and currency accounting. Accounting of work and salaries	Турбо Бухгалтер 6.x (ДИЦ), 1С:Бухгалтерия 7.7 (1С), ГРАН-БУХ, (Гранит-Центр), Инотек бухгалтер (Инотек НТ), Инфо-Бухгалтер (Информатик), Главный бухгалтер (Паритет-Софт), Бухгалтерский учет и расчет баланса (Синко), Дебет плюс (ДИЦ), FinExpert (IDM) ФОЛИО-БухМастер. 7Е (ФОЛИО)
4	Local automated workplaces	For a separate part of accounting work	Realization of separate accounting tasks	1С:Расчет (1С), Инвентаризация (Инфин), Торговый состав (Компьютер-сервис), АиТ: Зарплата, Зарплата (Звезда), Расчет заработной платы (Инкософт), Зарплата (УТЗП) (НИПИ статинформ), АРМ ЗАРПЛАТА (Электронные деньги), Зарплата, Состав, Учет МБП, Банк, Зарплата, Таможня (Компьютер-Приз), Комплекс задач по труду и заработной плате (Вызов), WAGES (Баланс-Центр)

5	Complex of connected automated workplaces	Accounting department not less 8 employees. Precise segregation of functions between employees	Complex of programs. Network architecture. Rather full realization of accounting functions.	Парус (Парус), RS-balance (R-Style Software Lab), БЭСТ-ПРО (Интеллект-Сервис), GRIMO (GRIMO), БОСС-компания (АйТи), Комплексная система бухгалтерского учета (Звезда), Тектон (Интелгрупп), Интегратор (Инфо-софт), Монолит (Монолит-Инфо)
6	Managerial systems	Accounting department; managers (managerial and financial accounting, financial management tasks)	Managerial accounting. Planning and management. Customization for client needs. Open architecture. Scalability	Галактика (Галактика), Platinum (Platinum Software Corporation), Тектон (Интелгрупп), SyteLine, SPTISA, SPFIL (SOCAP), АККОРД (Атлант-Информ), Scala (Scala), Парус-Предприятие 8.x (Парус)
7	Systems of financial analysis	Managers, chief accountants, internal and external auditors	Financial analysis on the basis of accounting data. Computerization of tasks of external and internal audit	ПОНИ (Планирование, Оптимизация, Налоги, Инвестиции) (GI-consulting), Инвестор, Аналитик, 1С: АФСП (1С), Баланс-2 (камеральная проверка) (Овионит), Audit Expert (ПРО-Инвест), ИНЭК-Аналитик (ИНЭК), АБФИ (ЛАНИТ), Аналитический комплекс Прогноз (Прогноз), БЭСТ-Анализ (Интеллект-Сервис), Торговля и кредит
8	Legislative databases	Lawyers, accountants, financiers, economists	Reference systems that contain picked up legislative acts on taxes, accounting etc.	Консультант бухгалтера (Консультант-плюс), Главный бухгалтер (Гарант), Помощник бухгалтера (Кодекс), Налоги и бухгалтерский учет (Референт), Гроссбух, Бизнес-эксперт, Сапфир (Динай), Libra (Libra), Ваше право, Энциклопедия Российского Права

