Contribution of the Computer Science at Debts Registering in Accountancy

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Abstract: The systems of artificial intelligence used in the financial-accounting field have a wide applicability in the tax determination as well as in the elaboration of the financial-accounting situations. The use of the expert systems at a large scale in the field of accountancy must take into consideration the possibilities of knowledge modelling. The reasoning and the symbolic knowledge are present in any activity. Wherever the knowledge administrated by experts is present, there is also the possibility of expert systems application.

The Specific Problems

The science of accountancy benefits nowadays of the principles of the theory systems, cybernetic principles and the methods provided by computer science in order to create highly-performance integrated systems and expert systems.

Computer science has a remarkable role in expanding the base of knowledge in the field of accountancy, due to the possibility to transfer the human intelligence to computer science products, specific to the accounting field. This leads to the theory improvement by developing concepts and principles and afterwards, to the formation of the unitary and dialectic process for the creating assimilation of the conceptual achievements from the frontier sciences, in order to create the most improved and efficient system of information and control over the activity of the economical agents and to increase the accountancy's contribution at the scientific decisional substantiation at all levels.

In the last decades, the accountancy recorded significant moments of systemic opening, in order to have a better theoretical and applicative approach of the whole research area.

Accountancy is legislated and applies in all the economic and social systems. The science of accountancy provides pertinent information regarding the preservation and development of the national wealth. Therefore, the computer science systems

and the expert systems present an outstanding interest for accountancy, due to the performances obtained in information processing.

Presently, the accountancy's informatization provides a plenary demonstration of the accountancy's principles and method, of the systematization, processing and reporting the information by using the balance and the other reports and financial & accounting situations.

As science, the accountancy exceeded for a long time the period of accumulation, entering in the phase of quality progress. It asserted itself as an economic and social quasi-science with all its rights, being present in any culture.

The introducing of the knowledge-based systems represents the most modern computer science technology. In the last years, accountancy proved to be very attracted by this most advanced technology, within the frame of the expert systems application in the economic field.

The computer science and cybernetic systems knew a tremendous development at the end of the 20th century. The nowadays practice created computer science systems applicable in accountancy, that integrate expert systems able to amplify the knowledge actions of the results of the economical activity. These systems notifies the pecuniary shortcoming and they can intervene in due time over the economical indicators or they can introduce new concepts and principles of accounting knowledge.

RONALD I. TEHACKER, the author of the paper "Introduction to Modern Accounting" examines the accounting from the perspective of an user of its information and asserts: "the elements of the computer science system of accounting represents the nucleus of the modern computer science systems"[1)] In his opinion, accounting has an indispensable contribution in the management activity.

In order to know better the accounting's contribution in its sphere of action, it's necessary first to make the difference between the activity of getting the information required by the decisional process from inside the patrimonial unit, called managerial accounting and the activity of getting the information from its outside limits, called financial accounting. Data contained in the managerial accounting are used by the council of administration only and other management levels of the same patrimonial unit. Data contained in the financial accounting are used by the management and third parts.

The accounting's utility could be considered from three points of view:

- The most obvious use is for the management of the patrimonial unit, to which provides every day information from five groups of activities: supply of material means and money, investments, production activity, dispatch and distribution of the financial results.

- Accounting has the same significance for the external users – shareholders, creditors, government, employees and clients of the patrimonial unit.
- Accounting presents an important utility for a company, by providing it with the information set for the control of the patrimonial unit, and perspectives of development.

In the same perspective of RONALD I. THACKER, the components of the informatically processing system of the accounting data are:

- Identification of the economic-financial operations and preparation of the source-documents;
- Data storage on support and its introduction in the system;
- Internal processing, with automatically data repartition on accounts, values calculation and memorization of the obtained accounting information;
- Reports editing for management and information selection required for a next use;
- Transmission of the reports and financial situations to the users from the inside and outside of the patrimonial unit.

The major concern of any modern accounting system is the complex process of selecting the information processed by using the accounting principles, values attaching at each economical transition and elaboration of the significant reports for taking decisions. In the modern management, a large number of decisions refer to the anticipation of the financial results, and from this perspective the accounting's results help the best. The same author also says: "The endeavours to substantiate the decisions based on information other than that provided by accounting, have lamentably failed."[1)]

Therefore, a computer science program could work only if the data basis contains correct and complete accounting information. The conversion on supports and data introduction in the integrated computer science field of accounting assumes the utilization of certain special procedures, as well as suitable computing systems, provided with software. The accounting data are memorized and processed following the automatic procedure. Finally, there are obtained reports and financial situations, as well as other information that is memorized with a view for certain next processing or utilization.

Integration and artificial intelligence are the future characteristics of the accounting computer science systems. The programs of artificial intelligence have as main goals to solve an issue by the symbolic processing of the knowledge stored in data basis containing symbolic languages. The solution of a problem in

the problems of artificial intelligence is identified by heuristic search or by logical intelligence.

The programs of artificial intelligence can be easily modified, updated and extended by dialogue in natural language. They accept approximate results. Such programs produce perfect solutions, as well as usually accepted solutions. Making a comparison with the conventional programs used in the past and that are currently used but in a smaller extent, there are noticed the performances brought by the programs of artificial intelligence. The conventional programs are based on algorithms and procedures, are difficult to be changed with programming instruments, ask for exact reply only and give only perfect responses.

The artificial intelligence started to be studied in the period 1936-1956. The Romanian scientist STEFAN ODOBREJA, the founder of cybernetics, between the years 1937-1939 predicted the artificial intelligence and its contribution in increasing the work productivity. In the field of the artificial intelligence, there are also very interesting the works of great scientists as A. NEWELL, J. C. SHOW, H. A. SIMON, A. TURING, C. E. SHANNON, L. von BERTALLANFY, N. J. NILSSON, T. WIENER, J. McCARTY, M. MINSKY, GR. MOISIL, T. WINOGRAD, E. HEMT.

Along the research development in the field of the artificial intelligence it was noticed the utility of the artificial intelligence programs in the field of computer science. They provide the best solutions and reduce a lot the working time. In 1956 it was presented the LT program (Logical Theorist) of the scientists A. NEWLL, J. C. SHOW and H. A. SIMON, a program that was proving theorems at a medium level of intelligence. This program remarked itself by the level of processing the information presented and memorized in symbolic form and proved that the symbolic thinking could be expressed using the terms of the issues that are to be solved, and on the basis of the knowledge gathered from the applicative field we could act with intelligent programs.

In 1872, M. MINSKY introduced the concept of “frame”, a very general term to describe the properties of the phenomena, objects and situations. Afterwards, there were developed semantic networks, systems of production rules and programming languages for the artificial intelligence.

In 1921, at Vancouver, in Canada, it was organized a conference where there were analyzed the progress made by the artificial intelligence in many fields of the scientific knowledge.

In the ’70-’80 decade, a series of products of the artificial intelligence entered the trade circuit.

Japan will present soon the first computers from the so-called “the fifth generation” that will use the concepts of logical programming that is the PROLOG language.

In our country, in October 1981, there were presented the principal Romanian achievements in the field of artificial science and robotics, at the first symposium of artificial intelligence of Bucharest, under the patronage of the Romanian Academy. Afterwards it was created an institute of specialty in Craiova.

The programming languages used in the applications of artificial intelligence are:

- Languages focused on topics: FORTRAN, PASCAL;
- Languages focused on objects: SMLLTALK;
- Languages of symbols manipulation: LISP, PROLOG.

The systems of artificial intelligence used in the financial-accounting field have a wide applicability in the tax determination as well as in the elaboration of the financial-accounting situations.

In the accounting of the relationships with third parts there are used the following languages:

EMYCIN – for planning taxes and governmental taxes;

AL/X and PROLOG – for the evaluation of the funds of the hardly solvable debtors;

EMYCIN – for diagnosis before credits granting;

AL/X – for the evaluation of the commercial credits.

One of the most performing computer science programs is the expert system. This program provides solutions at the quality level offered by a specialist at problems from a narrow field. The creation of an expert system requires the information extraction from specialists in that field and encoding it in a compatible language accepted by a computer.

The year 1964 is consecrated as the beginning of the expert systems due to the elaboration of the DENDRAL program for the enumeration and marking of the organic molecules as tree structures, a program conceived at Stanford University, USA. From the middle of the ’70, more and more programs of artificial intelligence are considered as expert systems.

For the accounting field, the development of the expert systems raises a series of problems related to the engineering of knowledge, knowledge acquisition and representation, the observance of the developing phases and danger avoiding, as: choosing an unsuitable problem, lack of an adequate computing technique, lack of financial resources, of the exports in the field, as well as the submitting of an extra-large demand.

The expert systems used in accounting are developed based on the following methodology:

- GURU, made by the Micro Data Base Systems, USA;

- ES-SDEM, Software Development Engineering Methodology for Expert Systems, made in Japan, by FUJITSU;
- IBM-ESE, a development environment for expert systems, that makes the proof of a well-dissimulated methodology, for being on top of the challenge;
- DEC, Digital Equipment Corporation, a transnational company having its main office in the USA, its own methodology, of a remarkable efficiency, considering that it has elaborated more than 30 expert systems since 1980 for its own interest.

From the scientists, specialists in the field of economic and managerial computer science, we can mention C. HOLSAPPLE, A. WHINSTON, and DONALD A. WATERMAN who have published a guide about the use of the expert systems in economy. The main characteristic of the expert system is the skill to get efficient solutions, by using the shortest paths of reasoning enabling to remove quickly the wrong rules. An expert system is characterized by a symbolic reasoning assuming the symbolic representation of knowledge and the reformulation of the symbolical knowledge.

Another characteristic of the expert systems is the profoundness, because the expert systems work with difficult problems and use complex rules. Self-knowledge is another characteristic of the expert systems because they examine their own reasoning and explain the operations and actions.

The development of the expert systems takes place in five interdependent and overlapped phases, as it follows:

- identification, a phase when there are characterized the main aspects of the problem that is to be solved;
- conceptualization, a phase in which there are settled the concepts required for getting a solution;
- formalization, a phase answering to the question “How could knowledge be represented?”
- implementation, a phase settling the rules including in the data base;
- testing, a phase confirming the rules.

In the tourism companies, due to the large number of accounting records, the use of the computer science programs represents an objective necessity. Presently, the big tourism agencies have highly performance computer science programs. The role played by the computer science application in the accounting of debts is better revealed by the following examples:

Program regarding the commercial relationships between suppliers and clients.

“Narrative specification of the production rule”.

IF the supplier offers product –A at price P1;

AND supplier provides product –B at price P2;

AND –B is a new product:

THEN accepts product –B;

AND send a delegate;

AND pay product –B.

In this case there will be used the LISP language:

(BF(SUPPLIER OFFERS PRODUCT –A AT PRICE P1);

(SUPPLIER OFFERS PRODUCT –B AT PRICE P2);

(-B IS A NEW PRODUCT:))

where BF=facts base.

The rules presented in the LISP language have the following form:

(C(CONDITION(SUPPLIER OFFERS PRODUCT –A AT PRICE P1);

(SUPPLIER OFFERS PRODUCT –B AT PRICE P2);

(-B IS A NEW PRODUCT:))

(ACTION ACCEPTS PRODUCT –B);

(SEND DELEGATE);

(PAY PRODUCT –B.))))

There can be noticed that the facts from the data base comply the conditions required to activate the set of rules. Thus, it is achieved a mechanism of simple matching. Because this mechanism does not allow the approach of the incomplete knowledge, it is required the use of variables. Of these variables there are connected the symbols from the conditions and actions. Also, the use of variables is connected with the use of patterns.

E.g., for the pattern [AB?XD]

And the facts base BF=⦃(AMCD),(EBCD),(ABBA),(ABBD)⦄

there are two matches of the pattern in the facts base:

(ABCD) links variable X and value C; and (ABBD) links variable X and value B. With ?C it was marked variable X, that has the significance of universal quantification.

The use of variables offer the possibility to use the production rules în which there could be introduce concepts instead of instantialized knowledge parts. Thus, by linking variables on the whole specification of the rule, there could be constructed

different instances for the same rule, if in the facts base there are facts corresponding to the pattern from the condition. For example, let's consider the rule of property inheriting:

(RULE –MP

(CONDITION(?X BELONGS CLASS ?Y)

(?Y HAS PROPERTIES >Z))

(ACTION(?X HAS PROPERTIES>Z)))

and the facts base:

((DEBT ACCOUNT BELONGS TO ACCOUNT CLASS)

(ACCOUNT HAS PROPERTIES

(IS AN ACCOUNTING COMPUTING MEAN)

(SETTLE THE INITIAL SOLD)

(SETTLE THE IN-OUT OPERATIONS DURING THE PERIOD)

(SETTLE THE FINAL SOLD)))

According to these descriptions, the rule's condition has a correspondent in the facts base because the first clause is satisfied by linking the ?X variable to the DEBT ACCOUNT and linking the ?Y variable to the ACCOUNT symbol. By linking propagation to the following clauses, the second clause becomes:

(ACCOUNT HAS PROPERTIES>)

that has a correspondent in the facts base and links the segment-type variable > to the segment defined in the second part of knowledge etc., so as the above-mentioned rule will become an instance, this way:

(RULE –MP1

(CONDITION(DEBT ACCOUNT BELONGS TO ACCOUNT CLASS)

(ACCOUNT HAS PROPERTIES

(IS MEAN OF ACCOUNTING CALCULATION)

(SETTLE THE INITIAL SOLD)

(SETTLE THE IN-OUT OPERATIONS DURING THE PERIOD)

(SETTLE THE FINAL SOLD)))

(ACTION(ACCOUNT HAS PROPERTIES

(IS MEAN OF ACCOUNTING CALCULATION)

(SETTLE THE INITIAL SOLD)

(SETTLE THE IN-OUT OPERATIONS DURING THE PERIOD)

(SETTLE THE FINAL SOLD))))

The action of rule MP1 will determine the introduction of an instance as a new knowledge part in the facts base. It's about its action part (RULE –MP1).

In order to illustrate the way of using the computer science program to register an economic operation, there will be considered the operation of supply with materials from the suppliers. In order to register the debt increase to the suppliers, there will be used the following series of rules:

[1] IF account-401 is debt account
THEN account-401 is account of liabilities

[2] IF operation is materials supply
AND account-401 is account of liabilities
THAN account-401 is credited

[3] IF operation is debt payment
AND account-401 is account of liabilities
THEN account-401 is debited

The rules execution changes the facts base as it follows:

FACTS BASE

Account-401 is debt account	Operation is materials supply	Account-4001 is account of liabilities	Account-401 is credited (new added fact)
Conditions are compared with facts			
IF operation is materials supply AND account-401 is account of liabilities THEN account-401 is credited			

The new facts added to the facts base could be themselves used for new reasoning of the same type. We reach to a chain of interference consisting in the successive execution of the rules:

Account-401 is debt account		Account-4001 is account of liabilities	
			Account-401 is credited
		Operation is materials supply	

Conclusions

The development of the expert systems is currently of a great interest for the computer scientists that consider such systems as concrete means for the informatization of the intellectual and creating activities in all fields of activity. The expert systems recorder o quick extension, governments and more and more companies invest massively in this technology.

The concept of model of expert system extended to the financial and bookkeeping activity contains as nucleus the components of expert type, as the engine of inferences, simulation modules specific to the support systems for decisions, as well as procedural modules and of interface with classic applications.

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