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"MANAGEMENT AND ENGINEERING"

FACULTY OF MANAGEMENT

XX JUBILEE
INTERNATIONAL
SCIENTIFIC CONFERENCE
"MANAGEMENT AND ENGINEERING '22"
DAYS OF SCIENCE AT TU-SOFIA

26-28 JUNE 2022
SOZOPOL

TECHNICAL UNIVERSITY OF SOFIA

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SCIENTIFIC TECHNICAL UNION OF MECHANICAL ENGINEERING NATIONAL SCIENTIFIC & TECHNICAL SOCIETY "MANAGEMENT AND ENGINEERING"

CONFERENCE PROCEEDINGS

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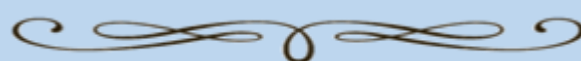F. Visbruk (France)

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XX ЮБИЛЕЙНА МЕЖДУНАРОДНА НАУЧНА КОНФЕРЕНЦИЯ „МЕНИДЖМЪНТ И ИНЖЕНЕРИНГ'22"

XX JUBILEE INTERNATIONAL SC IENTIFIC CONFERENCE "MANAGEMENT AND ENGINEERING'22"

26-28 June 2022

CONTENTS

The Role of Expert Systems on the Development of Business Processes

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Abstract— Expert systems have many applications and are being implemented worldwide. They offer specific intelligent solutions in various sectors, giving possible explanations of complex practical problems in various sectors of industry and economy. Expert systems provide many benefits in various applications with a view to business development and their impact on process management.

Keywords— expert systems, business process, impact, artificial intelligence, implementation

Introduction

"Expert system" means a complex, dynamic and intelligent computer system that has the ability to collect, process, store and correctly interpret information, data and information, learn from them and use them to solve complex practical problems and to explain the results obtained and the path of the decision. Reproduces (resembles) the ability to make decisions by a person expert in a field.

Business processes are related, structured activities or tasks by people or equipment in which a particular sequence produces a service or product. According to various authors, business processes are most often visualized (modeled) as a flowchart of a sequence of activities. Business processes can be categorized into three types: management processes (e.g. corporate governance, strategic management), operational processes (e.g. purchasing, production, marketing and sales, etc.) and support processes (e.g. accounting, recruitment, technical support, etc.).

Process-oriented organizations use business processes to improve the flexibility to respond to rapid market changes and customer satisfaction. Business process management aims to accelerate and optimize business processes in the organization and reduce risk.One such opportunity is the use of expert systems in management and their application in business process administration.

Ease of Use

Historical data

Expert systems initially, researchers working on the Stanford Heuristic Project, (creator of the Dendral and Mycin systems), Edward Shortleaf, Randall Davis introduced ExpIn France, Expert Systems have been developed, focusing on machines that use logic and logical arguments.

In 1972, the French programming language Prolog was developed as a core on which various expert systems could be launched. Prologue has a built-in straightforward interpreter with rules and consequences, it is the first declarative programming language, and later became the best-selling artificial intelligence system in the world.ert Systems and others introduced Expert Systems.

In the 1980s, expert systems became widespread as they were recognized as being able to be used as tools to solve real, practical problems. Universities are starting to offer expert systems training, and more than two-thirds of Fortune 1000 companies are starting to apply technology in their day-to-day business processes.

Implementation of expert systems

Expert systems were developed through rapid prototyping - rapid production of a preliminary version that uses feedback to correct the design. Expert systems prototyping includes selection for additional data, presentation mechanisms and analytical models. The development and implementation of expert systems involves technical risk. Experts should evaluate each version of the system and compare the reasoning built into the system with their own thinking.

In the development stage, it is decided whether to start on a large scale, on a small scale or a combination of both. On a small scale - short development time (maximum months) - fast payback. In combination with large and small projects - support infrastructure. For large-scale projects - a team of six months to at least two years to create and implement. Improvements in the expert systems development process are slow and the development of a large-scale expert systems is becoming a long-term proposal. The long incubation period is a prerequisite for competitive advantage

Basic implementation of expert systems

This article will look at the organization of expert systems, with the aim of highlighting their main uses and their impact on business processes. This kind of dissemination of expert systems is a prerequisite for a more efficient model of knowledge acquisition, which eliminates obstacles to the acquisition of new knowledge in the development of expert systems and will highlight the main functions performed by the expert system and is an attempt to emphasize their possibility of re-use in various other specific areas of each activity considered. The essential reasons for this influence are not necessarily technological, but may arise from other factors (such as financial importance, social, cultural and religious beliefs and other limitations related to the application of expert systems. Expert systems provide tools that make the development of new expert systems in the same domain much easier due to their enormous impact on business processes.

Every expert system consists of two main parts: the knowledge base and the expert system shell. The diagram below shows a typical expert system:
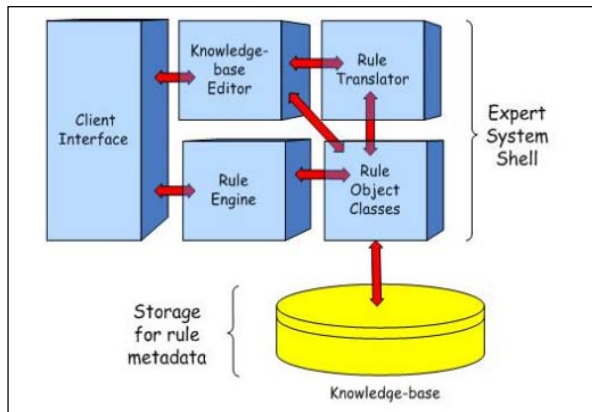

Fig. 1 Generic Expert System Architecture [5], [15]

In expert systems, the wrapper is an essential tool that has a special purpose because it is built according to the requirements and standards of expert knowledge in the field under consideration or specific applications in the studied topic. According to the researchers in [1], the expert system wrapper can be defined as a software system that easily builds a new expert system based on knowledge schema and logic.

One way to build an expert system, different from initially building from scratch, is that it can be built using a part of an already developed software system, which is known as a "tool", "skeleton" or "shell". By using this "wrapper" in the form of software systems, expert systems can be built that contain useful methods for solving problems without any domain-specific knowledge.

In Figure 2, the main components characteristic of much of the expert system envelope are shown.
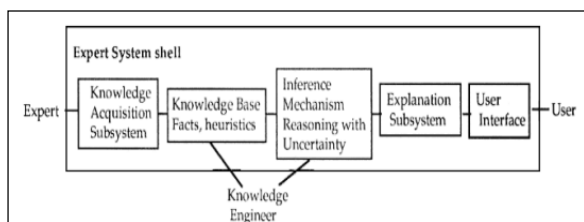

Fig. 2 Generic Components of an Expert System Shell [5],[16]

After analyzing the data from various authors on the subject, the results of the study can be summarized as follows:

Expert systems have an impact on control functions in information systems because they improve the management of job responsibilities and duties. This shows that expert systems have a high potential for controlling business processes in the organization.

The role of expert systems, as intended, is to influence the planning of the life cycle of the information system.

Expert systems in large industrial enterprises allow only authorized personnel access to the computer room and control systems. This ensures that expert systems read only those data and records that focus on business process development steps in information systems applications. Thus, the input is always authenticated and the adopted algorithm is certainly ensured, thereby documenting the impact of expert systems on business processes.

Expert systems improve security and file protection in industrial enterprises by using business-specific computer and software virus protection programs. Researchers in [1] believe that with the use of expert systems, databases are protected because they do not allow one user of information to access the data of other users, thereby categorically guaranteeing their security.

With the above arguments, the influence of expert systems on the improvement of management in the development and maintenance of methodological documentation, in industrial companies, is by creating a manual that specifically describes all programs and technical support for each document that is used in the system. With this, the authors in [1] and [2] explain this result that the application of artificial intelligence is important in the field of developing expert systems. Therefore, expert systems have a high capacity to generate creative solutions in practice for complex situations. In addition, these expert systems are used to verify specific knowledge and practical experience, and also support the construction of business processes in a semi-structured form for objective decisions, etc.

Various studies on the topic in [1], [2] explain the interaction between the expert system and business processes, and their impact in the regulatory and management information system, as well as their joint impact on corporate integrated information systems, so that according to all possible studies, artificial intelligence reduces the gap between formal control of responsibilities and duties in the information system. Investigation of the individual steps in the business process is possible with the help of new generation expert systems. The study makes the following recommendations:

The training of employees of holding companies increases their awareness and the correct use of expert systems. Thus, errors are avoided and the overall regulatory control in these companies is strengthened. The formation of common working groups between the heads of separate areas is necessary when summarizing expert systems, with corporately integrated information systems in order to reduce redundant information. In this way, the need for artificial intelligence and its possibility to be used in various expert systems is identified. According to analyzes in [8] [3], [6] expert systems are considered to be one of the most efficient and valuable artificial intelligence systems.

Expert systems have been extensively studied regarding their impact on improving overall control in business process modeling. In this study [7] the authors show the relationship between these two variables and increase the effectiveness of the corporative integrate information system. Thus, organizations can acquire the necessary knowledge, reorganize it and store all the information in big data sets, thereby boosting the decision-making process by experts.

Modern information systems based on expert systems that apply techniques based on artificial intelligence [9] and represent a new advanced branch of

corporate integrated information system that aims to design and implement systems that simulate human intelligence, as an attempt to apply artificial intelligence in obtaining and processing information to solve problems and/or cases and accept different opinions. Furthermore, expert systems seek to enable computers to perform intelligent cognitive processes that are inherent to humans [12]. Achieving this goal will help professionals in various fields in terms of response time and quality of performance in their routine work.

The authors in [12] believe that expert systems can be seen as "one of the branches of artificial intelligence" that works on identifying new knowledge and problem-solving skills by simulating the cognitive skills of a human expert in taking strategic positions for disclosure of various case studies. With the help of artificial intelligence, the expert system can deal with situations where there is "uncertainty of knowledge, consistency of actions and reasoning according to [10]. An expert system can also be seen as a set of thinking ability to solve a problem and create the basis for an effective problem solving method. Expert systems are designed by incorporating knowledge acquired by the human expert and are organized in a way that can be applied to a computer to deal with similar problems [4].

According to the authors in [11], expert systems are software products that are developed to provide additional input from specific experts in a given field, possibly ideas, research, predictions, and design in categorizing, communicating, clarifying, researching, and regulating knowledge and management of control, planning, instruction and testing. In this study [11] researchers are convinced that expert systems are easy to use by computer experts and non-experts and according to [14] expert systems can work under uncertain information and situations and can transfer knowledge from one place to another to efficiently solve unstructured tasks or activities. In addition, modern expert systems are adaptable and can be tailored to meet the challenges of today's business environment.

According to [7] expert systems can be classified into the following main types:

Support systems: A system where the user performs the routine analysis in the established way for a specific activity and the system contributes to the employee's work in the usual way.

Collage Systems: A system where in order to understand the logic of work, it is necessary to examine the requests that the system uses, and if the process is correctly interpreted, it is possible to arrive at the generation of a solution. As more additional information is provided, the system can adjust the generated process.

True expert: A system, with a level approximating the highest level of human intelligence, that performs tasks that only highly skilled experts can perform.

Many areas have successfully implemented expert systems to contribute scientifically and practically to excellence, such as in business administration, where employees are supported in a certain activity: accounting, finance and others. [1],[2] and [12]**.**

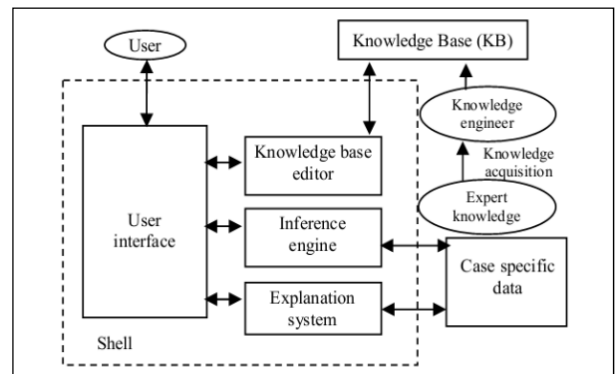Figure 3 shows the knowledge acquisition process.

Fig.3. Expert System Architecture [5],[17]

Conclusion

The main subtlety in acquiring new knowledge is knowledge engineers, and this is the main link between the human expert and the knowledge base of expert systems in the development and engineering and testing phases, this is combined with the fact that knowledge engineers in most (if not all) cases are beginners in the field under consideration.

From the examined proposals it is clear that the generated knowledge, the structured solutions of the expert systems can be reused. The development of expert systems is due to the construction of the shell and the programming (encoding) of the experience directly into the knowledge base. The main link between the shell and the knowledge base is the human expert in the structuring phase.

The main subtlety in the acquisition of new knowledge is knowledge engineers and this is the main link between the human expert and the knowledge base of expert systems in the development and engineering and testing phases, this is combined with the fact that knowledge engineers in most (if not all) cases are novices in the field under consideration.

From the considered proposals it is clear that the generated knowledge, the structured solutions of the expert systems can be reused or the so-called improvement through learning can be achieved. The development of expert systems is due to the construction of the shell and the programming (coding) of the experience directly into the knowledge base. The main link between the shell and the knowledge base is the human expert in the structuring phase. Therefore, expert systems have a great influence on the structuring of business processes, because they can present to the relevant specialist different options for the course of the process's activities and help to evaluate his behavior in these different situations. The combination of being able to generate a new business system and realistically assess any one location, position or circumstance is the strength of an expert system and is the means by which to assess the impact on business processes as well.

The human factor again plays an important role in the formation of the business process. For structuring a business model of a specific process, a leading role is played by the owner of the process, his understanding of the development of the activities in it. In essence, the manager is a visionary in developing the behavior of the process, for a consistent change of state in the development of activities or the development of events in it. With the help of modern expert systems, these operations can be

performed intelligently and successfully in a very short time.That is why expert systems have a great influence on the structuring of business processes, since they can present to the relevant specialist different options for the flow of the process activities and help to evaluate his behavior in these different situations. The combination of the ability to generate a new business system and realistic assessment of each location, position or circumstance is the power of the expert system and is the means by which to assess the impact on business processes as well.

From the considered examples and the various authors who write on the topics related to expert systems, it is clear that management, leadership and control are the basis of all expert systems with individual weights that determine their impact on business processes. Their synchronous work reflects the quality of the final product in the sequence of steps for the execution of certain actions, assessed by the end user, i.e. there is a direct impact of expert systems once on the business process and an indirect impact on the outcome of it, such as a produced unit, good or service.

This totality, as an influence, is decisive for the competitiveness of the respective enterprise. The set of measures for evaluating the work of an organization can be included in the project of the expert system to give a preliminary judgment or opinion about the quality of the output at each stage of the process technology. In an analogous way, the time for the production time or the cost price of the product under consideration can be determined. Improving or refine on business processes, through expert systems, means that activities are performed better, faster, more efficiently and more efficiently.

The development of a new business project is facilitated by the use of existing knowledge in the specific field or the environment close to it, because the skills of various experts in the field under consideration are applied. Their view on the subject is embedded in the existing expert systems.

The applicability of modern expert systems in business practice is easy and convenient for users of different levels of intelligence and knowledge. This helps a lot in the implementation process of corporate integrated information systems, not only in terms of time, money, but also in man-hours of business analysts and system implementation and testing team.

With the use of modern expert systems, risks in the introduction of corporate integrated information systems are minimized and/or managed very predictably. The planning of the commissioning of such systems is short-term, duplication of the work of the systems, new and current is for a shorter period of time, and it is not necessary to stop the network from the flow of information for more than a day, so they are preferred and convenient because within the weekly holidays there may be a complete realization.

Modern expert systems are a useful and powerful tool for the assistance of various specialists, together with the development of information technologies, for the establishment of new business realities.

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