

DEFINING THE PLACE OF EXPERT SYSTEMS IN THE OPERATION OF ORGANIZATIONS

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Abstract:

So far plenty of discussions have been made to review the knowledge but not many paid attention to its application in solving the real problems, therefore in this article we try to introduce and define the application of expert systems. Regarding the complexity and wide range of computation and considering the different aspects of major decision making process, these systems have been in the center of attention in recent years. Designing the professional systems is an attempt to apply computers in much more detailed fields and also try to gradually introduce them as potential working power to the market. These systems are basically designed to solve those problems that need to be solved by expert people. In fact an expert system is a branch of artificial intelligence which tries to present special services along with experts by collecting and applying specialized information and logic in a specific field. This article thoroughly attempts to view the case from managements' sight. Expert systems not only are really capable in big time processing of data but are also able to act and decide as an expert human being and since the art of management is totally visible in them so they have an undeniable place in management and organizations.

Key words: Expert system, experts in artificial intelligence, intelligent systems, organization.

1) Introduction:

Nowadays expert systems as a branch of artificial intelligence are of a great application in different fields. There are several debates about these systems but the main question is that how they lead to a proper result? Answering this question regarding the fairly heavy expenses of their execution is of a great concern.

The expert system is knowledge based informational system which uses its information in an applicable and complex field such as accounting and acts as and consultant for the ultimate user.

So far many debates have been made about how to project knowledge but not many of them concerned how to apply it in solving the real problems. Expert systems are looking for a solution for those real problems which require an expert human being such as a doctor or an engineer to be solved; therefore the building block of an expert system is gaining needed information of a specific field from expert human being. This form of information is basically heuristic and is earned based on the rules of thumb not based on absolute and certain conditions. Such a summarization of knowledge which can be applied by a computer needs its own expertise which can be handled by knowledge engineering.

The primary attempt to create such a system can be successful because it's really difficult for an expert person to express all his information and principles since most of them are applied unconsciously and many are so simple that they don't bother to express them. This action requires a series of technical and artistic methods.

Generally a primary sample based on obtained information from an interview is formed and then it is refined over and over based on the current feedback obtained from experts and potential users. So example expert systems must be designed the way where it can be investigated and verified. The system must be able to define its arguments for the operator the knowledge engineer and be able to answer its way of arguing and questions around it.

Expert systems are applied in solving problems in a wide range of different fields such as medicine, mathematics, geography, engineering, computer, business, law, defence and education and in any field it is used for solving different problems.

Expert systems aim to give unskilled ones access to the information of experts. These programs stimulate the thinking patterns and acting methods of human being and try to synchronize the actions of the machine as close as possible to those of human being.

With the development of information technology, decision making systems or generally computer based decision making process have come to a great importance. In this case expert systems as a related part of artificial intelligence play a main role. In expert systems different types of decisions are made by the help of computer. Expert systems are knowledge based and this information is in fact their most important part. In these systems knowledge from the elites of different branches is transferred to the computer. So far expert systems have had a great range of application in different fields of science and a lot of different types of them have been designed and presented in fields like industry, space, financial decision making and etc. (2)

The idea of applying such a system began with the researches about artificial intelligence in 1970 and achieved to applicable evolution with development of information technology and empowering the conclusion engines. The ultimate purpose of these systems is policy making, planning and decision making backup. These problem solving systems have been accepted in a lot of industrial organizations. They are used for analyzing the possible risk in automatic industrial factories and deciding on corrective procedures. Other applications of these systems are artificial intelligence stations with on line documenting which are equipped with laser discs by sales devices. However nowadays lots of portals and web networks handle some aspects of expert systems in guiding the users. (6)

Expert systems are intelligent computer programs which use the methods of conclusion or perception to solve those problems that need expert human being to be solved. These systems make their users capable of consulting the system about a problem and finding updated reasons and solutions. In this mode all soft wares and hard wares of the system just like a person tries to ask different questions and receiving the answers of user, referring to the data base and applying a logical method for concluding and offering a solution at the end. Expert systems unlike information systems which work on data are concentrated on knowledge. They are also able to use different types of data including digital, symbolic and analog in a conclusion process. Another characteristic of these systems is deploying a heuristic method instead of an algorithmic one. The conclusion process in these systems is based on comparison. On the other hand these systems can explain their reasons of concluding and navigation. Regarding their ability at working in no data state or having different levels of trust in answering to questions, they are really good options for working in uncertainty or multi dimensional spaces.

2) Review of literature (definitions and arguments):

Nowadays computers have overtaken human beings in many aspects such as speed and precision. They can solve simple and rerun problems with considerable speed and patience, do complex calculations or even compete against humans in games such as chess. But humans are still better in technical detailed tips. Although computers are far better in speed and precision but when it comes to solving complex problems humans overtake. Designing the expert systems is an effort to introduce computers into a much more technical area and gradually use them as human working power. The figure below shows the position of computers, expert systems and experts. Of course all experts do not act at the same level but at the moment this relationship can be observed among above mentioned elements. (1)

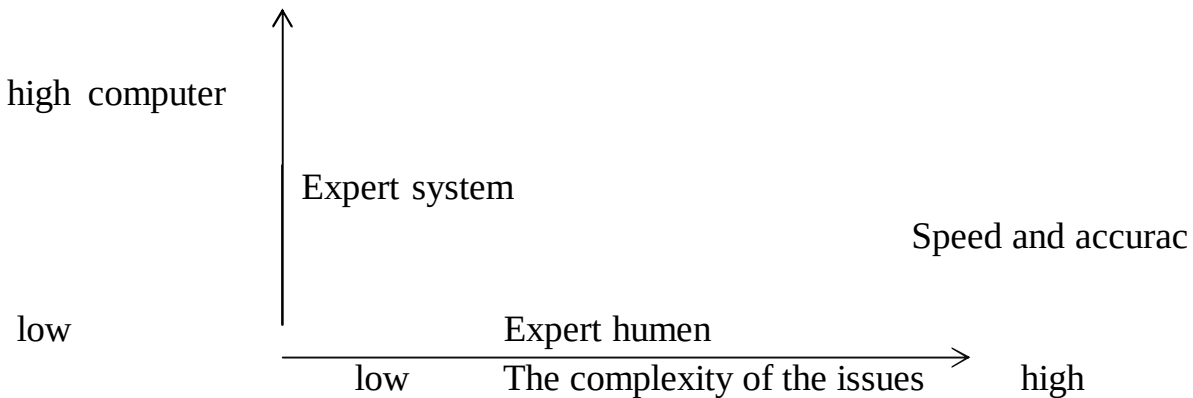


Diagram 1- Computer comparison, a human expert and an expert system in terms of power and speed and accuracy to solve complex problems

2-1) Definition of an expert system:

According to a general definition an expert system is a computer system which uses knowledge, facts and techniques of reasoning to solve problems that need expert people to be solved. (8)

For a better understanding of an expert system first we must define the artificial intelligence since they are in a close relationship. Artificial intelligence is a new field in computer science which tries to create a sort of intelligence similar to human's with computer programs. Artificial intelligence programs are including categories like solving complex problems, perceiving the human language, interpretation of visual information, learning from experiences and performing as the human mind at the end. Expert systems are a branch of artificial intelligence which tries to work and serve along with experts by gathering technical knowledge and information in a specific field. In other words these systems are intelligent computer soft wares which contain professional knowledge as information packs. These systems not only have a sort of information but a logical mind as well and by deploying the searching methods perform logical conclusion. (1)

As it was pointed out expert systems work with artificial intelligence and are able to help us as an expert in solving technical problems. Because of using searching methods these systems are much more flexible and precise than algorithmic programs and can adopt

themselves with new environments easily. The ability of accepting unpredicted data and adapting to new environments has given them the face of a real expert. These systems are also able to understand their user's language and contact them and this is one of the most significant characteristics of them. (1)

Expert systems are computer programs which are able to imitate the decision making ability of a human being. The term "imitate" here means to do what an expert person can perform and this is much different from simulating the same tasks. In fact an expert system is a computer software for making decisions which sometimes can even reach far beyond human abilities in action.

In expert systems the specialization and expert knowledge will be transferred to the computer and there is no human related problems (such as no access to expert human, human emotions, sickness or retirement) these systems reserve knowledge in the organization, increase the productivity, increase the quality, solve the problem of shortage of experts, perform tasks in dangerous environments, have high trusted state, are able to decide with imperfect data, remove the need to expensive equipments and flexibility, distribute knowledge by quick transfer from one site to another, educate by explaining and defining a problem and make you able to compete in the market and reduce the expenses. These systems act as a trusted consultant in management analysis and decision making and in many cases they replace expert human beings. Supporting systems often help the person in decision making by qualified analyzing. (9)

An expert support system is a computer program which is designed to save data and also imitating the principles applied by technicians to process information. They have been designed to recommend a certain decision to its user, define the correct operation and provide predictions.

These programs are edited by a vast range of knowledge which is called artificial intelligence and covers the process of instructing a computer to do a duty using intelligence. Most case studies concerning the artificial intelligence are far away from practical solutions though existence of artificial intelligence in supporting expert systems provides systems which can be used in real life experience. (12)

Expert support systems are used in cases where there is a high level of uncertainty. Individual powers and skills in this case are including the ability based on experience and good judgment. These skills are gained from the previous experiences of the same case. Provided experiences must be applied well to make the best decision when there is not enough data. (12)

Expert systems are also called principle-based systems. Analysis and programs of these systems are based on (If – Then). The designed algorithm of these systems is programmable or is designed in form of layers which must cover principles and knowledge. In the field of using expert systems in management decisions, management knowledge is based on the science of management and decision which its basis and output is decision making. Expert systems are used in all sort of activities regarding the decision making and have a great range of application. (9)

2-2) advantages, applications and characteristics of Expert systems:

In the age of changing technology, expert systems seem to be really essential. In cases where we need rare skills these systems provide us with precious assistant.

- They increase the productivity of organizations and use the best of the existing technical complex.
- They reduce the expenses and make it possible to use it in different fields.
- These systems lead us to not concentrating on technical sources and divide the sources all around the word in a fair way. .
- They present the achievements of human knowledge to a larger group of people and get it out of private domain.
- These systems make expert affairs public and make it possible for the technicians to gain other skills.
- They contribute multi dimensional and systematical point of view and provide us with the possibility of full consideration.
- The technical aspects of a subject can be considered and studied much easier with these systems assistance.
- They are trust worthy replacements for human knowledge; they can be used any time and anywhere, wont be tired, are free from human mistakes, wont be stressed by repeating, have no careless manners like humans and have endless patience.
- They see details clearly, consider the different aspects of theories and provide us with refined solutions.
- These systems decrease the work loads and give them a chance to increase innovation. (1)

Expert systems have advantages like reserving the knowledge, contributing it, education and competition, reducing expenses, increasing productivity, compensating the lack of experts, increasing the ability of computer systems, being trusty, ability to decide with imperfect data and high flexibility. (4)

Their most application is in the field of medicine, calculations and mathematics, basic instructions of computers and geology and etc. this also includes expert systems of trading like GPSS, programming space travel operation tables and also had been used in gulf war. (10)

Another field where these systems can be applied in is education. In addition to their expert data these systems contain teaching awareness and are able to change their method of teaching when they face different types of students. They have saved an average model which can realize conceptual mistakes of students and correct their behavior.

The third practical advantage of these systems is the ability to understand the human language. They can perceive our informal language and replay to it. Their collection of knowledge and expertise can be easily used and they can be addressed exactly as a human being. This aspect of these systems has given them manly character and opens a new dimension in this area. (1)

Expert support systems are a real important tool in the following situations:

For gaining skills and expertise: making a data base is often a good reason to create an expert support system. Managers usually rely on experts but they always desire to avoid possible risks of not having these experts. In this condition technicians of expert systems who are known as knowledge designing engineers work closely with those experts to understand how they analyze the situations and make decisions.

Decreasing errors to minimum amount: any kind of effort which can reduce number of risks is worth thinking about that is why expert systems nowadays get too much attention and are developing fast.

For creating an interrelated chain of main data: these systems are really helpful when a huge amount of data must be processed. The most important reason of their rapid development can be found in their great skill of conclusion, evaluation and decision making. (12)

These systems have found their place even in business management and trading affairs and provide users with needed tips about different areas and as supporting systems lead us to make a better decision. (11)

Expert systems are applied in variety of fields such as taking strategic decisions, making supporting systems, exploring oil, analyzing chemical structure of materials, medical diagnosis, aircrafts and vessels' navigation, solving problems of developing industrial equipments and finding their faults, educating employees, managing farms, analyzing the credit of business, mathematical analysis, setting computer equipments, controlling and arranging production, sorting and controlling such as cancer, managing space equipments, leading environmental activities and helping nurses to arrange their time. (14)

In general areas where expert systems can be applied in are as follow:

- 1- when there is a shortage of employees these systems can be a good replacement.
- 2- When there are different changes among expert workers and this causes problems, applying these systems is greatly recommended.
- 3- When there is a huge load of technical and complex data, these systems are really economical to use.
- 4- Using these systems is really beneficial when there is a repeated process of tasks.
- 5- When we face a great deal of data that must be thoroughly processed these systems are really helpful. (1)

Expert systems have a significant ability in the field of reasoning and conclusion. Their different characteristics have been mentioned in the following table.

table 1 : dimensions of knowledge-based expert system

characterestics	parameters
Saving and creating knowledge can not be defined as	-permenant expertise - stable operation - reserving knowledge - creating new knowledge - Applying system when goals and operations
	numbers
	- ability to transfer expertise by computer

Distributing knowledge	- processing knowledge instead of data - avoiding the waste of knowledge
	- ability to define a problem
	- ability to give chain reasons - ability of decision making with imperfect data
The power of conclusion	- ability to analyze the quality - able to be used for predictions - able to judge in uncertainty
	- trust worthy
	- able to work in danger - reducing expenses
Reducing expenses	- providing competing situation - increasing speed and precision - having no human errors
	- increasing productivity

2-3) background of expert systems:

Expert systems originally come from artificial intelligence studies. This subject as searching and development area began in 1940. During 60 years after it's emerge it has faced a lot of victories and failures. In 1970 a lot of expert systems were design as trial versions but they were just limited to university experiments. In 1980 the transformation of these experiments into trading versions began and the first of coming series was XCON. DEC was another model which was designed in early 80s and in a short time obtained a great reputation because of its high productivity qualities. it soon became a business bomb and made small and large organizations start trying to get a better understanding of the potential abilities of these systems. These systems have been applied in a lot of minor and major cases. This process has been expanded by development of expert supporting systems and knowledge management and now a lot of soft wares have been designed for these systems. These systems have been applied in many sciences but their usage in management especially human resource has been limited so far. (5)

Robots are the first generation of expert systems. They would do rerun and boring tasks with great care and had no understanding of their environment. The first documented murder by a robot was occurred in 1984 in Japan which was of course considered to be an occupational hazard since robots didn't have human intelligent and yet determined as machines. (15)

But expert systems introduce a version of robots which act intelligently and are aware of their surroundings. They execute special behaviors in addition to their former responsibilities. These systems can determine images and also interpret them for example they are able to receive and analyze satellite images instantly and give us proper information about the pollution around the word. (7)

Artificial intelligence was first mentioned by philosophers and mathematicians such as bull who presented principles and theories about logic. With invention of electronic computers in 1943, artificial intelligence brought scientists to a big challenge. At first it seemed just to be

able to simulate intelligent behaviors. In spite of many doubts and disagreements with its nature after only for decades of its creation we observed the birth of chess players and other intelligent systems in different industries(3).

The term artificial intelligence became known as a new science in 1965 of course activities around this field had began in 1960. most of its primary projects were based on making computer games and proving math theories by computers. at the beginning it seemed computers were able to do these tasks just by applying a great number of different solutions and picking the best one. The term artificial intelligence was first used by John Mc McCarthy who is remembered as the father of intelligent machines. Mc Carthy is also the inventor of a programming language known as (lisp). (11)

2-4) comonents of expert systems:

As it has been mentioned the origin of expert and knowledge related systems goes back to a study field called artificial intelligence. Artificial intelligence is a possibility to do computer duties which need knowledge, care, reason, education, and understanding and realization abilities. These systems have been consisted of two major parts:

1- data base: this is the core of knowledge of the system and its perfection has an important role in its operation. two types of information as supporting knowledge is regarded: 1) documented knowledge such as scientific principles related to the subject with written, formal and defined details which can be found in many sources such as books, articles, project reports, documents and soft ware packs that their correction has been approved. 2) Innovated or uncertain knowledge which is base on experience, vision and expert conceptions and their uncertainty lies in their subjectivity and cover a collection of science, views and experiences. this knowledge is used by systematic modeling and scientific information arrangement. (10)

Data base in consisted of special information in a technical field and origins from datas and regulations which exist to make decisions based on these data. principles and data are processed and saved saperately and independently from soft wares. expert support systems are classified by methods of presenting data. they are classified based on principles and framework. most of management systems are principle based. each principle is designed by (IF-THEN) data sets which design systematic regulations. (12)

2-conclusion engine: this engine which is also called reasoning base is in charge of arranging and controlling levels of solving a problem by applying the content of data base. the reasoning procedures in expert systems are executed as command chains of (IF-THEN). these commands are called direct chains. (13)

Elements of Expert system are displayed in Figure 1. This elements included:

- User - interface: Makes users able to interchange with systems
- Knowledge – based: Contains needed knowledge
- Inference engine: Has the ability to reason for data base
- Knowledge engineer: This technician uses expert systems

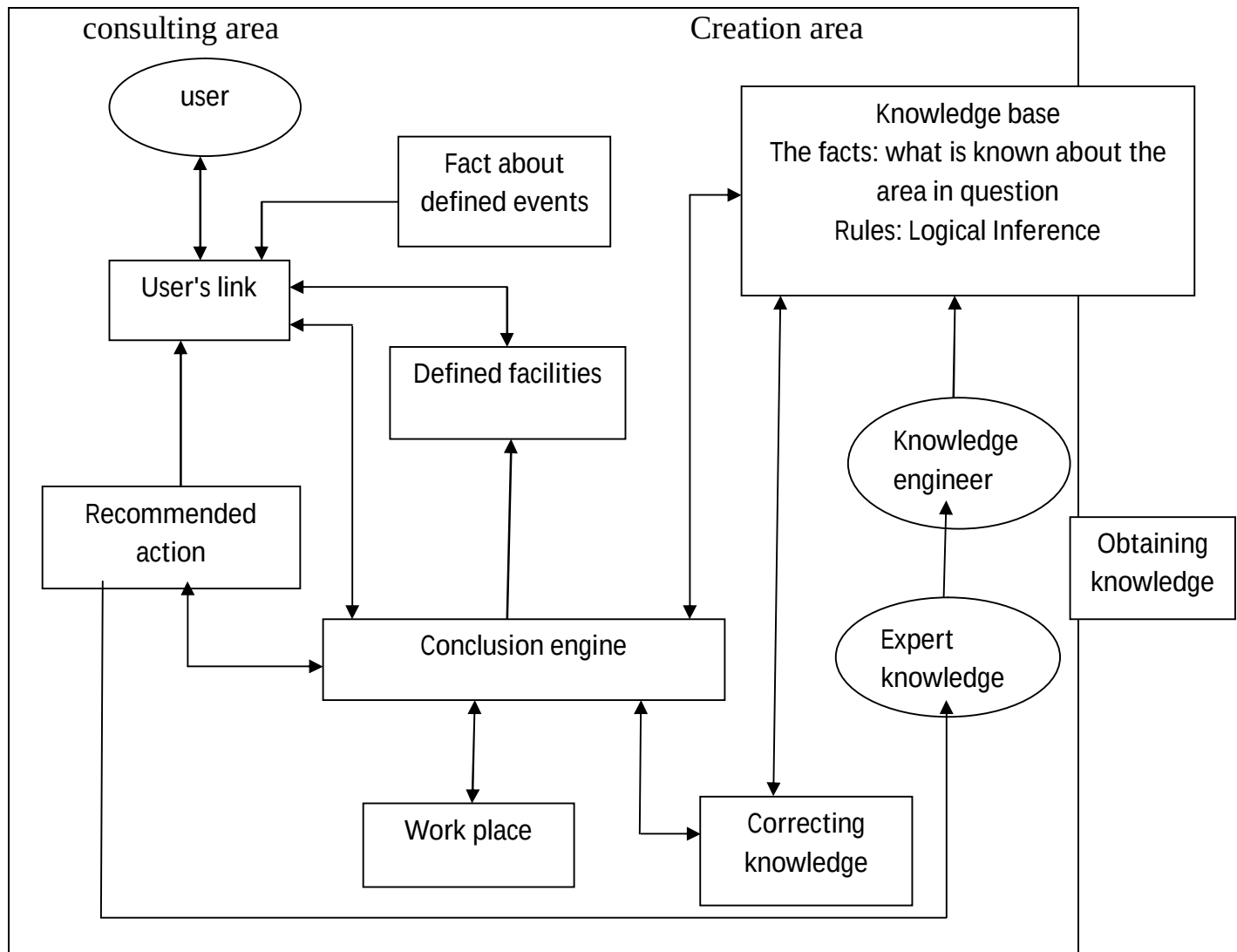


Figure 1- Structure of Expert system

2-5) Use rules to represent knowledge:

Expert systems differ from other traditional applications is that of expert systems, unlike conventional applications that perform information processing, knowledge processing pay. Knowledge in the form of a computer program rules are specified. They have expert guidance on how searches are saved.

In general, the rules are expressed in the form of expert systems.

- If the conditions
- The functions

According to this analysis it can be concluded that the activities are performed, if the conditions are provided. The rules in this case, the knowledge base is called. More sophisticated systems are developed with the rules and why they are called rule-based systems. Another feature that distinguishes the conventional expert system from other systems, the system's ability to learn. In this system, the learning ability (even without user

intervention), and is a process that is called rule induction. This method of statistical analysis, a problem may be possible to create new rules. These techniques, effective, well-defined problems in the field, are used.

Citing cases in the overall analysis of the expert system are the knowledge management approach. In each of the types of procedural knowledge, declarative (explicit) and is implicit and organizational decision making and the associated analysis based on it. Documentation of expert systems and decision analysis based on explicit knowledge and tacit knowledge mainly issues of structured and unstructured included.

Expert systems in the areas of business , manufacturing operations and human resources management has been used. Decisions in the field of trade and commercial production, various researchers have emphasized the use of expert systems. In the field of production and operations, human resources, Research studies are less applicable. (10)

2-6) who is a Knowledge engineer?

Expert systems and knowledge engineering designers call. They are not computer engineers, computer programming expertise, but also be aware of the principles of artificial intelligence and psychological skills to communicate with experts in other disciplines have. They should be able to use the knowledge and expertise to others for expert systems, recording and control of their health by experts. The working group of technical precision and artistic elegance to be enjoyed and used to give useful results .

In other words, knowledge engineering , expert systems, both the content and the form, manner and form and to impart their existence. (1)

Typically the leading role in providing specialist systems knowledge is occupied by the engineer, who is responsible for making rules and skills to find, discover and be informed about the human experience. Knowledge engineer with interviews, observations and similar methods, defines the key elements of the knowledge base is combined. Knowledge engineers to maintain and develop a system that is able to create and maintain knowledge bases to . (12)

2-7) Knowledge acquisition for expert systems:

Perhaps one of the most difficult steps in building expert systems, knowledge and information to be collected . However, apparently because the information may seem simple, but in practice the face of obstacles . Often, professionals, something that is normally done for them, because obviously assume, do not tell . While seemingly obvious, if the system does not know, he was not able to work properly. The knowledge engineer must try to Pyshpa Aftadhtryn Byahmytryn and ask them to get tips from the professionals to complete and detailed information about the problem can be stated. Another problem is that some Astntajhayy we need to tell them we do not see the logic. These logical problems that are in front of the car . Sometimes experts do not represent a problem, since the inferences are reasonable and do not see the need to mention it. In these cases, the knowledge engineer must assume your car, and all information is asked for.

Furthermore, the experts can do anything , take diagnostic, but unable to express it verbally. Finally, clinicians may be reluctant to put all their information available knowledge engineering.

These problems are all the work of gathering information and knowledge for an expert system is considered one of the longest and most difficult construction process . (1)

2-8) Steps to create expert systems (ES):

The overall process of an expert system can be summarized in three stages, to:

1. The first step in the process of developing practical cooperation with expert knowledge of the system is investigated by the Engineer. Careful analysis of the material needed to be done.
2. This stage is characterized by the maintenance system and educational programs are provided for using the system.
3. Third step is to organize how to use the system while the system is the ultimate test. This stage is characterized by the maintenance system and educational programs are provided for using the system.

After over a year of work in the system, another evaluation function is performed. (1)

Prototype: This method consists of three phases: analysis, design and implementation is that they are together and both iteration. The first method defined for the purposes and objectives of the expert system and then review relevant research and identify hardware and software and related experiences will be reviewed. The expert system environment is described, and then the analysis and conceptual design of the system is in fact a feasibility study is done by. The next step is the expert system components and software that can support the system components shall be evaluated and determined. In the end, making the system and its components are put together. (2)

2-9) Expert system disorders:

Expert systems are still a long history behind Nnhadhand and this time a few of them have reached the stage of operation. Buchanan took the stage name of 60 systems have been used in various fields have been exploited. We should notice that this criticism before the nature of expert systems are available on the performance of them.

One of the major criticisms of the expert system, the lack of human intelligence in these systems . They sometimes use their knowledge and understanding of the rules and predictable, with the understanding that mistakes are a normal person would never commit such an error. User interaction with the system, culture words that's used, and the reasoning of vulnerability Mtkhssand systems .

Another point to be noted about expert systems is that they can not experience anything Nmyamvznd and hence their behavior will improve with time. Current systems lack this capability, but it is possible that future systems designed to be able to experience new things and learn Byndvznd and their environment. Finally, the limited knowledge of expert systems, the group has been given to believe that, when the system users want to pursue something profoundly deeper layers of detail and Bshkafnd problem with a dead face. (1)

3) Conclusions:

This paper describes a study of expert systems (ES) have been studied. Globalization in the place in front of the new competitive situation has been, where scientific capabilities and behaviors to work towards providing a competitive edge that leads. In other words, complex and competitive business environment, and they need tools to assist decision-makers being able to decisions not accurate, has more. The success of an organization depends on many factors. Many of these factors are outside the control organizations, governmental regulations and other factors such as the relatively strong influence on organizational decisions, but most

of the factors that influence the decision organizations in the areas of control and authority are. Computer hardware and software technology in recent years, significant changes have created. The advantage of such technology to produce, collectors collect, store, making, management and distribution of information is more effective and easier manner. Computers have had a dramatic growth in the availability and reliability, the development of information systems has provided. expert system as an information system that the feasibility study and the design is appropriate in certain situations, leading to different conclusions A comparison of the information system is based on swap have. Exchanging information systems, the tool is usable with the process of storing transactions; for that reason, these systems provide a a special structure that has been short on regular bases. So the information system Mbadlhgra, with focus on information, Expert Systems with special focus Brtsmym is making. Expert systems can be used in various fields. These systems can help solve problems and be social worker. They can define problems accurately and completely, and how to find solution for their application to the solution in action. The advantages of expert system applications, primarily in the areas of management are discussed. Areas such as strategic planning, total quality management, the management Aryaby, production management, financial management, and ... Have been discussed. In this paper, we try to fully look at the issue from a management perspective. was. But one should not forget that the main advantages of such systems are separate from having its own limitations and problems are well. For example, the time and cost of development and one of them very much.

In order to achieve these benefits, companies are seeking ways to optimize their operations and plays a vital role in this regard, the use of expert systems. The different stages of expert systems technology on improving quality. Expert Systems with the above future look bright and clear.

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