

# Finding New Framework for Resolving Problems in Various Dimensions by the Use of ES: An Efficient and Effective Computer Oriented Artificial Intelligence Approach

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## Abstract

In this paper we will see how an expert system could be created. Expert system is a set of programs that manipulate encoded knowledge to solve problems in a specialized domain that normally requires human expertise. In this paper some of the applications of expert systems in different domains are discussed. Also we will look into the characteristics, advantages, and limitations of expert systems. The users and life cycle of Expert systems is also discussed.

**Keywords**— Expert system (ES), Production System (PS).

## INTRODUCTION

This document comprises of a brief description of Expert system development. Expert systems are made to make things simpler. Although ES are complex and sophisticated systems but their utility makes them such important in current environment that the acceptability has reached the current high level. Expert systems are developed for a wide range of domains. There are some fields where the deployment is currently easily possible, whereas there are fields where it is still very difficult. Expert system like other customized software products should satisfy the properties which should be there in every good software product. The properties include efficiency, effectiveness, portability, usability, reusability, timeliness, nice user interfaces etc. Figure 1 explains ES. Expert System helps the users to solve the problems by the application of processes that are analogous to human reasoning processes. Artificial Intelligence field is a very old field which has given the user the liberty to solve their problems by the use of Computer System. The word Artificial Intelligence comprise of two words where Artificial means copy of something natural whereas Intelligence means the ability to apply knowledge and skills. Artificial Intelligence is the art of creating machines that perform functions that require intelligence when performed by people. Artificial Intelligence is the branch of Computer Science that is concerned with the automation of intelligent behavior. Artificial Intelligence is the study of how to make computers do things which at the moment people do better.

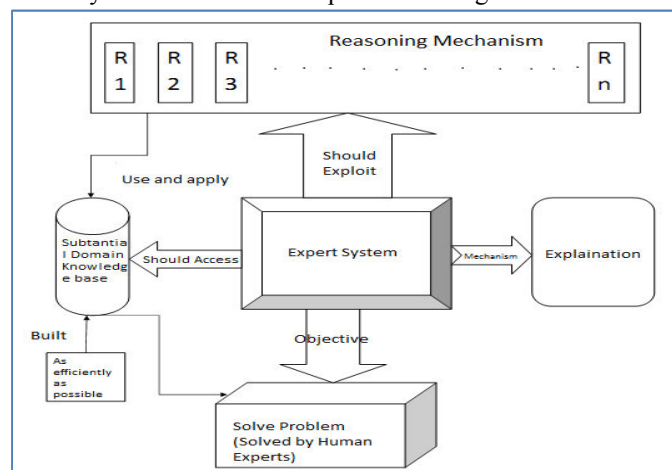


Figure 1:- Block Diagram of ES

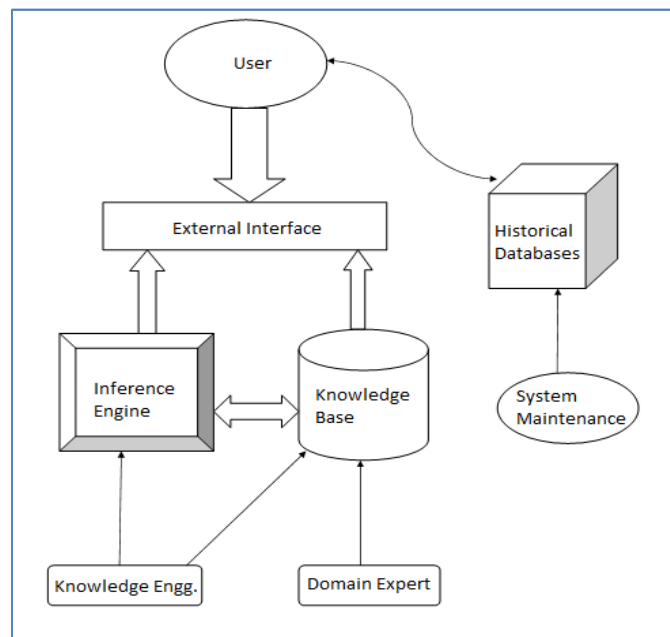


Figure 2:- Block Diagram representing persons having interaction with the ES

#### persons having interaction with expert system

The users of ES include users of the domain for whom the ES is being constructed; they are having interaction with the external interface. The second category of the persons having interaction with the ES include Domain Expert; they are responsible for placing experiential knowledge pattern which knowledge engineer the constructor may not predict as he may not belong to the domain for which he is constructing the system. There also one more person associated with the ES, which is system maintenance personal. They pursue maintenance activity for the Expert System. It is the knowledge engineer who makes coordination with others to deploy the ES for the domain. Figure 2 explains the interaction.

#### work already done

In [1] the importance of creating knowledge base with the help of domain expert is shown. The utility of having simple knowledge representation in the ES framework is explained. The research paper shows that only a very little amount of research is done to examine the predictive validity of expert systems. It is proposed that ES are more accurate than econometric models in one study and tied in two. It is shown that Protocol analysis is especially useful if the area to be modeled is complex or if expert lack an awareness of their process. It is proposed that in forecasting, the most promising applications of expert systems are to be replacing unaided judgment in cases requiring many forecasts, to model complex problems where data on the dependent variable are of poor quality, and to handle semi-structured problems. It is now bare fact that ES are used to forecast time series and to predict outcomes on the basis of cross-sectional data. In [2] how to use sensor web for making a monitoring and detection of hazard condition in near-real-time is specified. The paper shows how the combination of sensor technology, wireless technology, GIS software, and rule-based logic techniques for organizing and analyzing hazard –related data provides a powerful approach for hazard monitoring in real time environment. Also the use of the generated data for decision making is advocated. In [3] a program which is designed to assist in medical diagnosis depending on blood test results is proposed. The program merely lists an estimated order of likelihood and estimates probabilities of diseases or condition based on internal logics and answers given by physicians. In [4] the development of a legal expert system to carry out transfer of property act, a domain within the Indian legal system which is often in demand is discussed. The VisiRule software is used to attain the objective desired. It is felt in the paper that TAP-Expert proposed can benefit both the non-law literate who intended to purchase property and also for experts in the field of law for production and fast decision making. In [5] a unique approach for designing an ES that is going to help the Electronics technicians is proposed. El. Tech. (Electronic Technicians) is created for the purpose described above. The work contains an overview of knowledge elicitation methods that can be used for construction of model of the knowledge domain. In [6] first principles is explained, it refers to the understanding the structure and function of problem solving most of the system are utilizing empirical models relationship or models of the tax laws. The research paper focuses on the application of first principle to construct ES in the taxation based paradigm. This paper employs a theory based approach to make tax researchers and knowledge engineers aware of the benefits and limitations of

working in taxation based ES. In [7] a simulation expert system is proposed. In the research work prescribed the focus is on finding solution of the resource sizing problems for the production system(PS), defined as the specification of the number of each type of resources to be used in a production process for a given time period. The problem is tackled by a simulation expert-system approach, where coupling an ES with a simulation tool is made. A number of simulation ES optimizations are utilized for the purpose. It is an enhanced version of SESA coupling. The current version uses performance measures that are adapted to the Due Dates (DD) characterized make to order production context. In [8] a system for clinical performance improvement through rule-based analysis of medical practice patterns and individualized distribution of published scientific evidence is made. A quality feedback expert system (QFES) is developed to perform the objective.

#### architecture of expert system

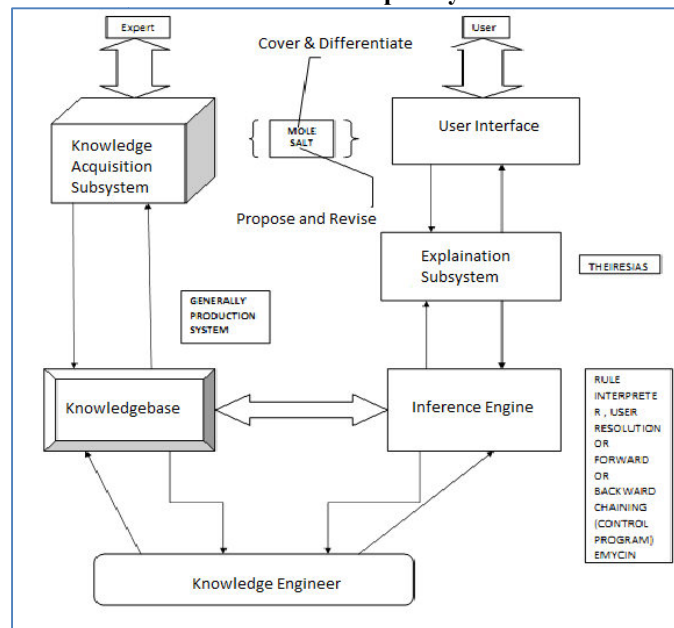


Figure 3:- Architecture of ES

There are five basic modules in the ES interface. The modules are:-

- A. Knowledge Acquisition Subsystem
- B. Knowledge base
- C. Inference Engine
- D. Explanation Subsystem.
- E. User Interface

#### **Knowledge Acquisition Subsystem**

Knowledge Acquisition System is the module utilizing which the experts makes entry onto the knowledge base. Interfaces are there in the knowledge acquisition sub-system which helps the experts to convey knowledge patterns to the knowledge engineer who is responsible for the creation of the ES.

#### **Knowledge Base**

This module is responsible for storing knowledge patterns. There are various models utilizing which knowledge could be stored in the knowledge base.

#### **Inference Engine**

Inference engine are there in the ES utilizing which the ES evaluates the queries with the help of the knowledge base. In other words inference engine is the module which produces answer to the queries of the user.

#### **Explanation Subsystem**

This module is there to help the user to have answers of their queries in there understandable form. It is formulated to implement high user and system interactivity.

#### **User Interface**

The user interface is the module from where the user makes interaction with the developed ES.

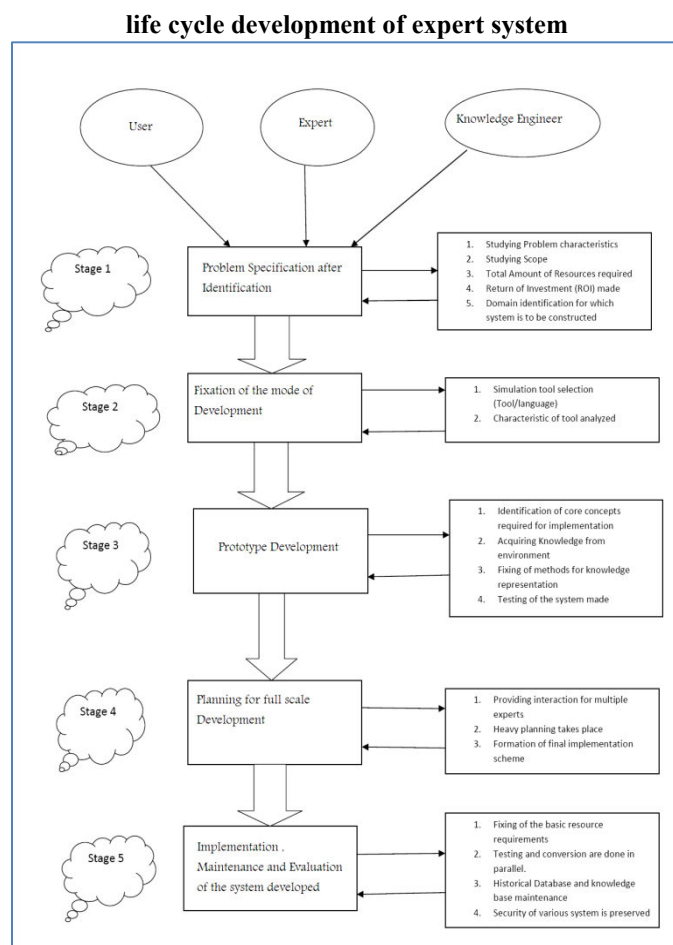


Figure 4:- Life cycle of ES development

. The life cycle development of ES basically comprises of five basic steps:-

*Step1:-Problem Specification after Identification*

*Step2:-Fixation of the mode of Development*

*Step3:-Prototype Development*

*Step4:-Planning of full scale development*

*Step5:-Implementation, Maintenance and Evaluation of the system to be deployed*

#### **characteristics of expert system**

In this section we will discuss some of the characteristics of Expert System. The basic characteristics are given below:-

*The main theme of Expert system is in the knowledge lies the power. This theme is exploited to construct the system.*

*The basic idea in ES designing is to construct a system for a domain where a human expert is required to solve the problem.*

*The domain specific knowledge should be placed in the knowledge base in such a manner that it contains all the minute details of the domain. The knowledge acquired by the professionals during their practice known as heuristic knowledge should be properly conveyed by the knowledge engineer to the system along with the conventional knowledge*

*The expert system facilitates the provision of heuristic search mechanism along with the conventional searches.*

*The ES shell program provides facilities to run the same control program with run with multiple knowledge bases. It also provides platform where addition is possible in the knowledge bases without recompilation.*

*ES is enabled to provide an answer as to how it came to the evaluation of a prescribed query.*

*ES are able to accept advice, modify its previous knowledge structure and update and expand the knowledge base.*

*ES uses symbolic notation to construct its knowledge base.*

*ES are able to deal with uncertain and irrelevant data.*

*ES should provide nice interfaces through which it is convenient for the users to make interaction with the ES.*

*ES is constructed with a lot of investment thus every ES is having nice framework for ROI.*

*L. ES is capable enough to provide solution for individual desires*

*M.ES often makes use of meta-knowledge to arrive to the solution of a given problem, although this facility is in very few systems.*

#### **expert system tools**

Four basic types of Software tools for ES construction are briefly explained in this section. The four types are algorithmic languages, symbolic languages, Development environments and expert system shells.

##### ***Algorithmic Languages***

The first category is algorithmic language under this come the conventional programming languages like C, Pascal etc.

##### ***Symbolic Languages***

Under this category come languages like PROLOG, LISP etc. It works on the symbolic paradigm.

##### ***Development Environments***

Under this category come ART, KEE, LOOPS etc.

##### ***Expert System Shells***

Under this category come products like CRYSTAL, XPERT RULE, LEONARDO, XI-PLUS etc.

#### **advantages of expert system**

In this section we will discuss some of the advantages of Expert System. The basic advantages are given below:-

*Domain specific knowledge of ES helps to play dual role of knowledge archiever and knowledge disseminator. ES could be accessed "round the clock".*

*ES plays a triple role of problem solver, a tutor and a knowledge archiever.*

*ES provides solution to the "why's & how's" of the user.*

*ES of current days provide facilities utilizing which the domain expert without taking help of the knowledge engineer may directly insert knowledge patterns onto the knowledge base.*

*ES are capable to handle uncertain and contradictory data.*

*ES does not suffer from stresses which a human may undergo from. There is no case of moods in ES*

*For creating one human expert it takes a large amount of time, in this terms also ES are beneficial*

*ES works well in interdisciplinary fields*

*ES has features of prioritizing the task assigned.*

#### **limitations of expert system**

In this section we will look into some of the limitations of ES. The limitations are described below:-

*ES are designed for specific domains*

*ES are represented using Knowledge representation schemes which are limited in number and have there customized specifications.*

*Lack of meta-knowledge*

*ES are brittle in nature*

*Lack of flexibility*

*Lack of proper validation facility*

*G. Knowledge boundaries not precise*

*H. Lack of understandability*

*I. Lack common sense*

*J. Most frameworks miss direct knowledge insertion facility for domain expert.*

#### **expert system applications**

The applications of ES are prescribed in this section. The applications are elaborated below:-

*Control and Monitoring*

*Debugging*

*Design*

*Diagnosis*

*Instruction*

*Interpretation*

*Planning*

*Prediction*

#### **Conclusion**

After going through all the sections of this paper we conclude that ES are the demand of the coming era which should be accepted with open hands. In current world of globalization ES is the need of the time. It has provided assistance to the human being in various aspects. It is of high importance to the professionals working in real time places to make quality and efficient operation. This paper is a theory based approach towards expert system development.

#### **ACKNOWLEDGMENT**

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