Expert System

Limitations of expert systems

- Not widely used or tested
- Limited to relatively narrow problems
- Cannot readily deal with “mixed” knowledge
- Possibility of error
- Cannot refine own knowledge base
- Difficult to maintain
- May have high development costs
- Raise legal and ethical concerns

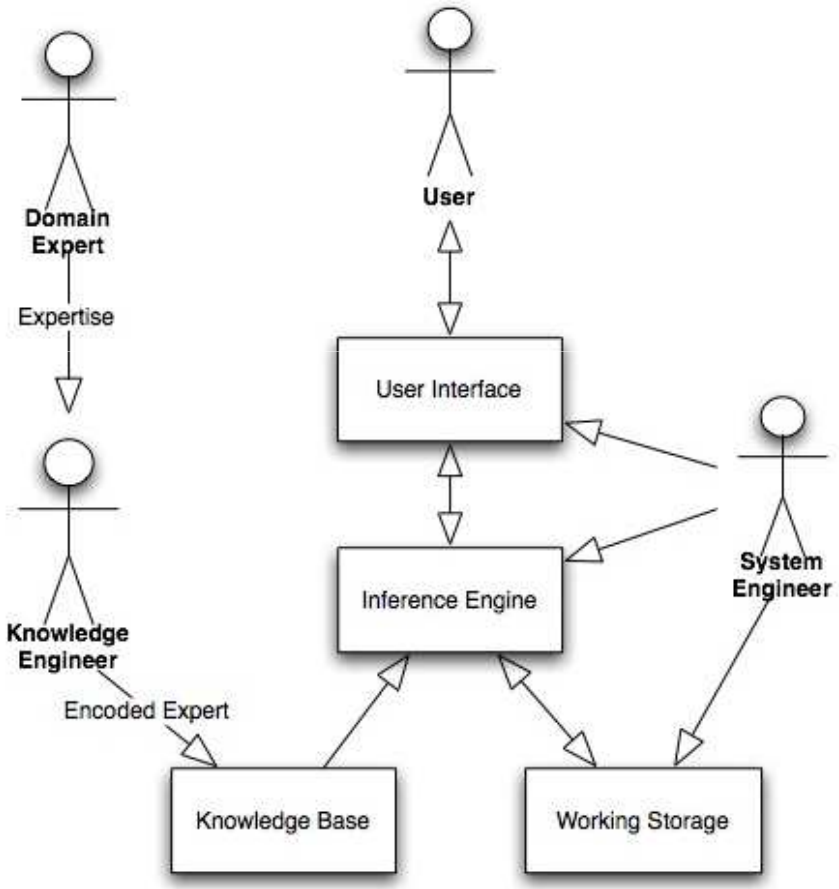
Applications

Some of the areas of applications

ES can be used for following purposes

1. Interactive or conversational applications: Chatterbot
2. Fault or medical diagnosis: **Dxplain, CDSS**(Clinical Decision Support System)
3. Educational software
4. Knowledge management
5. Decision support for engineering, process control related areas
6. Accounting, loan, credit
7. Health care, hospital management, estate management
8. MYCIN, DENDRAL, CADUCEUS
9. PROSPECTOR, DESIGN ADVISOR

Components


Domain Expert
Expertise
User
User Interface
Knowledge Engineer
Inference Engine
System Engineer
Encoded Expert
Knowledge Base
Working Storage

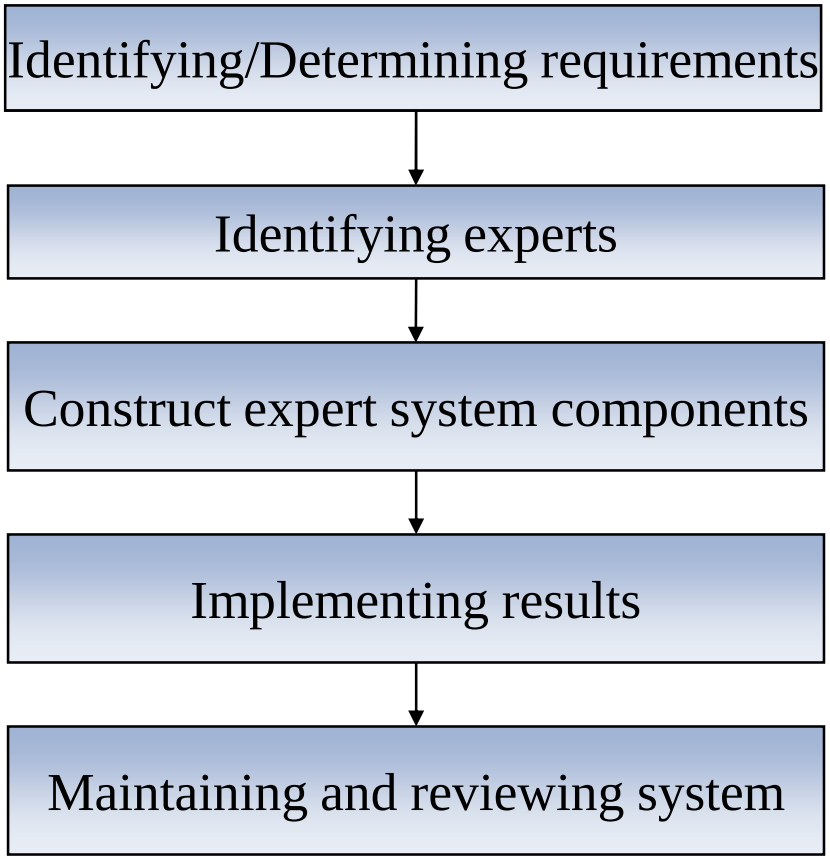
Major components

- ***Knowledge base -*** stores all relevant information, data, rules, cases, and relationships used by the expert system, a declarative representation of the expertise, often in IF THEN rules.
- ***Working storage*** - the data which is specific to a problem being solved
- ***Inference engine*** - the code at the core of the system.
- Derives recommendations from the knowledge base and problem-specific data in working storage, and provides answers, predictions, and suggestions in the way a human expert would perform the task.
- ***User interface*** - the code that controls the dialog between the user and the system

Major Roles of Individuals

- ***Domain expert*** – currently experts solving the problems the system is intended to solve
- ***Knowledge engineer*** - encodes the expert's knowledge in a declarative form that can be used by the expert system
- ***User*** - will be consulting with the system to get advice which would have been provided by the expert
- ***System engineer*** - the individual who builds the user interface, designs the declarative format of the knowledge base, and implements the inference engine. Systems are built with custom developed shells for particular applications

Developing an expert system



Expert system shells

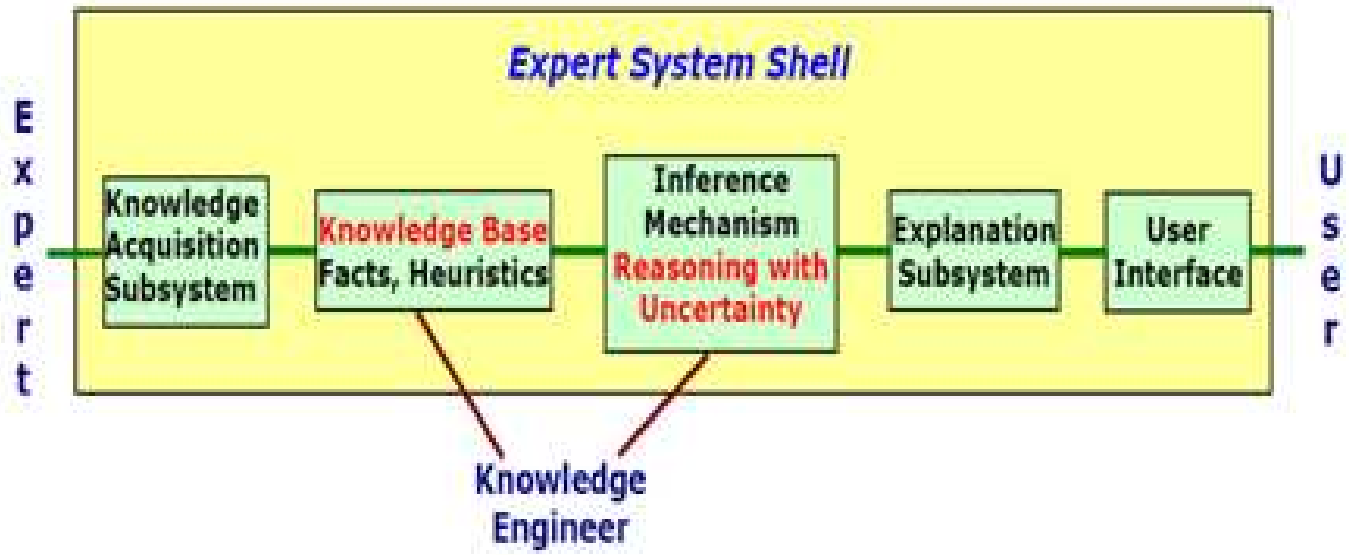
- Expert systems are built with products called expert system shells. A shell is a piece of software which contains the user interface, a format for declarative knowledge in the knowledge base, and an inference engine. The knowledge engineer and system engineer are the key persons for making shells of the expert system.

Expert system shells

- Kowledge engineer – uses the shell to build a system for a particular problem domain.
- System engineer – builds the user interface, designs the declarative format of the knowledge base, and inmplements an inference engine

6.1 Shell components and description

The generic components of a shell : the knowledge acquisition, the knowledge Base, the reasoning, the explanation and the user interface are shown below. The knowledge base and reasoning engine are the core components.



- **Knowledge Base**

  A store of factual and heuristic knowledge. Expert system tool provides one or more knowledge representation schemes for expressing knowledge about the application domain. Some tools use both Frames (objects) and IF-THEN rules. In PROLOG the knowledge is represented as logical statements.

- **Reasoning Engine**

  Inference mechanisms for manipulating the symbolic information and knowledge in the knowledge base form a line of reasoning in solving a problem. The inference mechanism can range from simple modus ponens backward chaining of IF-THEN rules to Case-Based reasoning.

- **Knowledge Acquisition subsystem**

  A subsystem to help experts in build knowledge bases. However, collecting knowledge, needed to solve problems and build the knowledge base, is the biggest bottleneck in building expert systems.

- **Explanation subsystem**

  A subsystem that explains the system's actions. The explanation can range from how the final or intermediate solutions were arrived at justifying the need for additional data.

- **User Interface**

  A means of communication with the user. The user interface is generally not a part of the expert system technology. It was not given much attention in the past. However, the user interface can make a critical difference in the perceived utility of an Expert system.