**Knowledge Acquisition:**

The knowledge acquisition component allows the expert to enter their knowledge or expertise into the expert system, and to refine it later as and when required.

Historically, the knowledge engineer played a major role in this process, but automated systems that allow the expert to interact directly with the system are becoming increasingly common.

The knowledge acquisition process is usually comprised of three principal stages:

1. **Knowledge elicitation** is the interaction between the expert and the knowledge engineer/program to elicit the expert knowledge in some systematic way.

2. The knowledge thus obtained is usually stored in some form of human friendly **intermediate representation**.

3. The intermediate representation of the knowledge is then compiled into an **executable form** (e.g. production rules) that the inference engine can process.

**Stages of Knowledge Acquisition:**

The iterative nature of the knowledge acquisition process can be represented in the following diagram (five stages):

- Identification: break problem into parts.
- Conceptualisation: identify concepts.
- Formalisation: representing knowledge.
- Implementation: programming.
Stages of Knowledge Acquisition

Representing the Knowledge:

We have already looked at various types of knowledge representation. In general, the knowledge acquired from our expert will be formulated in two ways:

1. **Intermediate representation:**
   a structured knowledge representation that the knowledge engineer and expert can both work with efficiently.

2. **Production system:**
   a formulation that the expert system’s inference engine can process efficiently.

It is important to distinguish between:

1. **Domain knowledge:** the expert’s knowledge which might be expressed in the form of rules, general/default values, and so on.
2. **Case knowledge** – specific facts/knowledge about particular cases, including any derived knowledge about the particular cases.

**The Inference Engine:**

We have already looked at production systems, and how they can be used to generate new information and solve problems. Recall the steps in the basic Recognize Act Cycle:

1. **Match** the premise patterns of the rules against elements in the working memory. Generally the rules will be domain knowledge built into the system, and the working memory will contain the case based facts entered into the system, plus any new facts that have been derived from them.

2. If there is more than one rule that can be applied, use a **conflict resolution** strategy to choose one to apply. Stop if no further rules are applicable.

3. **Activate** the chosen rule, which generally means adding / deleting an item to/from working memory. Stop if a terminating condition is reached, or return to step 1.

**The User Interface:**

The Expert System user interface usually comprises of two basic components:

1. **The Interviewer Component:**

   This controls the dialog with the user and/or allows any measured data to be read into the system. For example, it might ask the user a series of questions, or it might read a file containing a series of test results.
2. **The Explanation Component:**

This gives the system’s solution, and also makes the system’s operation transparent by providing the user with information about its reasoning process. For example, it might output the conclusion, and also the sequence of rules that was used to come to that conclusion. It might instead explain why it could not reach a conclusion.

**Creating an Expert System:**

1. **Knowledge Engineers:** is someone who is capable of designing, building and testing an expert system.
   - Interacts between expert and Knowledge Base
   - Needs to be skilled in extracting knowledge
   - Uses a variety of techniques

2. **Domain Experts:**
   - they have deep knowledge (of both facts and rules) and strong practical experience in a particular domain. The area of the domain may be limited. In general, an expert is a skillful person who can do things other people cannot.

**Two steps involved:**

1. extracting knowledge and methods from the expert (knowledge acquisition).
2. reforming knowledge/methods into an organised form (knowledge representation).
ES Development:

- Problem Definition.
- System design... (*Knowledge Acquisition*).
- Formalization. (*logical design,,,,, tree structures*)
- System Implementation. (*building a prototype*)
- System Validation.

Classification of Expert System:

Classification based on “Expertness” or Purpose Expertness

- An assistant
- A colleague
- A true expert