

Transaction Processing System (TPS)

Transaction processing systems are used to record day to day business transactions of the organization. They are used by users at the operational management level. The main objective of a transaction processing system is to answer routine questions such as

- How printers were sold today?
- How much inventory do we have at hand?
- What is the outstanding due for John Doe?

By recording the day to day business transactions, TPS system provides answers to the above questions in a timely manner.

- The decisions made by operational managers are routine and highly structured.
- The information produced from the transaction processing system is very detailed.

For example, banks that give out loans require that the company that a person works for should have a memorandum of understanding (MoU) with the bank. If a person whose employer has a MoU with the bank applies for a loan, all that the operational staff has to do is verify the submitted documents. If they meet the requirements, then the loan application documents are processed. If they do not meet the requirements, then the client is advised to see tactical management staff to see the possibility of signing a MoU.

Examples of transaction processing systems include;

- **Point of Sale Systems** – records daily sales
- **Payroll systems** – processing employees salary, loans management, etc.
- **Stock Control systems** – keeping track of inventory levels
- **Airline booking systems** – flights booking management

Transaction Processing System Features

There are several features involved in a good transaction processing system. A few of these critical features are described below.

- **Performance**

The concept behind the use of TPS is to efficiently generate timely results for transactions. Effectiveness is based on the number of transactions they can process at a particular time.

- **Continuous availability**

The transaction processing system should be a very stable and reliable system that must not crash easily. Disruption of TPS in an organization can lead to work disturbance and financial loss.

- **Data integrity**

The TPS must maintain the same method for all transactions processed, the system must be designed to effectively protect data and overcome any hardware/ software issues.

- **Ease of use**

The TPS should be user-friendly in order to encourage the use and also decrease errors from inputting data. It should be structured in such a way that it makes it easy to understand as well as guarding users against making errors during data-entry.

- **Modular growth**

The TPS hardware and software components should be able to be upgraded individually without requiring a complete overhaul.

- **Controlled processing**

Only authorized personnel, staff members, or employees should be able to access the system at a time.

Storing and Retrieving Data

A TPS must be able to easily be accessed by authorized employees so that information in the TPS can be retrieved. The information that goes through a TPS must never be deleted so that there will not be any confusion of what orders have gone through it. It is a good idea to have a back up hard drive so that older information can still be stored, but will not slow down the server which houses the TPS.

Types of Transaction Processing Systems

- **Batch processing**

Batch processing is when clusters of transactions are refined simultaneously using a computer system.

This method, although designed to be efficient for breaking down bulky series of programs, has a drawback

as there is a delay in the transaction result.

- **Real-time Processing**

Real-time processing carries out its transactions exclusively; this method ensures a swift reply on the condition of the transaction result. It is an ideal technique for dealing with singular transactions.

Expert System

Expert System is an interactive and reliable computer-based decision-making system which uses both facts and heuristics to solve complex decision-making problems. It is considered at the highest level of human intelligence and expertise. The purpose of an expert system is to solve the most complex issues in a specific domain.

The Expert System can resolve many issues which generally would require a human expert. It is based on knowledge acquired from an expert. It is also capable of expressing and reasoning about some domain of knowledge. Expert systems were the predecessor of the current day artificial intelligence, deep learning and machine learning systems.

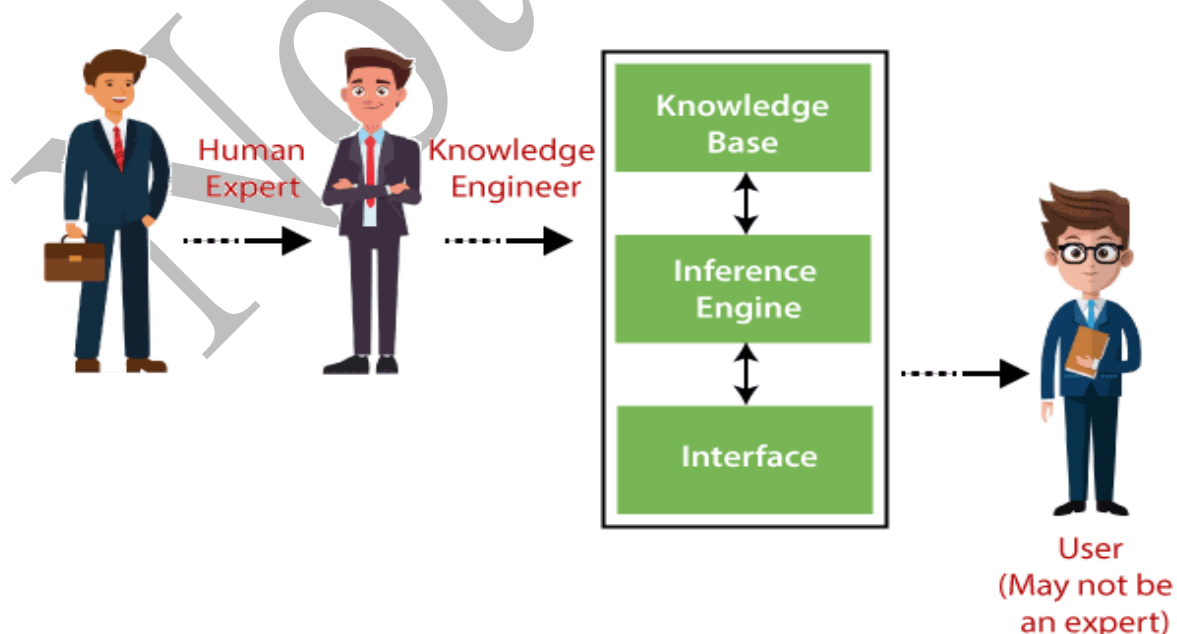
Characteristics of Expert System

- **High Performance:** The expert system provides high performance for solving any type of complex problem of a specific domain with high efficiency and accuracy.
- **Understandable:** It responds in a way that can be easily understandable by the user. It can take input in human language and provides the output in the same way.
- **Reliable:** It is much reliable for generating an efficient and accurate output.
- **Highly responsive:** ES provides the result for any complex query within a very short period of time.

Components of Expert System

An expert system mainly consists of three components:

- **User Interface**
- **Inference Engine**
- **Knowledge Base**



1. User Interface

With the help of a user interface, the expert system interacts with the user, takes queries as an input in a readable format, and passes it to the inference engine. After getting the response from the inference engine, it displays the output to the user. In other words, it is an interface that helps a non-expert user to communicate with the expert system to find a solution.

2. Inference Engine (Rules of Engine)

- The inference engine is known as the brain of the expert system as it is the main processing unit of the system. It applies inference rules to the knowledge base to derive a conclusion or deduce new information. It helps in deriving an error-free solution of queries asked by the user.
- With the help of an inference engine, the system extracts the knowledge from the knowledge base.
- There are two types of inference engine:
- **Deterministic Inference engine:** The conclusions drawn from this type of inference engine are assumed to be true. It is based on **facts** and **rules**.
- **Probabilistic Inference engine:** This type of inference engine contains uncertainty in conclusions, and based on the probability.

Inference engine uses the below modes to derive the solutions:

- **Forward Chaining:** It starts from the known facts and rules, and applies the inference rules to add their conclusion to the known facts.
- **Backward Chaining:** It is a backward reasoning method that starts from the goal and works backward to prove the known facts.

3. Knowledge Base

- The knowledgebase is a type of storage that stores knowledge acquired from the different experts of the particular domain. It is considered as big storage of knowledge. The more the knowledge base, the more precise will be the Expert System.
- It is similar to a database that contains information and rules of a particular domain or subject.
- One can also view the knowledge base as collections of objects and their attributes. Such as a Lion is an object and its attributes are it is a mammal, it is not a domestic animal, etc.

Components of Knowledge Base

- **Factual Knowledge:** The knowledge which is based on facts and accepted by knowledge engineers comes under factual knowledge.
- **Heuristic Knowledge:** This knowledge is based on practice, the ability to guess, evaluation, and experiences.

Knowledge Representation: It is used to formalize the knowledge stored in the knowledge base using the If-else rules.

Knowledge Acquisitions: It is the process of extracting, organizing, and structuring the domain knowledge, specifying the rules to acquire the knowledge from various experts, and store that knowledge into the knowledge base.

Capabilities of Expert Systems

The expert systems are capable of –

- Advising
- Instructing and assisting human in decision making
- Demonstrating
- Deriving a solution

- Diagnosing
- Explaining
- Interpreting input
- Predicting results
- Justifying the conclusion
- Suggesting alternative options to a problem

They are incapable of –

- Substituting human decision makers
- Possessing human capabilities
- Producing accurate output for inadequate knowledge base
- Refining their own knowledge

Participants in the development of Expert System

There are three primary participants in the building of Expert System:

1. **Expert:** The success of an ES much depends on the knowledge provided by human experts. These experts are those persons who are specialized in that specific domain.
2. **Knowledge Engineer:** Knowledge engineer is the person who gathers the knowledge from the domain experts and then codifies that knowledge to the system according to the formalism.
3. **End-User:** This is a particular person or a group of people who may not be experts, and working on the expert system needs the solution or advice for his queries, which are complex.

Development of Expert System

Here, we will explain the working of an expert system by taking an example of MYCIN ES. Below are some steps to build an MYCIN:

- Firstly, ES should be fed with expert knowledge. In the case of MYCIN, human experts specialized in the medical field of bacterial infection, provide information about the causes, symptoms, and other knowledge in that domain.
- The KB of the MYCIN is updated successfully. In order to test it, the doctor provides a new problem to it. The problem is to identify the presence of the bacteria by inputting the details of a patient, including the symptoms, current condition, and medical history.
- The ES will need a questionnaire to be filled by the patient to know the general information about the patient, such as gender, age, etc.
- Now the system has collected all the information, so it will find the solution for the problem by applying if-then rules using the inference engine and using the facts stored within the KB.
- In the end, it will provide a response to the patient by using the user interface.

Benefits of expert systems

- It improves the decision quality
- Cuts the expense of consulting experts for problem-solving
- It provides fast and efficient solutions to problems in a narrow area of specialization.
- It can gather scarce expertise and used it efficiently.
- Offers consistent answer for the repetitive problem
- Maintains a significant level of information
- Helps you to get fast and accurate answers

- A proper explanation of decision making
- Ability to solve complex and challenging issues
- Expert Systems can work steadily work without getting emotional, tensed or fatigued.

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