Expert System

What is an Expert System

"An expert system is a computer system that emulates, or acts in all respects, with the decision-making capabilities of a human expert."

Professor Edward Feigenbaum

Stanford University

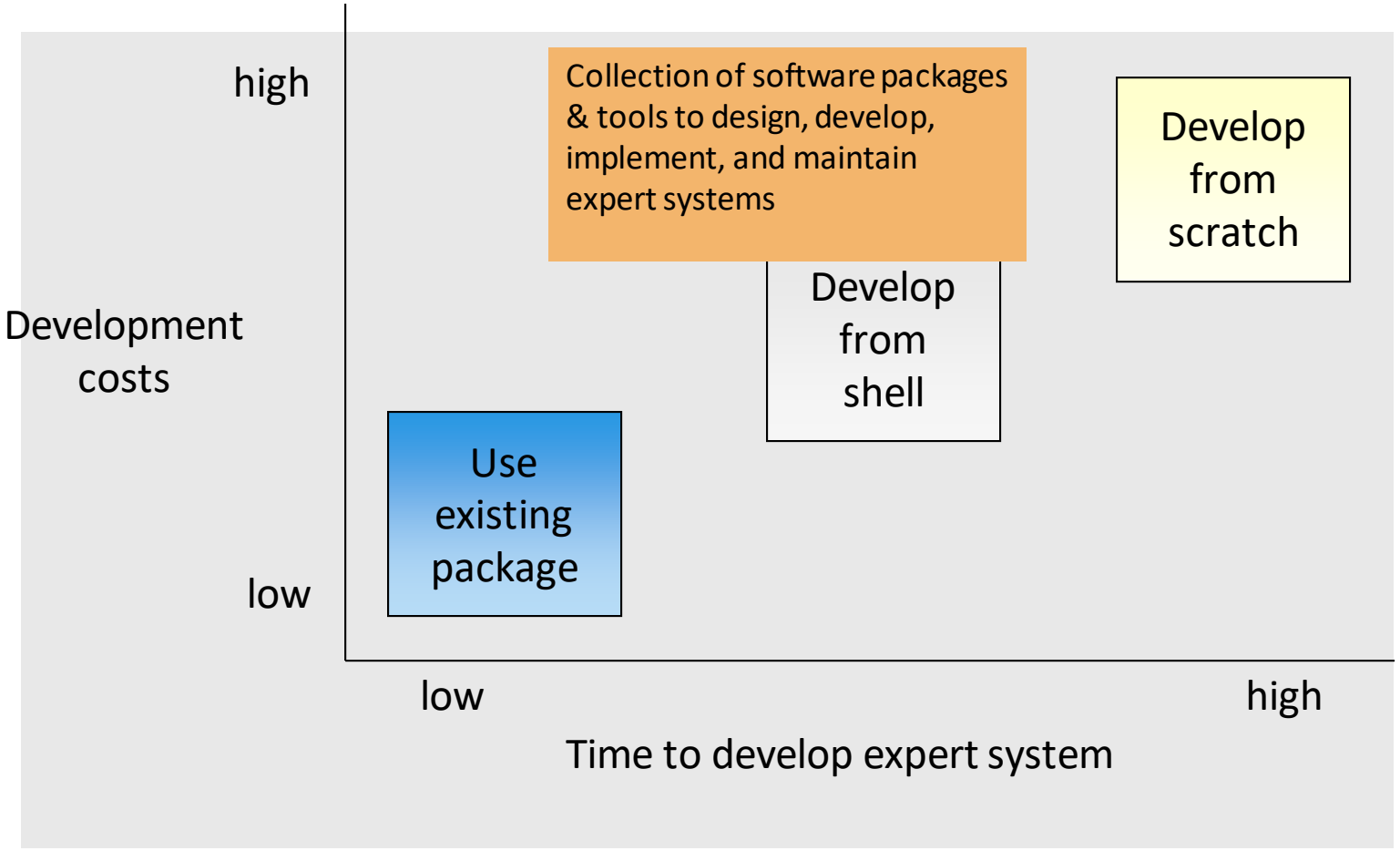
- Computer program
- Robots

Expert System and Conventional System

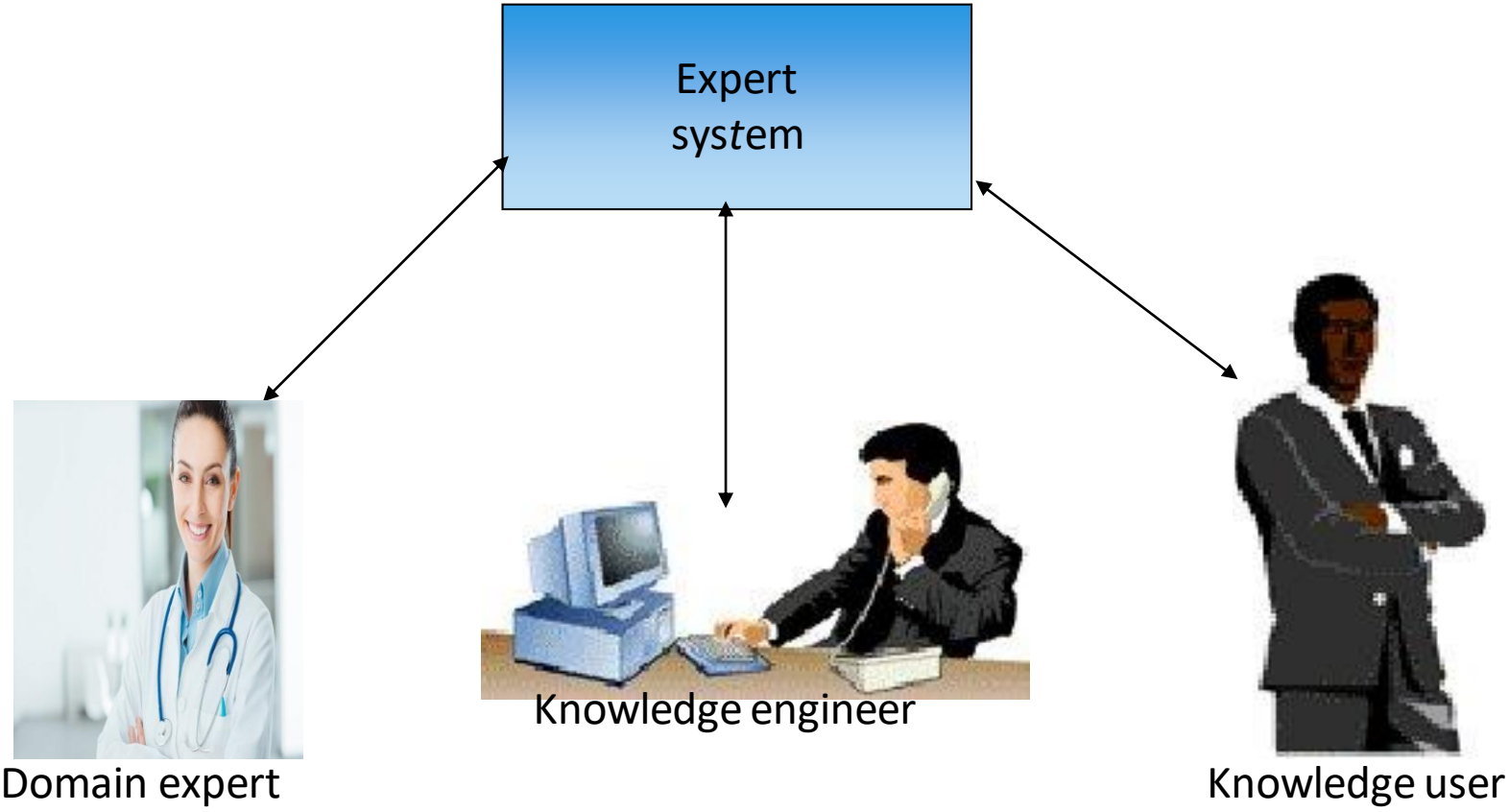
Conventional method

Expert System

Expert Systems Development Alternatives



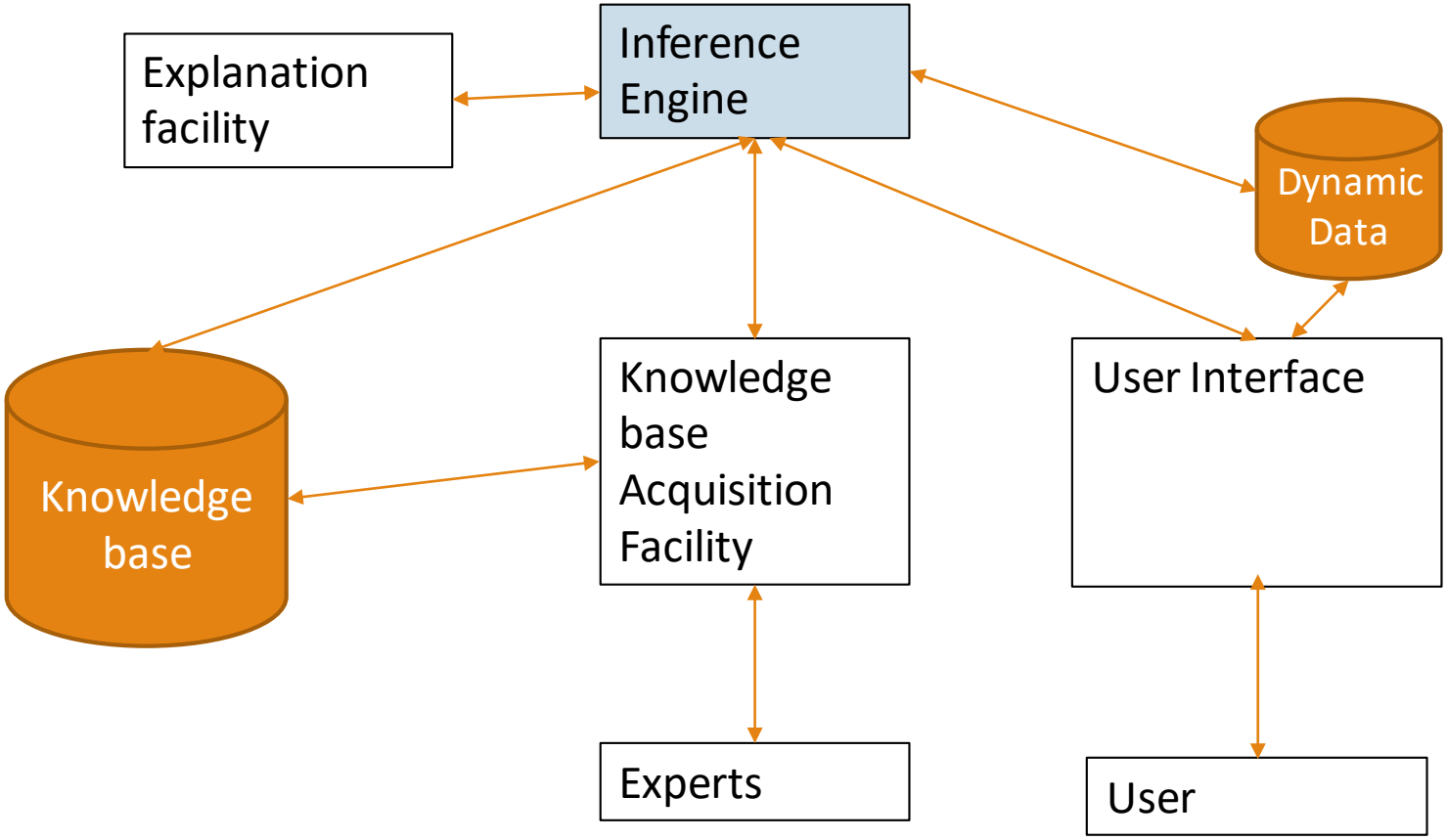
Participants in Expert Systems Development and Use



Capabilities of an Expert System

- Can explain their reasoning or suggested decisions.
- Can draw conclusions from complex relationships.
- Can display intelligent behavior.

Components of an Expert System



Components of an Expert System

Knowledge base

- Stores all relevant information, data, rules, cases, and relationships used by the expert system.

If (outside == red zone covid19) then action == Stay Home

If (outside == green zone covid19) then action == move outside by maintaining social distancing.

Components of an Expert System Cont…

Inference Engine

Seeks information and relationships from the knowledge base and provides answers, predictions, and suggestions in the way a human expert would.

- Backward chaining

  A method of reasoning that starts with conclusions and works backward to the supporting facts

- Forward chaining

  A method of reasoning that starts with the facts and works forward to the conclusions

Components of an Expert System Cont…

- **Explanation Facility**

  A part of the expert system that allows a user or decision maker to understand how the expert system arrived at certain conclusions or results

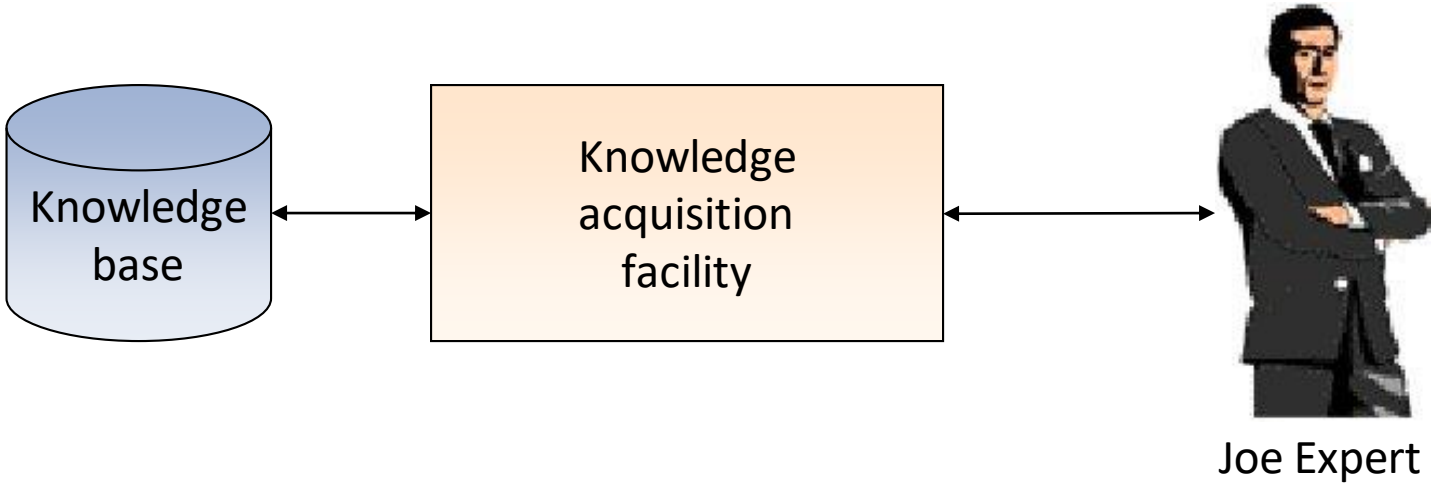
- **Interface**

  A medium to communicate with the system

Components of an Expert System Cont…

Knowledge acquisition facility

- Provides a convenient and efficient means of capturing and storing all components of the knowledge base



The MYCIN Architecture

Applications of an Expert System

- Capture and preserve irreplaceable human expertise
- Provide expertise needed at a number of locations at the same time or in a hostile environment that is dangerous to human health

Applications of an Expert System Cont..

- Provide expertise that is expensive or rare
- Develop a solution faster than human experts can
- Provide expertise needed for training and development to share the wisdom of human experts with a large number of people

Advantages of Expert Systems

- Expert system never relies on mood and stress, so it cannot make the wrong decision. It provides greater reliability.
- It is available 24*7 unlike human experts.
- The duplication of another expert system is easy.
- The Expert system accepts commands in natural language of the user.

Limitations of Expert Systems

- Don’t have human-like decision making power.
- Can’t possess human capabilities.
- Can’t produce correct result from less amount of knowledge.
- Requires excessive training.
- Expert systems do not have common sense.
- If knowledge representation is faulty, the expert system will provide wrong results.
- In case of human experts, performance degradation is gradual, while in the case of expert system, it is steep

Difference between Conventional System and Expert System

Conventional System	Expert System
Solves the generic numeric problems.	It solves the problem in very narrow domain.
It is sequential program where information and processing are combined.	The knowledge base is separated from the processing (inference engine). The program may not be sequential.
Tested program never makes mistakes.	The well tested expert system may make mistakes and gives wrong answer.
No explanation is provided for output	An explanation is provided in most cases.
When incorrect information is provided, the system may not function.	The system can arrive at a conclusion, even when some information is missing or incomplete.

Existing Expert Systems

Crop Advisor: - It advises cereal grain farmers on appropriate fertilizers and pesticides for their farms. Farmers can access the system via internet.

KISAN: - It is used for soil nutrient management. It uses the knowledge of visual deficiency symptoms evident in the plants to diagnose the nutrient.

ELIZA: - It allows the user to type a sentence through the keyboard and the computer would respond with a sentence of its own.

Thanks