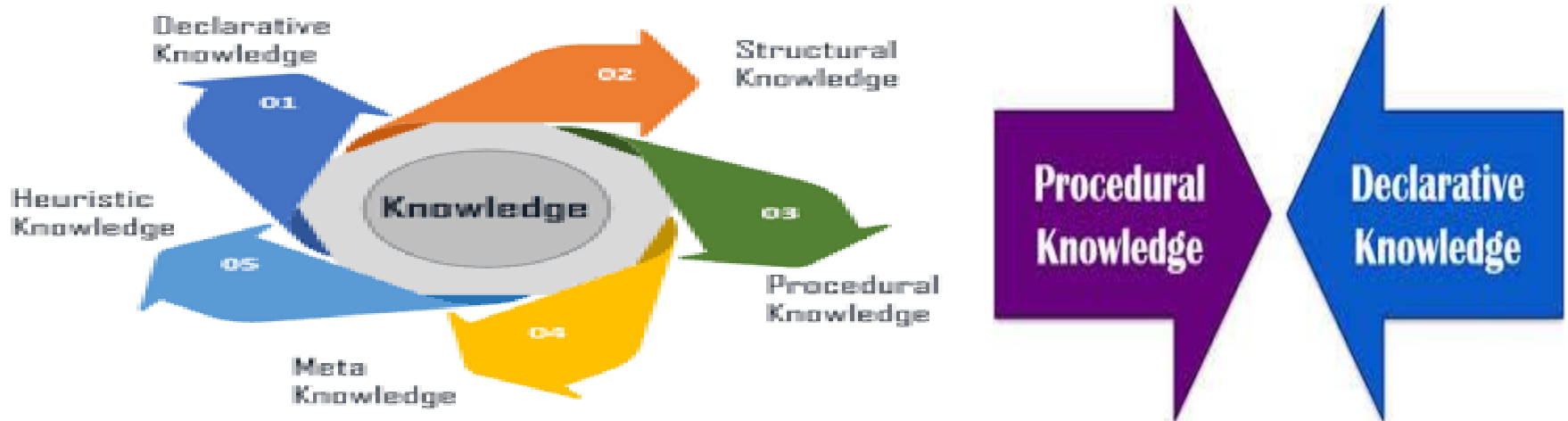


## CHAPTER – 5

### REPRESENTING KNOWLEDGE USING RULES



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# Procedural and Declarative Knowledge

## 1. Procedural Knowledge

- The **Procedural knowledge** is a type of knowledge where the essential control information that is required to use the information is integrated in the knowledge itself.
- It also used with an interpreter to employ the knowledge which follows the instructions given in the knowledge.
- Ex - It can include a group of logical assertions merged with a resolution theorem prove to provide an absolute program for solving problems. Here, the implied income tax of an employee salary can be thought of as a procedural knowledge as it would require a process to calculate it as given below.

- So, this is how the tax of an employee is calculated by following a lengthy process instead of just collecting facts.

= GTI (Gross Taxable Income) = Annual Salary of an employee - (Standard deduction + deduction under section 80C)  
= Tax computed on GTI (according to slab rate) = A,  
= Rebate under section 87A = B;  
= Total tax = A - Less B + add: health and education Cess @ 4% on (A-B)

## 2. Declarative Knowledge

- A **Declarative knowledge** is where only knowledge is described but not the use to which the knowledge is employed is not provided.
- So, in order to use this declarative knowledge, we need to add it with a program that indicates what is to be done to the knowledge and how it is to be done.

# Difference the Procedural and Declarative Knowledge

<b>PROCEDURAL KNOWLEDGE</b>	<b>DECLARATIVE KNOWLEDGE</b>
It is also known as Interpretive knowledge.	It is also known as Descriptive knowledge.
Procedural Knowledge means how a particular thing can be accomplished	While Declarative Knowledge means basic knowledge about something.
Procedural Knowledge is generally not used means it is not more popular.	Declarative Knowledge is more popular.
Procedural Knowledge can't be easily communicate.	Declarative Knowledge can be easily communicate
Procedural Knowledge is generally process oriented in nature	Declarative Knowledge is data oriented in nature.
In Procedural Knowledge debugging and validation is not easy.	In Declarative Knowledge debugging and validation is easy.

# Forward Reasoning

- The solution of a problem generally includes the initial data and facts in order to arrive at the solution. These unknown facts and information is used to deduce the result
- For example, while diagnosing a patient the doctor first check the symptoms and medical condition of the body such as temperature, blood pressure, pulse, eye colour, blood, etcetera. After that, the patient symptoms are analysed and compared against the predetermined symptoms. Then the doctor is able to provide the medicines according to the symptoms of the patient. So, when a solution employs this manner of reasoning, it is known as **forward reasoning**.

## Steps that are followed in the forward reasoning

1. In the first step, the system is given one or more than one constraints.
2. Then the rules are searched in the knowledge base for each constraint. The rules that fulfill the condition are selected(i.e., IF part).
3. Now each rule is able to produce new conditions from the conclusion of the invoked one. As a result, THEN part is again included in the existing one.
4. The added conditions are processed again by repeating step 2. The process will end if there is no new conditions exist.

# Backward Reasoning

- The **backward reasoning** is inverse of forward reasoning in which goal is analysed in order to deduce the rules, initial facts and data.
- We can understand the concept by the similar example given in the above definition, where the doctor is trying to diagnose the patient with the help of the inceptive data such as symptoms. However, in this case, the patient is experiencing a problem in his body, on the basis of which the doctor is going to prove the symptoms. This kind of reasoning comes under backward reasoning.

## Steps that are followed in the backward reasoning

1. Firstly, the goal state and the rules are selected where the goal state reside in the THEN part as the conclusion.
2. From the IF part of the selected rule the sub goals are made to be satisfied for the goal state to be true.
3. Set initial conditions important to satisfy all the sub goals.
4. Verify whether the provided initial state matches with the established states. If it fulfills the condition then the goal is the solution otherwise other goal state is selected.



# Difference between backward chaining and forward chaining

<b>Forward Chaining</b>	<b>Backward Chaining</b>
It starts from known facts and applies inference rule to extract more data unit it reaches to the goal.	It starts from the goal and works backward through inference rules to find the required facts that support the goal.
It is a bottom-up approach	It is a top-down approach
It is known as data-driven inference technique as we reach to the goal using the available data.	It is known as goal-driven technique as we start from the goal and divide into sub-goal to extract the facts.

It applies a breadth-first search strategy.	It applies a depth-first search strategy.
It tests for all the available rules	It tests only for few required rules.
It is suitable for the planning, monitoring, control, and interpretation application.	It is suitable for diagnostic, prescription, and debugging application.
It can generate an infinite number of possible conclusions.	It generates a finite number of possible conclusions.
It operates in the forward direction.	It operates in the backward direction.

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Thank you!