



# **SNS COLLEGE OF ENGINEERING**

Kurumbapalayam (Po), Coimbatore – 641 107

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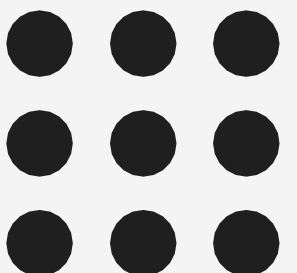
**DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**

**COURSE NAME: 19OE116 - PRODUCT DESIGN AND DEVELOPMENT**

**III YEAR / VI SEMESTER**

**Unit 2 - Concept Generation and Selection**

**Topic 2 – Structured Approaches**

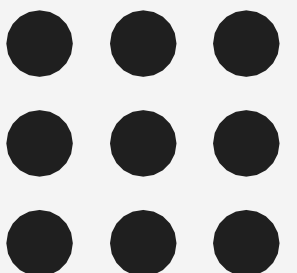




## **Structured Approaches in Concept Generation and Selection:**

**A structured approach ensures that concept generation and selection are systematic, objective and effective.**

**The following methodologies help in organizing ideas, evaluating them, and selecting the best solution.**

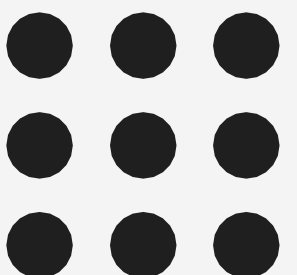




# 1. Structured Approaches for Concept Generation:

## a) Brainstorming:

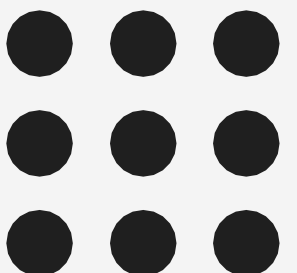
- . A team-based technique that encourages free-thinking and idea sharing.
- . Can be structured (with predefined rules) or unstructured (free flow of ideas).
- . Example: Generating new sensor-based irrigation techniques for smart farming.





## **b) Morphological Analysis:**

- . Breaks down a problem into its key components and explores all possible combinations.**
- . Uses a morphological matrix to structure solutions.**
- . Example: Developing an automated greenhouse control system by combining different sensors, power sources, and control algorithms.**



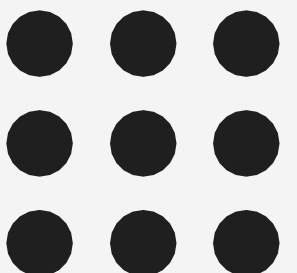


## **c) SCAMPER Technique:**

**A creative method that modifies existing solutions using seven strategies:**

**Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, Reverse.**

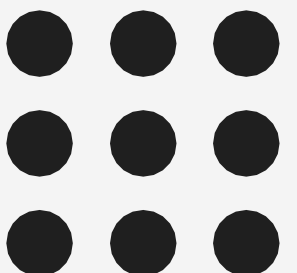
**Example: Adapting existing IoT-based monitoring systems for pest control in agriculture.**





## **d) TRIZ (Theory of Inventive Problem Solving):**

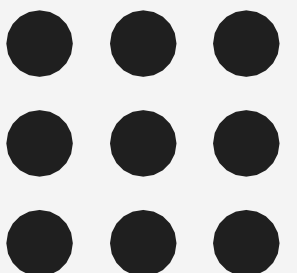
- . A problem-solving framework based on patterns of innovation.**
- . Uses principles such as contradiction resolution and ideality to generate solutions.**
- . Example: Resolving the trade-off between high water usage and optimal crop growth in irrigation systems.**





## **e) Functional Decomposition:**

- . Breaks the system into smaller subsystems or functions.**
- . Helps in understanding different aspects and generating ideas for each function.**
- . Example: Dividing a precision farming system into sensing, processing, and control functions.**

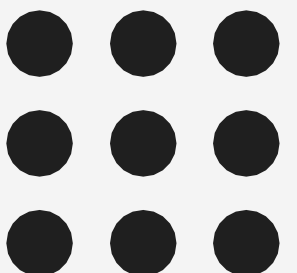




## **2. Structured Approaches for Concept Selection:**

### **a) Concept Screening (Pugh Matrix):**

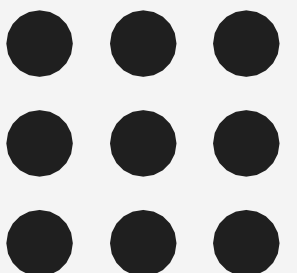
- . A relative comparison method where concepts are evaluated against a baseline (reference concept).**
- . Each idea is rated as better (+), worse (-), or same (0) compared to the baseline.**
- . Example: Comparing different embedded controllers for a precision farming system.**





## **b) Weighted Decision Matrix:**

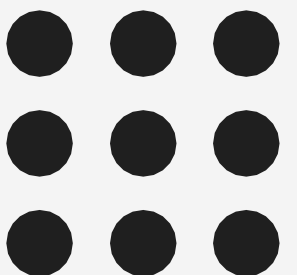
- . Assigns numerical scores based on predefined criteria (cost, efficiency, feasibility, scalability, etc.)**
- . Each criterion is weighted based on importance, and concepts are scored accordingly.**
- . Example: Selecting the best wireless communication protocol (LoRa, Wi-Fi, Zigbee) for farm data transmission.**





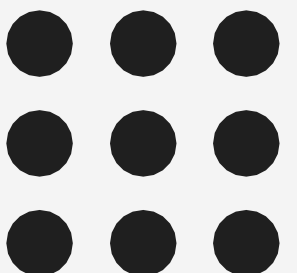
## **c) Analytical Hierarchy Process (AHP)**

- . Breaks decision-making into a hierarchy of criteria and sub-criteria.**
- . Uses pairwise comparisons and mathematical ranking to find the best alternative.**
- . Example: Choosing the most suitable embedded platform (Arduino, Raspberry Pi, ESP32) for an agricultural automation system.**



## **d) Kano Model:**

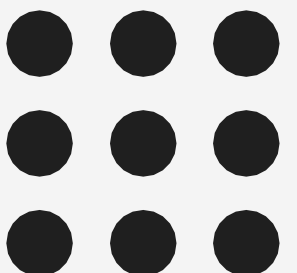
- . Classifies concepts based on customer satisfaction and necessity.**
- . Helps prioritize features based on user expectations.**
- . Example: Selecting features for an IoT-based soil monitoring system.**





## **e) Cost-Benefit Analysis:**

- . Evaluates concepts based on expected benefits versus costs.**
- . Ensures the chosen concept provides maximum value with minimal investment.**
- . Example: Assessing the ROI of deploying autonomous robots for weed control in large farms.**

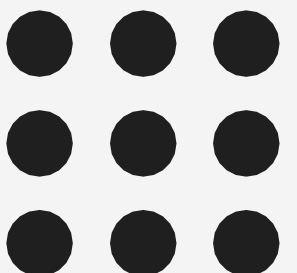




## **Conclusion:**

**Using structured approaches in concept generation and selection ensures innovation, feasibility, and efficiency in design.**

**Combining different methodologies enhances decision-making and leads to optimal solutions.**





**Thank You...**