Empowering IoT and Edge Computing with Design Thinking

Presentation to CSCI 4907 - Introduction to IoT and Edge Computing Applications

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Introduction to Design Thinking

- Design thinking is a **non-linear**, **iterative** process that teams use to **understand users**, **challenge assumptions**, **redefine problems**, and **create innovative solutions** to prototype and test
- Design thinking is particularly valuable in the tech sector—including IoT and edge computing—where user needs and system efficiency are paramount

Core Principles of Design Thinking

EMPATHIZE
Innovation should be human-centered.

IDEATE
Innovation is born from a clash of ideas.

DEFINE
Innovation should solve a problem.

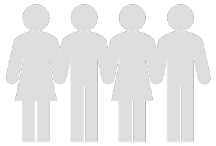
TEST
Innovation should be refined.

PROTOTYPE
Innovation should be brought to life.

Implementing Design Thinking in Your Projects - Start with User Research

- Identify Your User
- Conduct Empathy Work
- Define User Personas
- Map User Journeys

Implementing Design Thinking in Your Projects - Build Interdisciplinary Teams



Assemble a Diverse Team

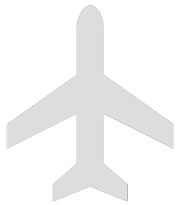
Foster Collaboration

Educate on Design Thinking

Implementing Design Thinking in Your Projects - Encourage Rapid Prototyping

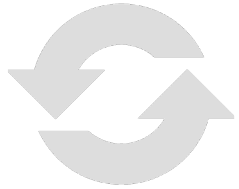
- Prototype Early and Often
- Iterative Development
- Utilize Lean Prototyping Techniques
- Involve Users in Testing

Implementing Design Thinking in Your Projects - Implement and Iterate



Pilot Your Solution

Gather and Analyze Feedback



Iterate Based on Feedback

Examples of Design Thinking in IoT and Edge Computing - Smart Agriculture

- **Challenge:** Farmers need to increase crop yields while managing resources efficiently.
- **Design Thinking Application:**
  - **Empathize**
  - **Ideate**
  - **Prototype**
  - **Test**

Examples of Design Thinking in IoT and Edge Computing - Smart Agriculture

- **Challenge**: Farmers need to increase crop yields while managing resources efficiently.
- **Design Thinking Application**:
  - **Empathize**: Conduct field visits to understand the daily challenges farmers face, including water usage, pest management, and crop health monitoring.
  - **Ideate**: Brainstorm solutions that leverage IoT devices for soil moisture sensing, drone-based surveillance for pest detection, and climate condition monitoring.
  - **Prototype**: Develop a prototype of an integrated farm management system that uses edge computing to process data locally, allowing for real-time decision-making.
  - **Test**: Pilot the system with a group of farmers to gather feedback and iterate on the design based on their experiences and suggestions.

Examples of Design Thinking in IoT and Edge Computing - Healthcare Monitoring

- **Challenge**: Enhancing patient care through continuous health monitoring while minimizing intrusiveness.
- **Design Thinking Application**:
  - **Empathize**
  - **Ideate**
  - **Prototype**
  - **Test**

Examples of Design Thinking in IoT and Edge Computing - Healthcare Monitoring

- **Challenge**: Enhancing patient care through continuous health monitoring while minimizing intrusiveness.
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Examples of Design Thinking in IoT and Edge Computing - Smart City Infrastructure

- **Challenge**: Cities need to improve traffic management and reduce congestion without extensive infrastructure overhauls.
- **Design Thinking Application**:
  - **Empathize**
  - **Ideate**
  - **Prototype**
  - **Test**

Examples of Design Thinking in IoT and Edge Computing - Smart City Infrastructure

- **Challenge**: Cities need to improve traffic management and reduce congestion without extensive infrastructure overhauls.
- **Design Thinking Application**:
  - **Empathize**: Observe traffic patterns and conduct interviews with city planners, residents, and commuters to understand the complexities of urban traffic flow.
  - **Ideate**: Brainstorm solutions that use IoT sensors to gather traffic data and edge computing nodes to analyze this information locally, allowing for dynamic traffic light control and real-time congestion alerts.
  - **Prototype**: Develop a traffic management system prototype that integrates with existing city infrastructure.
  - **Test**: Implement the prototype in a small area of the city, collecting data on traffic flow improvements and gathering feedback from the community to refine the solution.

Examples of Design Thinking in IoT and Edge Computing - Industrial Automation

- **Challenge**: Factories want to improve efficiency and reduce downtime through better machinery monitoring and predictive maintenance.
- **Design Thinking Application**:
  - **Empathize**
  - **Ideate**
  - **Prototype**
  - **Test**

Examples of Design Thinking in IoT and Edge Computing - Industrial Automation

- **Challenge**: Factories want to improve efficiency and reduce downtime through better machinery monitoring and predictive maintenance.
- **Design Thinking Application**:
  - **Empathize**: Spend time on the factory floor to observe operations and maintenance processes, interviewing workers to identify pain points and inefficiencies.
  - **Ideate**: Develop ideas for IoT sensors that monitor machine health and edge computing solutions that can analyze data on-site to predict maintenance needs.
  - **Prototype**: Create a system that integrates these technologies, offering a dashboard for maintenance staff to view alerts and analytics.
  - **Test**: Test the system in a factory setting, iterating based on worker feedback and system performance data to enhance predictive accuracy and user interface design.

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