

# ROBUST SYSTEMS DESIGN

## Systems Analysis & Design

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# Outline

1 Concepts Generation & Selection



2 Quality Guidelines in Systems Design



3 Systems Architectures



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# Concepts Generation

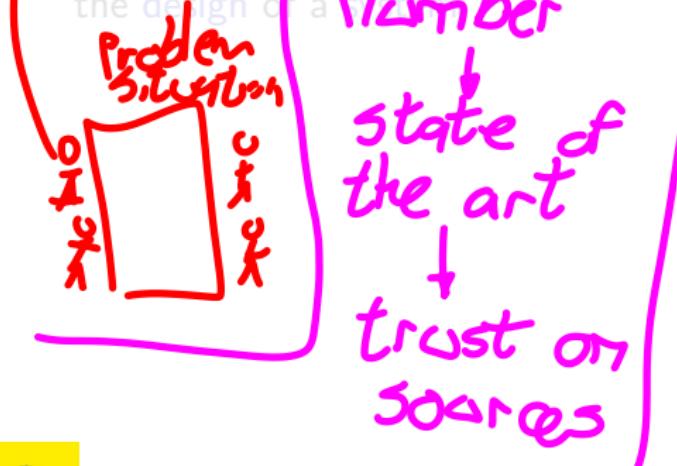
- **Concepts generation** is the process of creating ideas for a system that meet the needs of its users.
- It involves brainstorming, research, and analysis to generate innovative ideas for a system.
- It is a creative process that encourages innovation and creativity in the design of a system.

Problem  
Solving



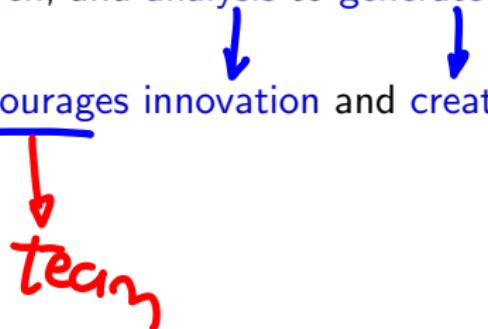
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# Innovation and Creativity

- **Innovation** is the process of **creating new ideas** and **solutions** that **improve** the performance of a **system**.
- **Creativity** is the ability to generate original and innovative ideas that solve problems and meet the needs of users.
- They are important for ensuring that a system is robust, efficient, and effective.



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T  
solution

T  
Resources



Is this Innovation & Creativity?

bluetooth  
(10 years  
before)



WiiMote-wireless

IR ~30 μm

~200

Pyt.



20y before



# Concepts Selection

- **Concepts selection** is the process of evaluating and choosing the best ideas for a system.

- It involves analysis, comparison, and evaluation of concepts to determine which ones are the most feasible and effective.

ideas

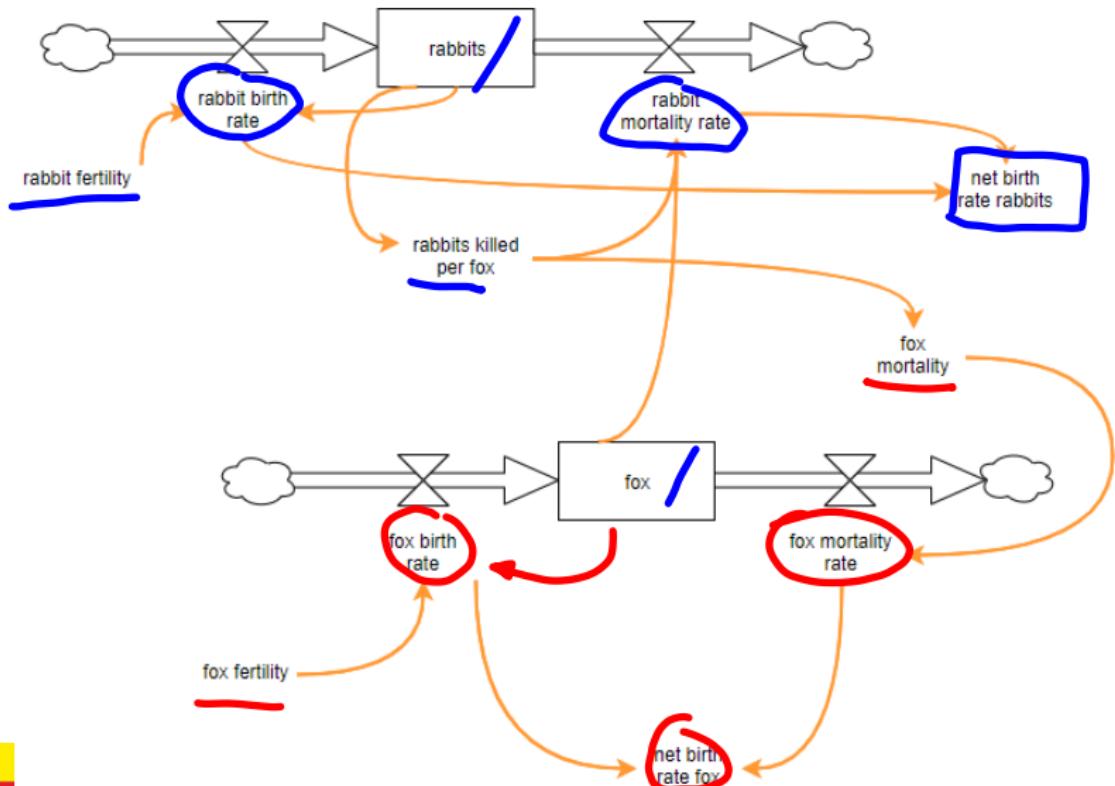
rubric

Fair

Comparison



# Stock and Flow Diagram



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# Quality Guidelines

- **Quality guidelines** are principles that **guide the design** of a **system** to ensure that it **meets** the **needs** of its **users**.
- They include **reliability**, **scalability**, **maintainability**, and **usability** guidelines.
- They are **important** for ensuring that a **system** is robust, efficient, and effective.

*recommendation*



*trust*

*demand*

*fix errors*



T T

*consequence*



# Reliability Guidelines

- **Reliability guidelines** are *principles* that *guide* the design of a system to *ensure* that it is **reliable** and **dependable**.
- They include **fault-tolerance**, **redundancy**, and **error-handling guidelines**.
- They are *important* for *ensuring* that a **system** is **robust** and **resilient** to **failures**.



# Scalability Guidelines

- **Scalability guidelines** are *principles* that *guide* the *design* of a system to *ensure* that it is **scalable** and **flexible**.
- They include **modularity**, **extensibility**, and **performance guidelines**.
- They are *important* for *ensuring* that a **system** can **grow** and **adapt** to **changing requirements**.



# Maintainability Guidelines

- **Maintainability guidelines** are *principles* that *guide* the design of a **system** to *ensure* that it is **easy** to **maintain** and **update**.
- They include **modularity**, **documentation**, and **versioning** guidelines.
- They are *important* for *ensuring* that a **system** can be **easily maintained** and **updated** by its **developers**.



# Quality Standards

- **Quality standards** are **benchmarks** that *define* the level of **quality** that a **system** must **meet**.
- They include **ISO 9000**, **CMMI**, and **Six Sigma** standards.



# ISO 9000

- ISO 9000 is a quality standard that *defines* the requirements for a quality management system.
- It is *designed* to help organizations ensure that they *meet* the needs of their *customers* and *stakeholders*.
- It is *based* on a number of quality management principles, including *customer focus*, *leadership*, and *continuous improvement*.



# ISO 27001

- ISO 27001 is a quality standard that *defines* the requirements for an information security management system.
- It is *designed* to help organizations protect their information and ensure that it is *secure* and *confidential*.
- It is *based* on a number of information security management principles, including *risk assessment*, *security policies*, and *incident response*.



# CMMI

- CMMI is a quality standard that *defines* the **requirements** for a mature software development process.
- It is *designed* to help **organizations** improve their **software development processes** and **deliver** high-quality products to their **customers**.
- It is *based* on a number of best practices for software development, including **requirements management**, **project planning**, and **process monitoring**.



# Six Sigma

- **Six Sigma** is a quality standard that *defines* the **requirements** for a **process** that is *capable* of producing high-quality products.
- It is *designed* to help **organizations** improve their **processes** and reduce **defects** in their **products** and **services**.
- It is *based* on a number of quality management principles, including **data-driven decision-making**, **process improvement**, and **customer focus**.



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# What is a System Architecture?

- A **system architecture** is the **structure** of a system that **defines** its components, interactions, and relationships.
- A **system architecture** is the **blueprint** of a system that guides its development and implementation.
- A **system architecture** is the **foundation** of a system that ensures that it meets the needs of its users.



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# Types of System Architectures

- There are **several types** of **system architectures** that are **used** in **systems development**.
- They include **monolithic**, **client-server**, **peer-to-peer**, and **distributed** **architectures**.
- Each **type** of **architecture** has its own **advantages** and **disadvantages** that depend on the specific requirements of the system.



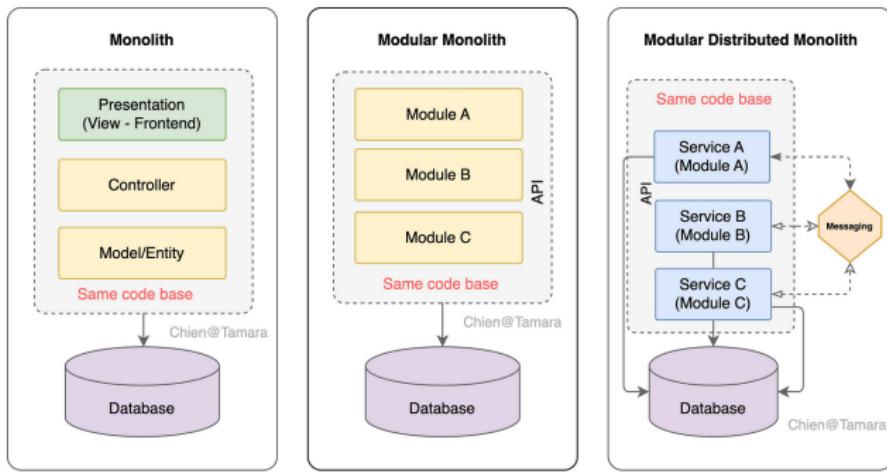
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# Monolithic System Architecture

- A **monolithic system architecture** is a **single-tier architecture** that *consists of a single unit that performs all the functions of the system.*
- It is **simple, easy to develop, and maintain**, but it is **not scalable and flexible**. It is *used for small systems that do not require high performance or reliability.*



# Client-Server System Architecture

- A **client-server system architecture** is a **two-tier architecture** that *consists* of a **client** and a **server** that *communicate* with each other over a **network**.
- It is **scalable**, **flexible**, and **efficient**, but it is *complex* and *difficult* to **develop** and **Maintain**. It is *used* in **medium** to **large systems** that require high performance and **reliability**.



# Peer-to-Peer System Architecture

- A **peer-to-peer system architecture** is a **two-tier architecture** that *consists of a network of peers* that *communicate* with each other directly.
- It is **scalable**, **flexible**, and **efficient**, but it is *complex* and *difficult* to *develop* and *Maintain*. It is *used* in **medium** to **large systems** that require **high performance** and **reliability**.



# Distributed System Architecture

- A **distributed system architecture** is a **multi-tier architecture** that *consists of a network of nodes* that *communicate* with each other over a **network**.
- It is **scalable**, **flexible**, and **efficient**, but it is **complex** and **difficult** to **develop** and **Maintain**. It is *used* in **large systems** that **require** high **performance** and **reliability**.



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# Thanks!

## Questions?



Repo: <https://github.com/EngAndres/ud-public/tree/main/courses/systems-analysis>

