

Systems Design Fundamentals I

CSIT883 System Analysis and Project Management



UNIVERSITY
OF WOLLONGONG
AUSTRALIA





Outline

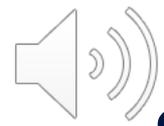
What Is Systems Design?

Systems Design Activities

System Controls and Security

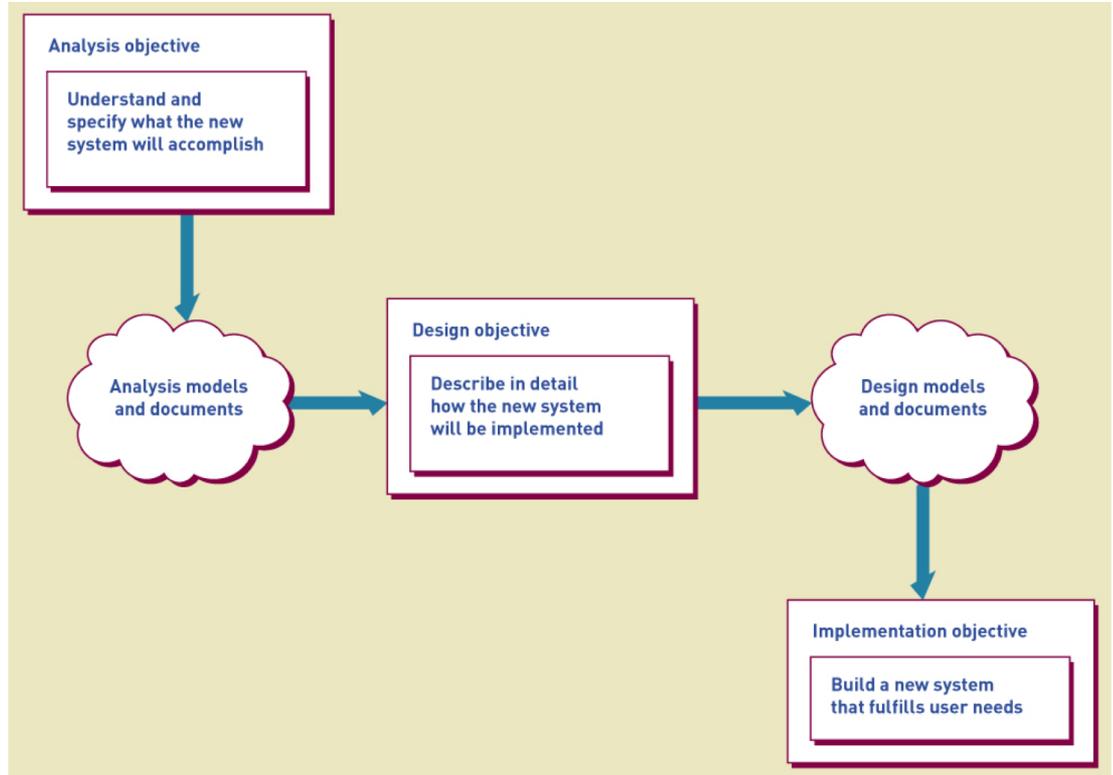
Part I

Part II



Systems Analysis vs Systems Design

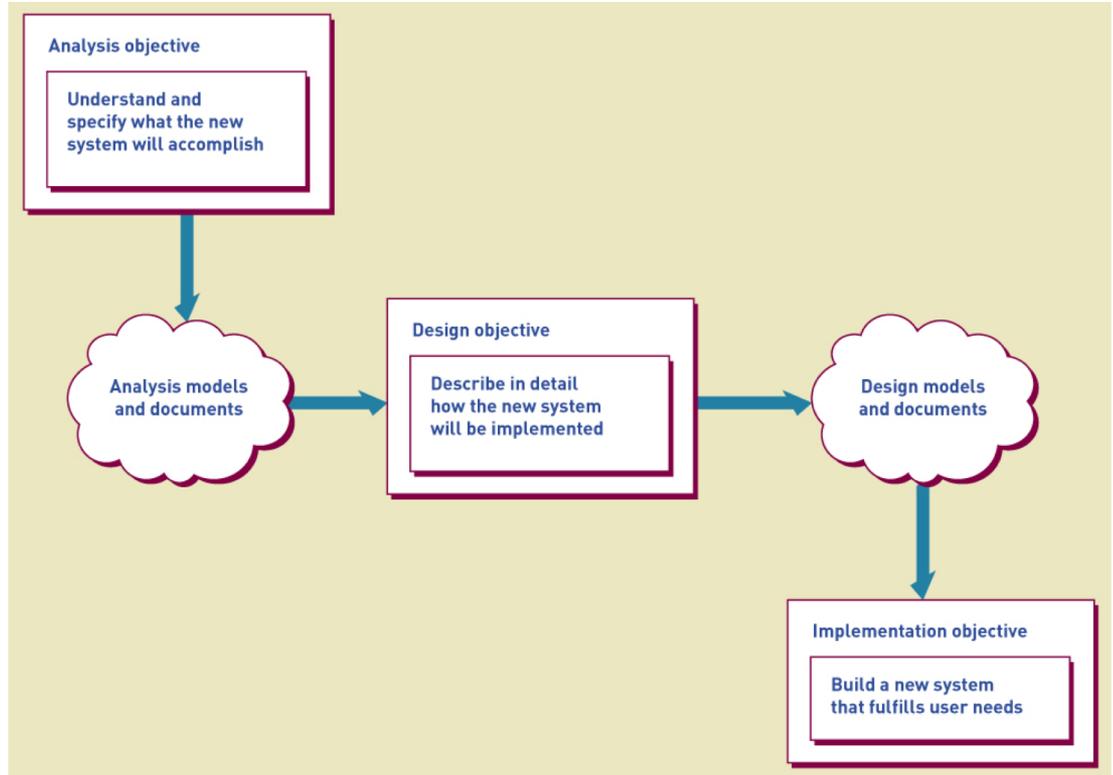
- **Systems Analysis:** System development activities that enable a person to *understand* and specify **what** the new system should accomplish.
- **Systems Design:** System development activities that enable a person to describe in detail **how** the resulting information system will actually be *implemented*.





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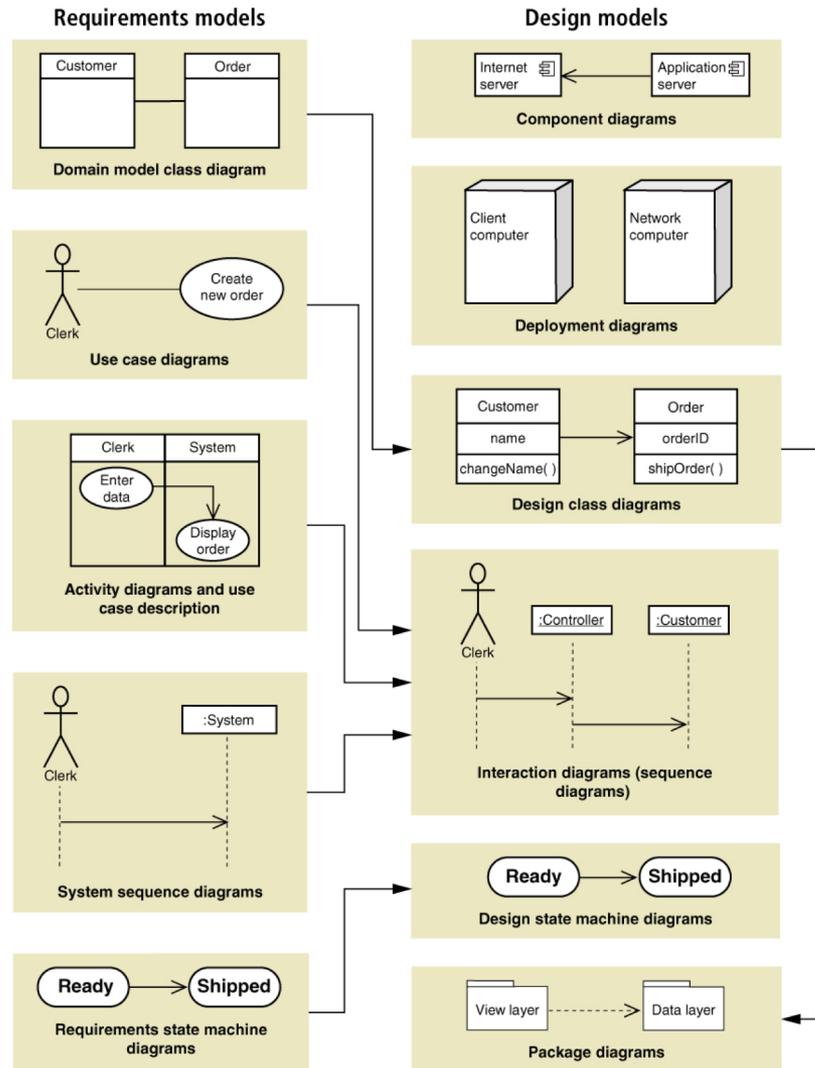


Design Models

- Design begins with documents and models created during analysis activities.
 - Analysis and design may occur concurrently (e.g., in iterative projects).
- During analysis, requirements models are built to represent the real world and to understand business processes and the information used in those processes.
- Designers convert requirements models into models that represent the solution system.
- The formality of a project also affects how much design details are modeled.



Analysis Models to Design Models





Design Activities and Iterations

Design activities

- Describe the environment.
- Design the application components.
- Design user interface.
- Design the database.
- Design the software classes and methods.

Core processes	Iterations					
	1	2	3	4	5	6
Identify the problem and obtain approval.	[Activity occurs in iteration 1]					
Plan and monitor the project.	[Activity occurs in iterations 1-6]					
Discover and understand details.	[Activity occurs in iterations 1-6]					
Design system components.	[Activity occurs in iterations 1-6]					
Build, test, and integrate system components.	[Activity occurs in iterations 1-6]					
Complete system tests and deploy the solution.	[Activity occurs in iterations 1-6]					



Key Design Questions for each Activity

Design activity	Key question
Describe the environment	How will this system interact with other systems and with the organization's existing technologies?
Design the application components	What are the key parts of the information system and how will they interact when the system is deployed?
Design the user interface	How will users interact with the information system?
Design the database	How will data be captured, structured, and stored for later use by the information system?
Design the software classes and methods	What internal structure for each application component will ensure efficient construction, rapid deployment, and reliable operation?



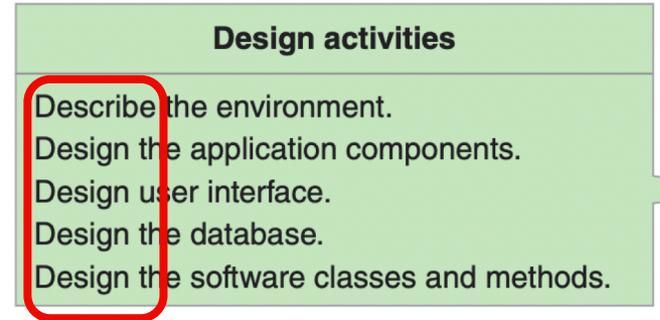
Describe the Environment

- *Two key elements* in the environment
 - Communications with External Systems
 - Message formats
 - Web and networks
 - Communication protocols
 - Security methods
 - Error detection and recovery
 - Conforming to an existing **Technology Architecture**
 - i.e., the set of computing hardware, network hardware and topology, and system software employed by an organization.



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Design the Application Components

- **Application component** is *a well defined unit of software that performs some function(s)*.
- Issues involve how to package components including
 - Scope and size – what are the functions, boundaries, interfaces?
 - Programming language – what are the accepted languages?
 - Build or buy – is an acceptable version available to purchase?

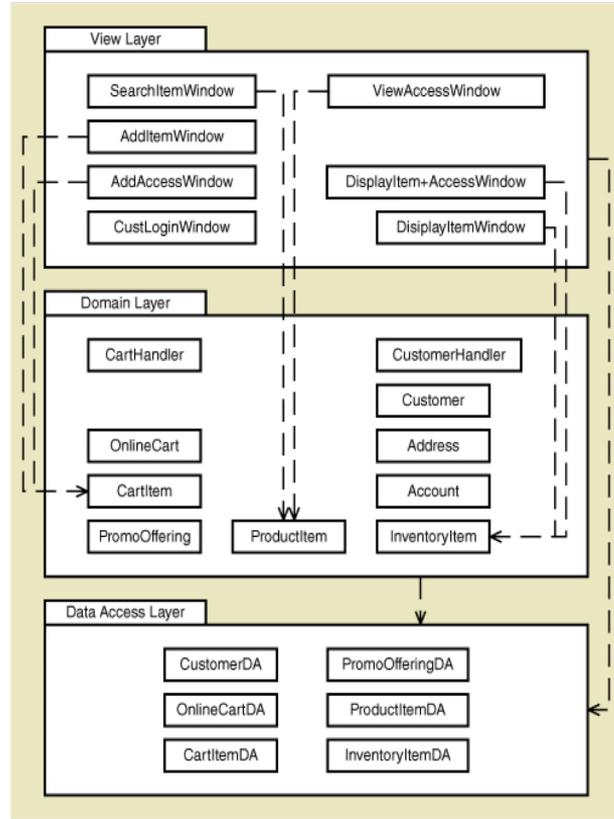


Design the Application Components

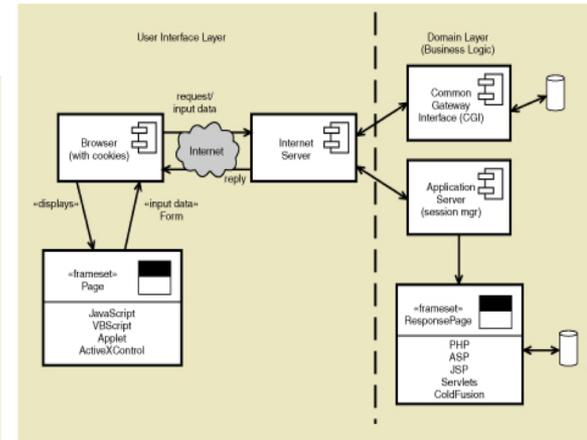
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 - Build or buy – is an acceptable version available to purchase?
- Key decisions:
 - how functions of the system will be grouped or packaged
 - how they'll interact with one another once built (or acquired) and assembled
- Impact of technology architecture
- Followed by the software class design



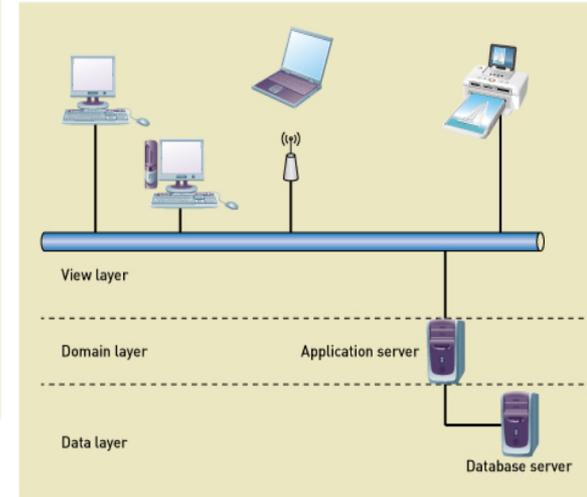
Typical models for defining application components



Package diagram



Component diagram



Deployment diagram



Design the User Interface

- Importance of user interface design: *To the user, the UI is the system.*
- The user interface has large impact of user productivity
- Includes both Analysis and Design tasks
 - Requires heavy user involvement
- Current needs require multiple user interfaces
 - Many different devices and environments

1 Ridgeline Mountain Outfitters
Browse Share Cart Orders Account
View Empty Check out

2 Ridgeline Mountain Outfitters
You need to log in. Please enter your email address or account number.
nwells22@gmail.com

3 Ridgeline Mountain Outfitters
Browse Share Cart Orders Account
Please confirm account information
Nancy Wells
1122 Silicon Avenue
Alamogordo, NM 87989
That's me That's not me

4 Ridgeline Mountain Outfitters
Browse Share Cart Orders Account
Order summary
Qty SKU Description Price Status
1 10967335 Toddler parka red 44.95 in-stock
1 94462 Ladies parka blue 72.95 in-stock
All items will ship today. Please choose ship. method
 Free - UPS ground (3-5 days)
 \$35.00 - UPS next day
 \$20.00 - UPS two days
 \$11.70 - USPS parcel post (5-7 days)

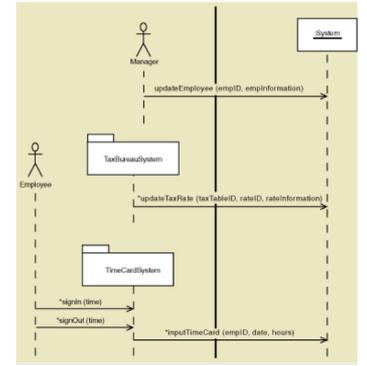
5 Ridgeline Mountain Outfitters
Browse Share Cart Orders Account
Please confirm shipping address
Nancy Wells
1122 Silicon Avenue
Alamogordo, NM 87989
OK Use another address

6 Ridgeline Mountain Outfitters
Browse Share Cart Orders Account
Please enter shipping address
Name John Wells
Appt Street 1612 Jefferson Street NE
City Albuquerque
State New Mexico
Zip Code 87123
OK Cancel

7 Ridgeline Mountain Outfitters
Browse Share Cart Orders Account
Order summary
Qty SKU Description Price Ext
1 10967335 Toddler parka red 44.95 44.95
1 94462 Ladies parka blue 72.95 72.95
Subtotal 117.90
Shipping 0.00
Please confirm payment
Nancy Wells
Sales Tax 7.66
Visa xxxx-xxxx-xxxx-0899
Exp. 02/17 Total \$125.56
OK Another method

8 Ridgeline Mountain Outfitters
Browse Share Cart Orders Account
Your payment has been approved. Your Visa credit card (xxxx-xxxx-xxxx-0899) has been charged for \$125.56.
Your order number is 6773823.
The order will be shipped today for delivery in 3-5 days.
Thank you shopping with RMO!

Storyboard



System sequence diagram

Home Stores Log In Cart

Search

- Shop for Clothing
 - Women's Apparel >
 - Men's Apparel >
 - Kids' Apparel >
 - Footwear >
 - Accessories >
 - Sale & Clearance >
- Shop for Gear
- Wish List
- My Account

Small screen menu prototype



Design the Database

- By definition, an Information System requires data – usually in a database
- Current technology frequently use Relational Database Management Systems (RDBMS)
- Converts the data model (i.e. domain model class diagram) to a relational database
- Requires addressing of many other technical issues
 - Throughput and response time
 - Security

The screenshot shows the phpMyAdmin interface. On the left, the 'Database' dropdown is set to 'RMO (1)' and the 'InventoryItem' table is selected. The main area displays the table structure for 'InventoryItem' with the following columns:

	Field	Type	Collation	Attributes	Null	Default	Extra
<input type="checkbox"/>	productItem	varchar(15)	latin1_swedish_ci		No	None	
<input type="checkbox"/>	inventoryItem	mediumint(9)			No	None	
<input type="checkbox"/>	size	varchar(8)	latin1_swedish_ci		No	None	
<input type="checkbox"/>	color	varchar(10)	latin1_swedish_ci		No	None	
<input type="checkbox"/>	options	varchar(12)	latin1_swedish_ci		No	None	
<input type="checkbox"/>	quantityOnHand	mediumint(9)			No	None	
<input type="checkbox"/>	averageCost	decimal(8,2)			No	None	
<input type="checkbox"/>	reorderQuantity	mediumint(9)			No	None	
<input type="checkbox"/>	dateLastOrder	date			No	None	
<input type="checkbox"/>	dateLastShipment	date			No	None	



Design Software Classes and Methods

- Extends the analysis models to incorporate software-specific elements
- Resulted models:
 - Design Class Diagram
 - Sequence Diagrams
 - State-Machine Diagrams

