Object Reloaded

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- Introduction: What's the big deal?
- The basic OO principle
- Encapsulation
- Inheritance
- Again, what's the good of it?
- Structured Development
- Object-orientation: A Consistent Model
- Rapid Application Development
- A Simplified Practical Process

📖 ▸ Introduction: What's the big deal?

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Or better, the "Object-oriented" way:

- say to your friend "Please pass me the salt", and she would do so.

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Remember the single most important principle of object-orientation: *Objects are responsible for their own actions.* And it is called "***Encapsulation***"

▸ Encapsulation

Procedural thinking is based on performing actions on data
Object-orientation is based on the data (objects) performing actions on themselves

- Model Real-World Objects
- Isolate Knowledge
- Protect System from Change
- Use Behavior from Other Objects

📖 ▶ Encapsulation ▶ Model Real-World Objects

- we're describing objects in the real world more closely, you don't have to give detailed instructions to a friend to pass you the salt (because she knows how to do it).

- Structured analysis also models the real world. The difference is that these methods focus on *data flow*, while object-oriented techniques focus on *objects*.

- The advantage of modeling objects in the real world is that you reduce the amount of work you have to do when your requirements change

- Why?

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- Why? Because, as a rule, objects in the real world don't change (and even when they do, they don't change *much*)

📖 ▶ Encapsulation ▶ Isolate Knowledge

The knowledge of how a service is performed by an object is kept with the object itself.

- Your obliging friend picks up the salt and passes it to you.

- Another friend might have chosen to slide it across the table.

- Another might have picked it up, stood up, walked around the table and handed it to you.

- Yet another might have checked the salt shaker, found it empty, stood up, walked to the cupboard, refilled the shaker, and then passed it to you.

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The point is that if your objective was to get the salt from your friend, you don't care exactly how your friend gets it for you.

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- Look how much detailed knowledge about salt-passing you're using to make your request.
- You're not only making a request, you're also insisting that it be carried out in a specific way.
- If your friend later comes up with a different way of passing the salt (e.g. balancing it on two toothpicks), then you (and everybody else) will have to change the way you make your request.
- If, on the other hand, you leave it up to her to decide how to pass the salt, if she comes up with a new, more effective, more efficient, faster, cheaper, funnier, or more creative method, you still get your salt.

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Customer requirements change all the time, and your product needs to change with them.

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- Or it could be that somebody from the other side of the table reaches over and hands it to you.
- Or perhaps your well-trained Labrador retriever jumps up, grabs the salt shaker in its mouth, and brings it to you.
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In OO jargon, Bank Customer *inherits* the properties of Customer (or *is derived from* Customer).

- It allows us to capture the similarities and the differences between classes of objects.
- It can increase reusability greatly.

📖 ▸ Again, what's the good of it?

Object-oriented techniques can help software/product development in quite a few areas:

- Modeling of real-world objects makes it easier to describe and communicate behavior.
- Encapsulation of knowledge means that behavior can be isolated. This in turn means that changes in requirements can be accommodated without affecting the entire system.
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These are all good things , but none of these is the most significant impact of object-orientation on the design and development process.

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- Start with a structured analysis.
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- Write procedural programs.

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The crux of the problem is using different techniques for analysis, design and implementation. It's very difficult to accommodate requirements changes late in the development process, because it's just so difficult to work out what parts of the program code are affected by a change in the requirements.

▶ Object-orientation: A Consistent Model

Object-oriented computing allows us to use the same model throughout the entire software development process.

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- Convert this into an object-oriented design.

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As you can see, an object-oriented approach is used each step of the way. In fact, the same object-oriented model that was developed right at the start is used in the program code.

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Yes, there are differences here and there to do with particular implementation details (just as an architect doesn't worry about how the bricklayers mix the cement), but the two models are essentially the same.

► Rapid Application Development

- Requirements gathering
- Analysis
- Design
- Development
- Deployment

► Rapid Application Development ► Requirements gathering

- ♡**Discover Bussines Processes: Activity diagram(s).**

- ♡**Perform Domain Analysis: High-level class diagram and a set of meeting notes.**

- Identify Cooperating Systems: Deployment diagram.

- Discover System Requirements: Package diagram.

- ♡**Present Results to Client**

📖 ▸ Rapid Application Development ▸ Analysis

- ♡Understand System Usage: Use case diagram(s).

- ♡Refine the Class Diagrams: Refined class diagram.

- ♡Analyze Changes of State in Objects: State diagram.

- ♡Define the Interactions Among Objects: Sequence and collaboration diagrams.

- Analyze Integration with Cooperating Systems: Detailed deployment diagram and if necessary data models.

📖 ▶ Rapid Application Development ▶ Design

Design and Analysis should go back and forth until the design is complete.

- ♡**Develop and Refine Object Diagrams: Activity diagrams.**

- Develop Component Diagrams: Component diagrams.

- Plan for Deployment: Part of the deployment diagram developed earlier.

- ♡**Design and Prototype User Interface: Screen shots of the screen prototypes.**

- Design Tests: Test scripts.

- Begin Documentation: Document structure.

⌨ ▶ Rapid Application Development ▶ Development

- Construct Code: The code.

- Test Code: Test results.

- Construct User Interfaces, Connect to Code and Test: Functioning system, complete with user interfaces.

- Complete Documentation: System documentation.

📖 ► Rapid Application Development ► Deployment

- Plan for Backup and Recovery: The crash recovery plan.

- Install the Finished System on Appropriate Hardware: Fully deployed system.

- Test the Installed System: Test results.

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- Plan for Backup and Recovery: The crash recovery plan.
- Install the Finished System on Appropriate Hardware: Fully deployed system.
- Test the Installed System: Test results.
- ♡**Celebrate!**

📖 ▸ A Simplified Practical Process

- Requirements gathering: Discover Business Processes
- Analysis: Identify objects/attributes/behaviors
- Analysis: Find out classes and their relations
- Analysis: Refine classes and their relations
- Analysis: Dynamic behavior of classes
- Design

► A Simplified Practical Process ► Requirements gathering: Discover Business Processes
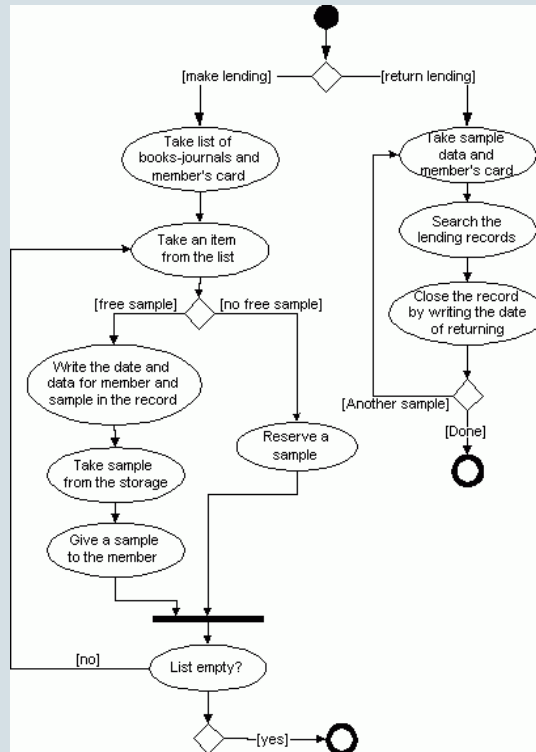
📖 ► A Simplified Practical Process ► **Analysis: Identify objects/attributes/behaviors**

Work on the nouns:

corridor, data record, storage folder, local network, computer server, computer terminal, paper book, paper journal, electronic book, electronic journal, item, date, limit of time, limit of copies, book, journal, sample, author, paper card, library, database, ISBN, title, publishing year, genre, publishing house, volume, area, reservation, employee, lending, lending area, lender, user, member, lending record, report, number of samples, DataEntry clerk, DatabaseSpecialist, reception place, name, lastname, address, place of living, PersonalRegistrationNumber, telephone, e-mail, date of birth, member's card, library's documentation, multimedia data, information, text, audio, video, picture, signature

and verbs in the requirements:

- go, search, lend, take, sort, print, put, do, has, have, convert, write, manage, access, read, preview, take a sample, reserve, give, inform, make, set free, check the data, recommend, post, buy, operate, maintain, conclude, browse, input

Understand System Usage: Use case diagram(s).

▶ A Simplified Practical Process ▶ Analysis: Find out classes and their relations
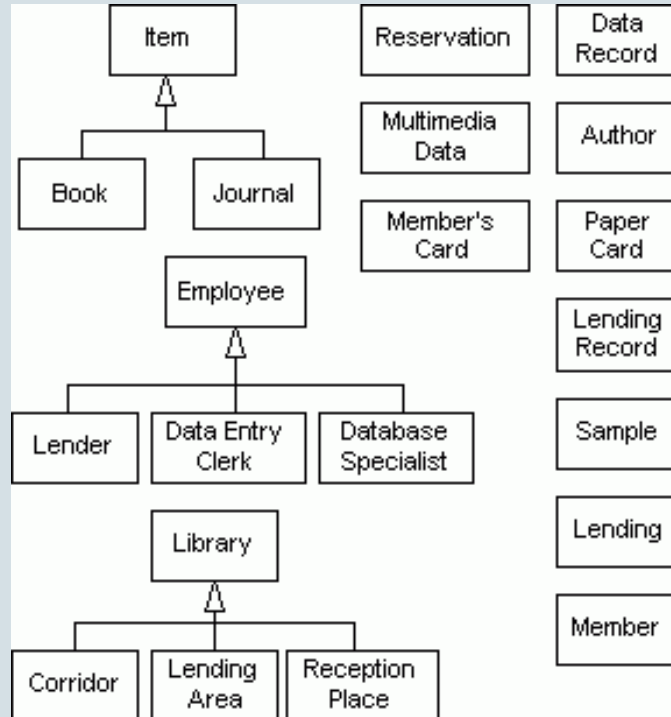
▸ A Simplified Practical Process ▸ Analysis: Refine classes and their relations

Class, Responsibilities, and Collaboration (CRC) Cards:

Class Name:	
Superclasses:	
Subclasses:	
Responsibilities:	Collaborators

▸ A Simplified Practical Process ▸ Analysis: Dynamic behavior of classes

- ♡Refine the Class Diagrams: Refined class diagram.

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▶ A Simplified Practical Process ▶ Design

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Iterate analysis and design.