

CAT 1

Introduction to Software Engineering and Object Orientation

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Self-Responsibility Declaration

I understand that plagiarism, the use of AI or other generated content will imply that the delivered work will not be reviewed and it will be automatically assigned a grade of D. I certify that I have completed the CAT1 individually and only with the help that the professors of this subject considered appropriate, according to the FAQs about plagiarism.

Module 1 Questions

Question 1

1. Model the main classes of the system following the defined architecture.
 - The role is *architect* and the activity is *Modeling* because the architect is the one in charge of defining the outline of a system, which includes the main classes of the system.
2. Refine and validate the identified requirements, from the system domain's perspective.
 - The role is *Functional Analyst* and the activity is *Requirements identification and management* because he is responsible for unifying the different views of the domain in a single model that is clear, concise, and consistent.
3. Plan and estimate project tasks.
 - The role is *Project Manager* and the activity is *Project Management* because he is the one who has to organize the project to make sure every aspect of it goes as planned.
4. Develop the application code from the documents made by analysts.
 - The role is *Programmer* and the activity is *Construction and testing* because a programmer must write the code for the application, following the designs appointed by analysts.
5. Compile and package the code of the new version of the application and distribute it to the corresponding servers.
 - The role is *Deployment Manager* and the activity is *Maintenance and Re-engagning* because he is in charge of packaging a new version of a software coded by programmers into a server.

Question 2

Project 1

A fashion company director has requested a redesign of their online clothing and accessories sales website to attract younger customers. The marketing team believes that by redesigning, they can attract young people back to the website but hasn't found a clear way to do so. The work will involve several different proposals, progressively made available to users, and based on their effectiveness with the target audience, they will be maintained, modified, or permanently removed.

- Type of project: **Group 2**. The objective is clear (attract younger customers by redesigning the website), but the solution isn't well-known as it involves several proposals and depends on user feedback.
- Development Method: **Iterative and Incremental Life Cycle method**. This method allows for progressive development and testing of different proposals and is flexible and adaptable to changes, which is crucial for this project, as it involves a lot of experimentation and user feedback.

Project 2

A banking entity is considering modernizing its bank transfer system from a Mainframe-based system to a more current Unix-based system. This critical process cannot tolerate failures, so the entity will hire experts, both functional and technical, to replicate the existing functionalities on the new platform, which must be available in their entirety from the first version.

- Type of project: **Group 1**. The objective is clear (modernize the bank transfer system), and the solution is also well-known (replicating the existing functionalities on a new Unix-based platform).
- Development Method: **The Classic or Waterfall Life Cycle method**. This method suits best projects in which the requirements and solutions are well-defined, and allows for a systematic and sequential approach (which is crucial for a project of this nature where no failures can be tolerated).

Project 3

The legal department of a multinational corporation aims to reduce paper usage for ecological reasons, which would also save physical storage space and time. This pilot project will evaluate market solutions, analyze how other companies have implemented them, and study the extent to which the solution can be adopted by the company. This exploration may lead to identifying new approaches, such as avoiding physical document generation and digital information storage and indexing.

- Type of project: **Group 4**. Neither the objective nor the solution are very clear, since it involves evaluating market solutions and studying how other companies have implemented them.
- Development Method: **Lean and Agile Development**. It is flexible and allows for continuous learning and adaptation, and encourages experimentation and feedback.

Question 3

My proposal for a **Group 3** project would be the following:

Implementation of a new algorithm to suggest news articles in a popular News App

In this case, the solution is known (the creation of a new algorithm) but the objective is not very clear.

The News Feed is a critical part of the app's user experience, and the company is constantly working on ways to improve its algorithm. However, defining what constitutes an "improved" News Feed is not straightforward:

- Is it one that maximizes user engagement?
- Is it one that promotes high-quality content?
- Is it one that helps users discover new interests?

The objective is not at all obvious and may shift over time based on user feedback, changes in the digital media landscape, and the News Company's own strategic goals.

In this project, the App would need to engage in a process of discovery and iteration to clarify its own objectives, which may involve conducting user research to understand what people value in their News Feed, analyzing data on how changes to the algorithm impact user behavior, and refining the algorithm based on these insights.

The justification for this project is that even though the objective is not very clear at the outset, improving the News Feed is crucial for maintaining user engagement and satisfaction. By continually refining its algorithms, the News Broadcast App can ensure that its platform remains relevant and valuable to its users.

Module 2 Questions

Question 4

Appliance Abstract Class

- **Subclassess:** HomeAppliance, OfficeAppliance
- **Association:** an appliance is supplied by one and only one Supplier and a Supplier supplies one or more Appliances.
- **Attributes:**
 - Appliance: serialNumber
 - HomeAppliance: powerConsumption
 - OfficeAppliance: networkCapability (e.g., WiFi, Ethernet, etc.)
- **Instances:**
 - Appliance: {serialNumber: “A123B456”}
 - HomeAppliance: {serialNumber: “C789D012”, powerConsumption: “800W”}
 - OfficeAppliance: {serialNumber: “E345F678”, networkCapability: “WiFi, Ethernet”}

Store Class

- **Subclassess:** BookStore, ClothingStore
- **Association:** a store employs one or more Employees and an Employee works at one and only one Store.
- **Attributes:**
 - Store: storeName
 - BookStore: genreSpecialty
 - ClothingStore: clothingType (e.g., Men’s, Women’s, Children’s, etc.)
- **Instances:**
 - Store: {storeName: “General Store”}
 - BookStore: {storeName: “Mystery Books”, genreSpecialty: “Mystery”}
 - ClothingStore: {storeName: “Fashion Forward”, clothingType: “Women’s”}

Question 5

1. `size` should be protected. This will allow it to be accessible from instances of its subclasses `HouseForSale` and `HouseForRent`, but not from instances of the class `Owner`.
2. `cadastralReference` should be private. This will make it accessible only by the `House` class itself, and not visible to instances of `HouseForSale` or `HouseForRent`.
3. `name` should be public if we want instances of the classes `House`, `HouseForRent`, `HouseForSale`, and `Owner` to have access to this attribute.
4. An owner can own multiple houses, and a house can have one owner. Thus, the multiplicity would be 1 (Owner) to many (Houses). This is not a polymorphic association because it doesn't involve subclasses or superclass.
5. a) **Association.** A city can contain multiple houses, and a house is located in one city. This is not inheritance because a house is not a type of city, they are distinct entities that are related.
6. b) **Inheritance.** A `MajorHolder` is a specific type of `Owner` (one who owns more than a certain number of homes), so it makes sense for `MajorHolder` to inherit from `Owner`.

Question 6. Online Bookstore App

Classes

- `HealthcareStaff` (Abstract Class)
 - Attributes: Name, Surname, ID, Date of Birth, Phone Numbers (can have multiple)
- `Nurse` (Concrete Class, Subclass of `HealthcareStaff`)
 - Attributes: Years of Experience, Supervisor (may or may not have)
- `Doctor` (Concrete Class, Subclass of `HealthcareStaff`)
 - Attributes: Resident Status, Specialties (at least one)
- `Specialty` (Concrete Class)
 - Attributes: Name, Involvement in On-call Duties
- `HealthCenter` (Concrete Class)
 - Attributes: Name, Address, Floor Number (may or may not have)

Associations

- Supervision: Links each `Nurse` to none or one other `Nurse` as a supervisor and each `Nurse` can supervise multiple other `Nurses`. This is not a polymorphic association as it only involves the `Nurse` class.
- Specialization: Connects each `Doctor` to at least one `Specialty` and each `Specialty` can be linked to multiple `Doctors`. This is not a polymorphic association as it only involves the `Doctor` and `Specialty` classes.
- Assignment: Binds each `HealthcareStaff` to exactly one `HealthCenter` and each `HealthCenter` can have multiple `HealthcareStaff` members assigned to it. This is a polymorphic association as it involves the abstract class `HealthcareStaff` and its subclasses `Doctor` and `Nurse`.

i Note**Assumptions**

- A nurse cannot supervise him/herself.
- A doctor can specialize in multiple areas.
- Each healthcare staff member is assigned to only one health center.
- Each health center must have at least one healthcare staff member.
- The phone numbers for healthcare staff are unique to each individual, hence they can have multiple.
- The floor number for a health center is optional because not all health centers may have multiple floors.