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## Object-oriented analysis and design models worksheet answers sheet

"Providing access to an object only through its messages, while keeping the details private is called encapsulation" (2). Messages define the interface to the object. Object Oriented Analysis and Design: What is it? Classes An object is defined via its class which determines everything about an object. 2i. www.aw.com/cseng/titles/0-201-89542-0/techniques, Techniques for OO Analysis and Design. Ambler, Scott, Take an Object-Oriented Approach to Analysis, Computing Canada, July 21, 2000. Pei, Daniel, Object Oriented Analysis and Design, Information Systems Management, Winter 95, Vol 12 Issue 1, p54. These languages are: C++, SmallTalk, and JAVA. Arguments are supplied as part of a message. Gora, Michael, Object-Oriented Analysis and Design, DBMS, May, 1996. An object state diagram shows all the possible states of an object and the allowed transition between the states (8). Object-oriented decomposition provides a method to decompose a complex arrangement by the primary objects apparent in the system (4i). Top What is OO Computing Tools and Approaches Used in OOA OOA vs. 3828.0805353402.00.html , Object Oriented Analysis and Design with Applications. In the 1980s, planning and modeling of data began to play a more important role in development, resulting in data-oriented methodologies such as information engineering. "For example, the "fetch" message might contain an argument that says what to fetch or the "roll-over" message could contain one argument to say how fast, and a second argument to say how many times" (2i). Researchers in the object-oriented community assert that the OOA approach has many advantages in meeting the requirements of OOP (9). www.well.com/user/ritchie/oo.html. The Object Oriented Page. More than one object can be created for a class. Identifying objects and classes. Naduri, Sastry, Requirements Validation Via Automated Natural Language Parsing, Journal of Management Information Systems, Winter 95/96, Vol. Structured systems development began in the 1960s with the concept of systems development life cycle. The object-oriented way is to say "Pass the salt," and leave it up to the object to carry out the request any way it chooses. OOD results in a design having several different levels of modularity i.e., the major system components are partitioned into subsystems (a system level "modular"), and data their manipulation operations are encapsulated into objects (a modular form that is the building block of an OO system).In addition, OOD must specify some data organization of attributes and a procedural description of each operation.Shows a design pyramid for object oriented systems. Or it might make more sense to define a common class called Canis, of which both Dog and Wolf are subclasses" (2i). Object diagrams are used to model the interactions between objects, whereas object state diagrams model the dynamic behavior within a single object. Tools are only the means by which developers communicate requirements or the design of the system. Large and small-scale applications relied heavily on testing and debugging to meet the required specifications" (2). Developers who are currently using structured analysis techniques usually discover that their experience in modeling requirements using data flow diagrams is irrelevant or worthwhile only in the context of modeling existing procedures. 9i. This layer also represents each object. The Message Layer- it represents the design details that enable each object to communicate with its partners. "The so-called structured revolution was based on computer program structures, with separate program steps (processes) and data" (8). Identifying the object relationships. Information engineering is closer to OOA because it provides a variety of tools for modeling of entities (namely, entity-relationship diagramming). 2. What is Object Oriented Computing? It establishes internal and external interfaces for the system.The Responsibilities Layer- it represents the data structure and algorithmic design for all the attributes and operations for each object.The Object Oriented design pyramid specifically emphasizes specific product or system design.Note, however, that another design layer exists, which forms the base on which the pyramid rests. The action that a message carries out is called a method. How they actually apply these tools for OOA and OOD is also important (7i). "Once the objects are defined and the system functionality is assigned, major components of the software system are developed independently. OOA differs the most from Structured analysis. The attributes and services of each class are then identified and documented in class templates. 11i. Top OOA vs. Why is it used? Encapsulation An object is a "black box" which receives and sends messages. There are three main tools used in object-oriented analysis and design techniques (8): Class diagrams/templates. 3i. On the other hand, instead of saying just "Please pass me the salt," you could try, "Please remove your right hand from your wine glass, move it to the left until it contacts the salt shaker, grasp it, lift it from the table, move it in a natural arc in my direction, stop when it contacts my hand, wait until my hand has closed around it, and then release it." This would probably word as well, though it might also result in a quiet phone call from your friend to the local mental asylum. 3. 8i. 10. Websites used as References: 1i. www.eiffel.com/products/bon.html. The BON Analysis and Design Method. Traditional Methods Before the introduction of Object Oriented Analysis and Design, most Information Systems professionals were taught that the classical waterfall development life cycle was the proper way to approach software engineering and that "top level decomposition of processes was a practical way of handling large software development projects" (8). The object to which a message is sent is called the receiver of the message. www.is.cs.utwente.nl:8080/dmrg/OODOC/oodoc/oo.html. Object Oriented Analysis and Design Methods. "Although the data-oriented methodologies made better use of the powerful database models that were evolving, when it came to design, data methodologies still relied on process decomposition and simply mapped processes to data" (8). Davidson, Barry, An Expert System for Design and Analysis of Composite Structures, IIE Transactions, April, 1999. There are two key concepts in object-oriented computing: encapsulation and inheritance. Rossion, Mary Beth, Integrating Development of Task and Object Models, Communications of the ACM, January, 1999. This example illustrates the difference between procedural and object-oriented computing. Everything an object can do is represented by its message interface. Here are a few that might be useful for further study: Object Oriented Analysis and Design Methods: www.is.cs.utwente.nl:8080/dmrg/OODOC/oodoc/oo.html Techniques for OO Analysis and Design: www.aw.com/cseng/titles/0-201-89542-0/techniques Object Oriented System Development: DBMS Object Analysis and Design: www.dbmsmag.com/9606d15.html Object Oriented Analysis and Design with Applications: 3828.0805353402.00.html The Root System Homepage: Object Oriented Analysis: www.sei.cmu.edu/str/descriptions/ooanalysis.html The Object Oriented Page: www.well.com/user/ritchie/oo.html Use Cases in Object Oriented Analysis: www.efd.lth.se/~d87man/EXJOB/UseCases in OOA.html The BON Analysis and Design Method: www.eiffel.com/products/bon.html Bibliography: 1. Top What is OO Computing Tools and Approaches Used in OOA Conclusion Bibliography III. Finally, the class and object diagrams are completed along with all class templates (8). All object-oriented languages have some means to create object instances from a class definition. 6. 12 Issue 3, p9. OOA introduces new concepts to investigate a problem. Most new client/server application development tools emphasize object-oriented features. In object-oriented analysis, there are four key steps to be performed (6i): 1. Wang, Shouhong, Two MIS Analysis Methods: An Experimental Comparison, Journal of Education for Business, Jan/Feb96, Vol. Defining object life cycles. Each service that is provided by a class is defined including any logic that is necessary. Next, Object relationships are documented on object diagrams. Process decomposition can lead to unstable designs because the design is based on processes that often change as a result of new requirements, error corrections, new environments, or enhancements. Encapsulation is important because parts of software must sometimes be changed or re-used. Identifying services. 6i. Related Websites There are many websites containing further information about Object Oriented Analysis and Design. 10i. Object Oriented Design (OOD) fundamentally changed the way software designers and specification writers approached the problem of efficiently designing applications (2i). It is the code that gets executed when the message is sent to a particular object. Whiting, Rick, More Flexible Analysis, Informationweek, June 28, 1999. Structured design and information engineering do not support this. Quillin November 25, 2001 i. Object-oriented systems are designed to be changed. "Stepwise refinement works when all requirements must be determined before design can start, however, and object-oriented developer may be required to do some preliminary analysis, designing the class and object structure, building a preliminary prototype, testing it with the user, and going back to analysis or design without being constrained" (8). Object state diagrams. 7i Issue 3, p136. The Root System Homepage. This assumption has an inherent risk of carrying forward incorrect or incomplete analysis into design and construction (8). Cackowski, David, Object Analysis in Organizational Design: A solution for matrix organizations, Project Management Journal, September, 2000. "Information engineering violates this rule because operations may access numerous entities and are not subordinated to one entity" (8). Top-down structured design approaches development as a simple matter of algorithmic decomposition, where each module in a system denotes a major step in some overall process. Class diagrams are used to model key abstractions in the problem domain and their relationships with each other. www.efd.lth.se/~d87man/EXJOB/UseCases in OOA.html, Use Cases in Object Oriented Analysis. Object Oriented design is completely contrary to both structured methodologies and information engineering, by Michael J. 5. Fredrickson, Neil, Up-front Investment for OOAD Can Pay Off, Electronic Engineering Times, September, 1998. It is not necessary to start from scratch when writing a new program if the existing classes have similar behaviors to those needed in the new program. 12i. 5i. Tools and approaches involved in OO Analysis and OO Design Object-oriented decomposition is the concept upon which OOA and OOD are based. Defining service logic. Therefore, an object can be used without knowing exactly what is inside of it, and it becomes unnecessary to directly modify the object. However, developers still need to alter their views from modeling disembodied processes to encapsulated services (8). "Both structured design and information engineering use function-oriented decomposition rules, resulting in a structure of procedure-oriented program modules that contain programs, subroutines, and functions with only procedural code" (8). www.sei.cmu.edu/str/descriptions/ooanalysis.html, Object Oriented Analysis. 9. Traditional software development methodologies suggest developing software from scratch rather than reusing existing code -- which is not surprising because process decomposition results in the separation of processes from data, making transportation and reuse of code extremely difficult (8). You might say to your friend, "Please pass me the salt," and she would do so. "The old paradigm, Algorithmic Decomposition, offered a top-down methodical approach. "A primary rule of object-oriented programming is this: as the user of an object, you should never need to peek inside the box (or object)" (3i). This new class inherits all the existing messages, and therefore, all the behavior of the original class. It is based in a set of basic principles, which are as follows-The information domain is modeled.Behavior is represented.Function is described.Data, functional, and behavioral models are divided to uncover greater detail.Early models represent the essence of the problem, while later ones provide implementationdetails.The above notes principles form the foundation for the OOA approach.Object Oriented Design (OOD):An analysis model created using object oriented analysis is transformed by object oriented design into a design model that works as a plan for software creation. 11. Defining class relationships. OOD allows large-scale applications to be developed in independent modules. www.firststep.com.au/education/solid\_ground/oo.html, Object Oriented Computing -- What's the Big Deal? Object-oriented analysis strives to describe what the system should do in terms of key objects in the problem domain while object oriented design strives to describe how the system will work using these objects. Object-oriented systems development is in the forefront of this shift in thinking. "For example, you may create an object called Spot from class Dog. "Traditionally, code and data have been kept apart." In Object Oriented Programming, code and data are merged into a single indivisible thing -- an object. The Dog class defines what it is to be a Dog object, and all the "dog-related" messages a Dog object can act upon" (2i). Traditional Methods Conclusion Bibliography IV. Organizations continue to use traditional methods of software development, but they are coming to realize that these methods have shortcomings that include the following: The traditional waterfall approach to software development dictates the completion of the analysis phase before design and likewise the completion of all design steps before construction. It is having the following four layers.The Subsystem Layer :It represents the subsystem that enables software to achieve user requirements and implement technical frameworks that meet user needs.The Class and Object Layer :It represents the class hierarchies that enable the system to develop using generalization and specialization. Montlick, Terry, What is Object-Oriented Software? The procedural way is to specify each and every step of getting that shaker of salt into your hands. Inheritance If there is already a class which can respond to many different messages, it is possible to make a new, similar class which adds just a couple more messages without having to re-write the entire class by creating a subclass. The first step involves identifying candidate objects and classes, which may be people, places, things, organizations, concepts, or events. There are almost two dozen major object-oriented programming languages in use today, but there are only a few leading commercial languages. These traditional methods built the foundation of modern software practices, and yet this foundation is being shaken by object oriented analysis and design. 7. Processes must be disassembled, changed, then reassembled, frequently with uncertain outcomes (8). The parallel development and testing of individual modules requires strict adherence to the specification interface requirements" (2). Using the object-oriented approach, system analysts model information systems by identifying a set of objects, along with their attributes and operations that manipulate the object data (6). Elaborating on the above example, objects named Filo and Rover might also be created in class Dog. Those developers schooled in information engineering will find the road to object-oriented analysis much easier to follow. Object Oriented Analysis (OOA):Object Oriented Analysis (OOA) is the first technical activity performed as part of object oriented software engineering. Object diagrams. The first step involves analyzing life cycle of each object and formalizing the life cycle in an object state diagram. Because process decomposition is oriented to solving a specific business problem, the resulting answer (design) is unique, making it difficult to reuse a generic application (8). In a class, messages are defined that objects in the class understand. It focuses on the core layer the design of the domain object, which plays an important role in building the infrastructure for the Object Oriented system by providing support for human/computer interface activities, task management. The single most important principle of object oriented computing is that "objects are responsible for their own actions" (1i). Next, class relationships are defined in a class diagram. OOD, by contrast, decomposes using object-oriented rules, resulting in collections of services encapsulated within objects. Object-Oriented Analysis vs. The differences between OOA and information engineering lie in OOA's requirement for encapsulated operations. V. www.dbmsmag.com/9606d15.html, DBMS Object Analysis and Design. All communication is to be done via messages. Traditional Methods Conclusion Bibliography II. Conclusion Using Object Oriented Analysis and Design methods to develop real-time systems has the potential to produce safer, more reliable and maintainable code (4). Suppose you're at the dinner table, you would like some salt, and the salt shaker is inconveniently located at the other end of the table. If used properly, OOD improves the maintenance, reusability, and modifiability of the software. Inheritance also promotes reuse. The following is an example of how Object Oriented computing is a different way of looking at the world (1i). Again, using the above example, the Dog objects might understand messages such as Bark, Fetch, and Roll-over. Traditional Methods Conclusion Bibliography Therefore, developers schooled in either structured design or information engineering need a completely different set of skills and tools (4i). Johnson, Richard, An Industry Analysis of Developer beliefs about Object-Oriented Systems Development, Database for Advances in Information Systems, Winter, 1999. Unlike the traditional waterfall approach, the overall approach to object-oriented analysis and design is highly integrative. A black box contains code and data. The original class is called the superclass of the new class. 4. "Structured analysis maintains a process-oriented view of systems, providing a decomposition based on processes, whereas OOA decomposes the problem domain base on classification entities" (8). Objects are individual instances of a class. In contrast, object-oriented decomposition is based on objects and not algorithms. 8. The introduction of the object-oriented approach in the 1970s marked a radical change in the methodology and approach of large-scale application development. In the 1970s, process-oriented structured methodologies were developed to promote a more effective analysis and design technique (9i). Instead of using functional decomposition of the system, the OOA approach focuses on identifying objects and their activities (10). These shortcomings have prompted developers to examine different ways of thinking about approaches to systems development. Similarly, in object-oriented design, there are four key steps to be performed (6i): 1. 7i. Identifying the attributes. 4i. Object Oriented System Development. How Does it Work? Completing class definitions. "For example, after creating the class Dog, you might make a subclass called Wolf, which defines some wolf-specific messages, such as hunt.



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