Object - oriented system development

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Introduction

- Object-Oriented Programming(OOP) has bee the subject of several studies with some programming languages such as C++, Eiffel and Smaltalk.

- Also, OOP Approaches have recived some attention in office automation.

- More recently, serveral methods have appeared claiming to be 'object method'.

  ex) OOSA(Object Oriented System Analysis)

       OOA(Object Oriented Analysis)

       HOOD(Hierarchically Object Oriented Design)

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Introduction

- But, Object - Oriented System(OOS) Approch has received little attetion in studeies on system development methods.

- Also, Object - Oriented System(OOS)development methods are not in widespread.

Introduction

- So one question tha is not resolved is "What is the essential diffrence btween Object-Oriented Method and 'structured camp'?"

- If Object Oriented System development methods are to become accepted?

structured camp ex)
    SSADM(Structured System Analysis and Design Method)
    JSD(Jackson System Development)
    SA/SD(Structured Analysis/Structured Design)

Object Oriented Concept

OO Priciples

- OO development is claimed to improve software design for reliability and maintenance.

- Further claims are that the development process is made more efficient by reuse.

- The justification for these claims rests on three principles:

Abstraction   Encapsulation   Inheritance

Object Oriented Concept

Abstraction

- OO approaches are based on modelling structure and system in the real world.

Encapsulation

- Encapsulation is the concept that objects should hide their internal contents from other system components to improve maintainbility.

Object Oriented Concept

Inheritance

- Object should have generic properties and it support reusability by property inheritance from super-class to sub-class.

- This facilitates reuse of more general, higer level objects by specialization.

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Object Oriented Concept

Evaluation of modelling components

- **Entity instances**
  -The actual occurrence of one example of an entity type.

- **Entity type**
  -A type defined by a set of common properties to which all instances belong.

- **Entity class**
  -All possible entity for which a proposition holds, i.e, the set of instances for a particular entity type.
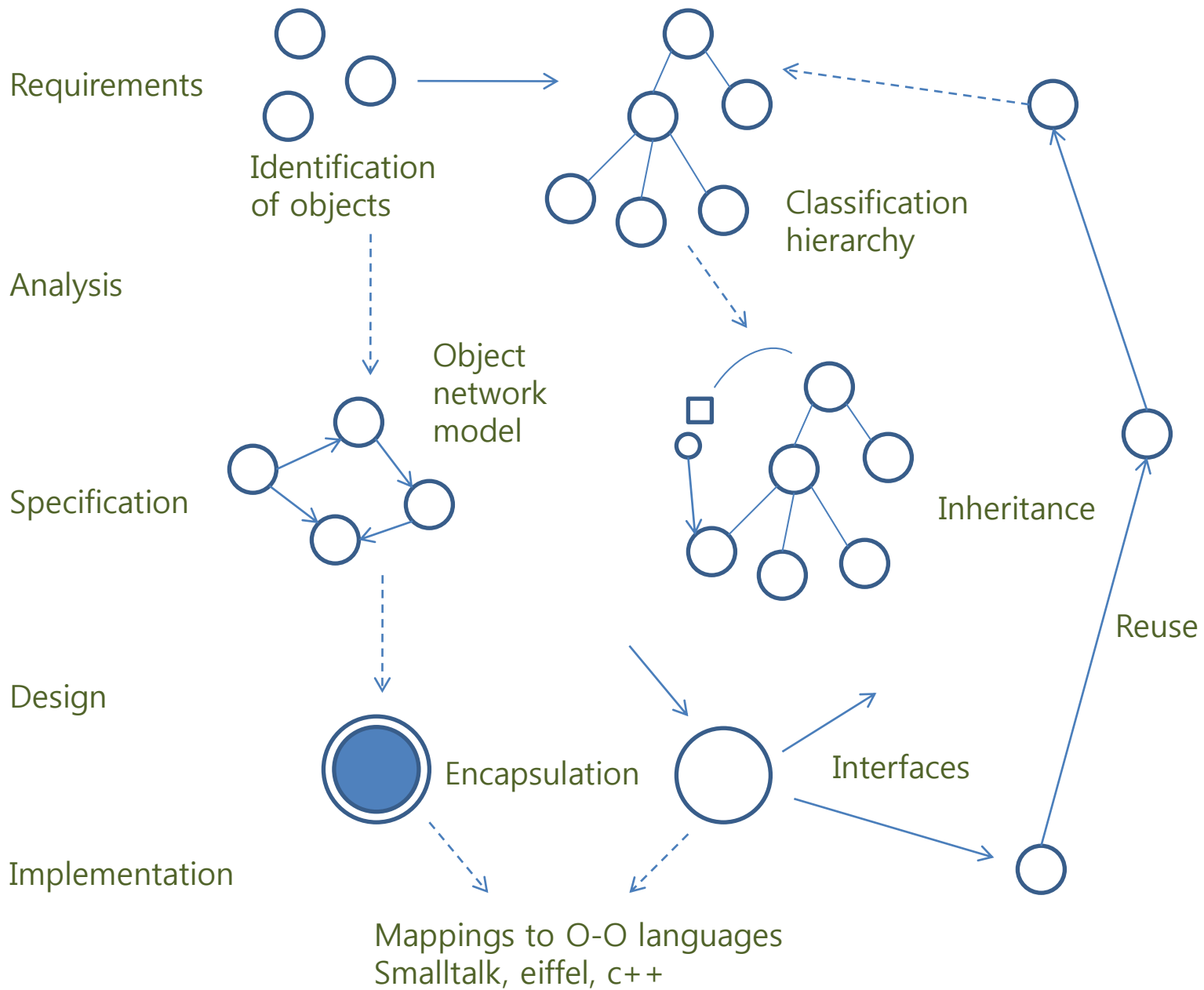
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Object Oriented Concept

Evaluation of modelling components

- Object are close with to entity concept.

- Object are a type with one or more instances of the type , essentially the same as the entity-type concept.

- Objects instances may be changed by events in the outside world or within the system and record a state resulting from change.

Evaluation Procedure

- Methods should advise practitioners how to proceed as well as giving them the tools with which to analyse and design systems.

- Four dimensions are used in the evaluation framework:

  Conceptual modelling
  Procedural guidance
  Transformations
  Design products

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Requirements

Identification
of objects

Classification
hierarchy

Analysis

Object
network
model

Specification

Inheritance

Design

Encapsulation   Interfaces

Reuse

Implementation

Mappings to O-O languages
Smalltalk, eiffel, c++

Evaluation Procedure

Conceptual modelling

-The method should contain a means of modelling
 applications.

-The model should meet OO criteria.

Procedural guidance

-A method should have clear steps telling the analyst
 how to conduct analysis, specification, and design.

Evaluation Procedure

Transformations

-Methods should give heuristics, rules and algorithms for
 changing specifications into designs.

-Ideally, these steps should be automatable.

Design products

-The results of specification and design should be clearly
  described, ideally delivering executable design as code.

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Table 1. Feature analysis of object-oriented methods

Method	Abstraction	Classification	Inheritance	Encapsulation	Coverage (R-A-S-D-I)
HOOD	Y	Y	Partial	Y	-----
OOSD	Y	Y	Y	Y	-----
OOSA	Y	Partial	-	-	-----
OOA	Y	Y	Y	-	-----
ObjectOry	Y	Y	Y	Partial	-----

Key: Y = Yes.
  R-A-S-D-I in coverage refers to Requirements Analysis. Analysis, Specification, Design, and Implementation. The measure of coverage is judged from the methods procedures and notations.

Object-Oriented Methods

- HOOD(Hierarchical Object Oriented Design)

- OOSD(Object – Oriented System Design)

- OOSA(Object-Oriented Systems Analysis)

- OOA(Object-Oriented Analysis)

- Object Ory
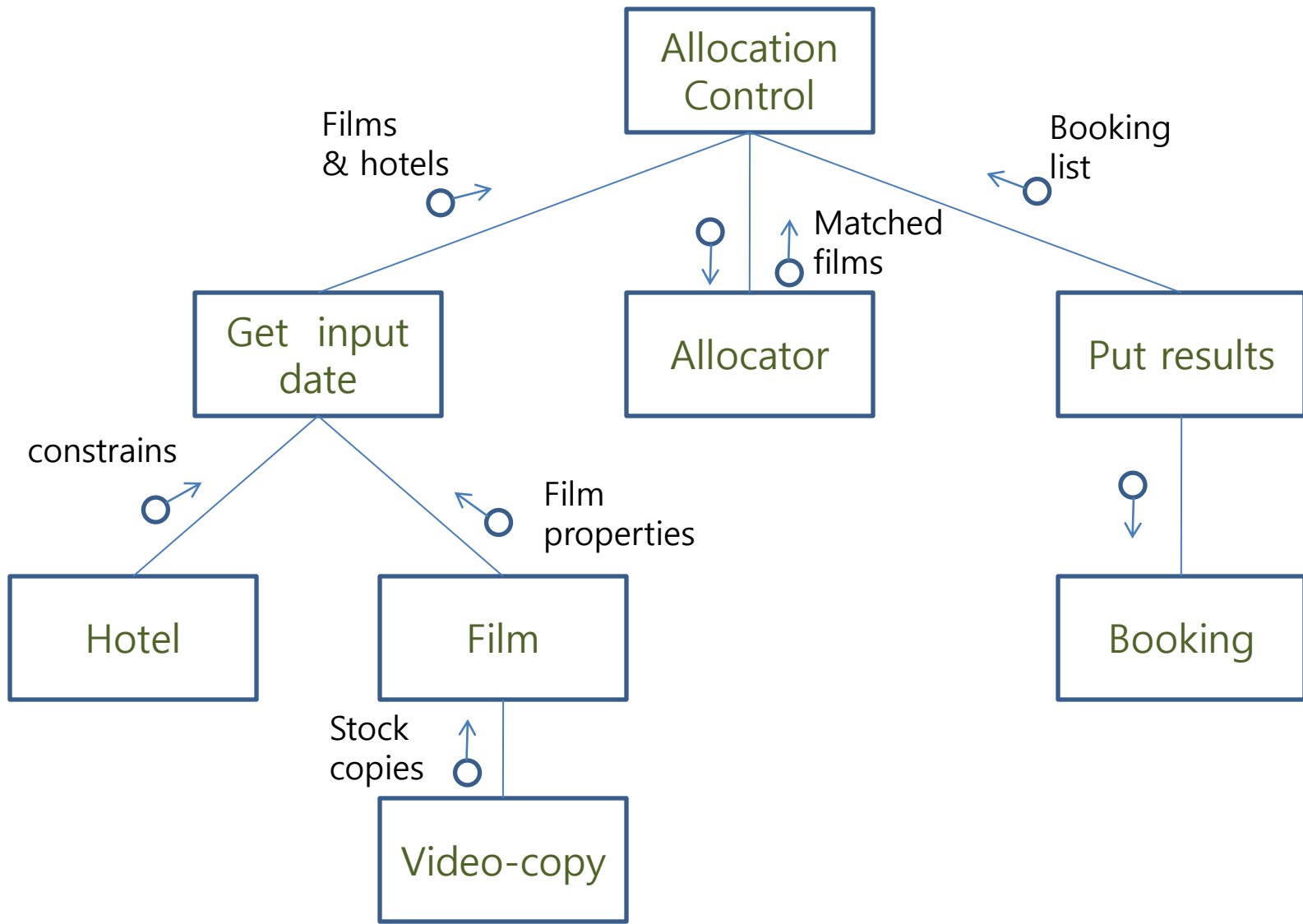
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Object-Oriented Methods

HOOD(Hierarchical Object Oriented Design)

- HOOD supports object classes, but inheritance specification is not detailed and reuse support is not explicit.

- The method is better developed in the design phase and gives explicit transformations into Ada.

- HOOD incorporates many OO properties, but it is a real-time design method.

Object-Oriented Methods

OOSD(Object – Oriented System Design)

- Detailed notation for object classes and management of inheritance. Inter-object communication is also specified in terms of event massage types.

- But, The notation can become overcrowded and difficult to read.

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Allocation Control

Films & hotels

Booking list

Matched films

Get input date

Allocator

Put results

constrains

Film properties

Hotel

Film

Booking

Stock copies

Video-copy

Design component (object or module)
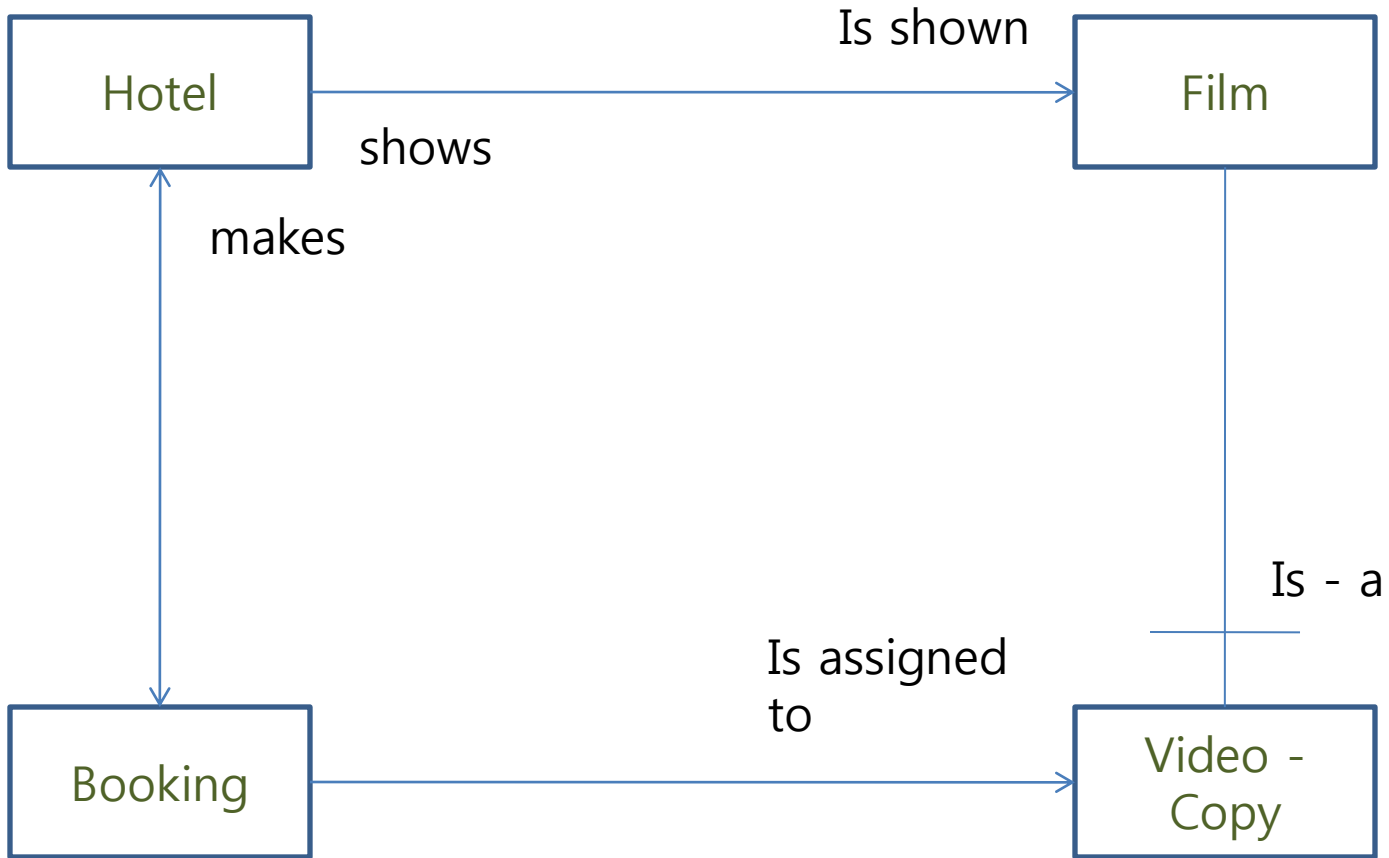
Stock copies

Dataflow message

Object-Oriented Methods
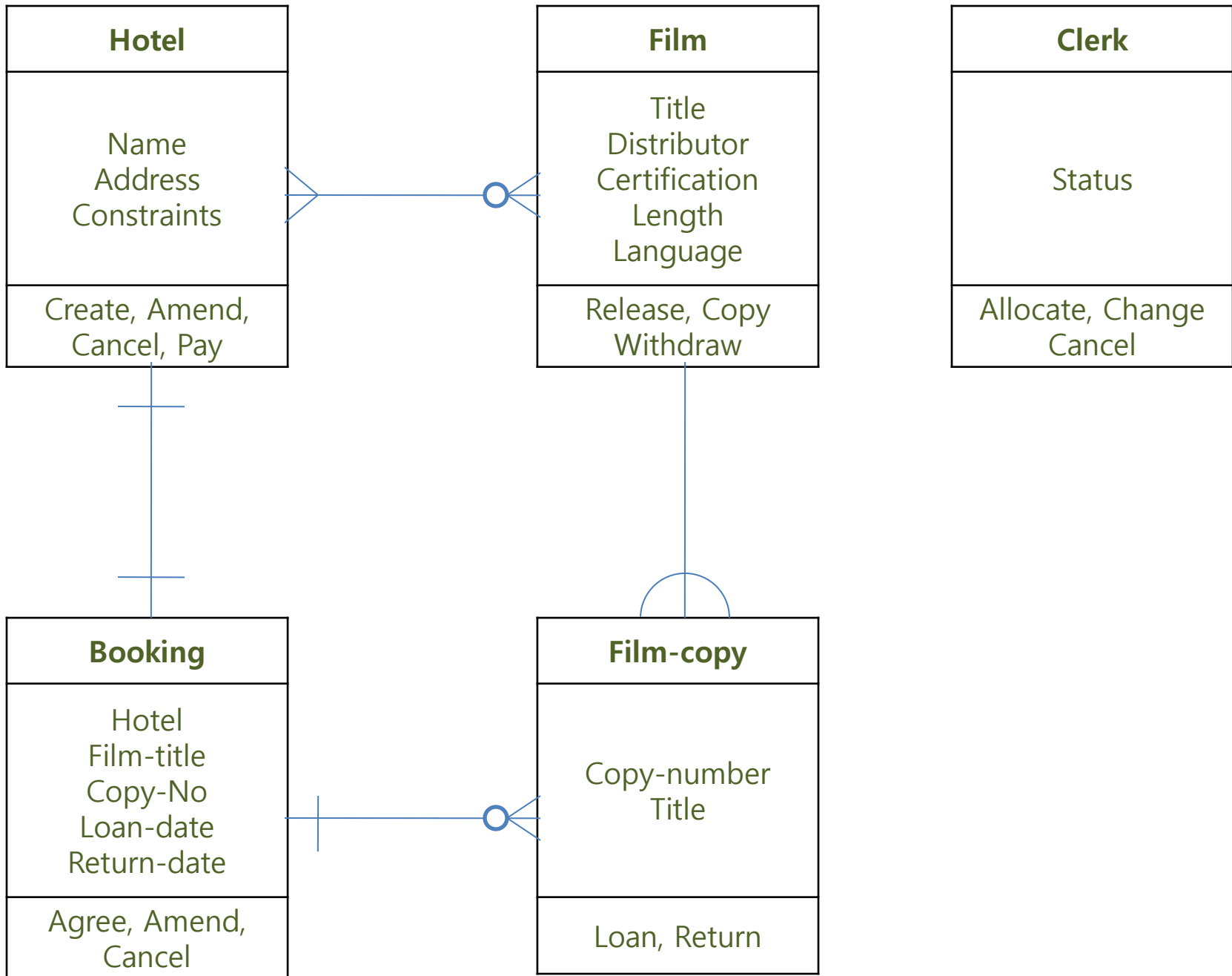
OOSA(Object-Oriented Systems Analysis)

- It gives many heuristics for object identification and analysis which help initial abstraction and object modelling.

- The main criticism of OOSA is its lack of support for inheritance

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Object-Oriented Methods

OOA(Object-Oriented Analysis)

- The method uses hierarchical inheritance and masking rather than multiple inheritance, and specification of encapsulation and object interfaces is nor as detailed as in OOSD or HOOD Overall, however it does meet many OO criteria.

Hotel

Name
Address
Constraints

Create, Amend,
Cancel, Pay

Film

Title
Distributor
Certification
Length
Language

Release, Copy
Withdraw

Clerk

Status

Allocate, Change
Cancel

Booking

Hotel
Film-title
Copy-No
Loan-date
Return-date

Agree, Amend,
Cancel

Film-copy

Copy-number
Title

Loan, Return

Object-Oriented Methods

Object Ory

- This method supports OO concepts of classification, and inheritance.

- Object Ory adds concepts of user-centered design 'uses cases' to the OO approach for specification of the user interfaces and tasks provided by object service.

Object-Oriented Methods

Summary of OO methods

Table 2. Summary of method specification models and approaches

Method	Functional process	Data relationship	Event sequence	Coverage (R-A-S-D-I)	Application
IE	Y	Y	Y	--------	IS
ISAC	Y	Y	N	-----	IS
SASD	Y	N	Y	------	IS
SSADM	Y	Y	Y	--------	IS
SADT	Y	Y	N	-----	IS. RT
JSD	N	Y	Y	--------	IS. RT
NIAM	Y	Y	N	------	IS(data intensive)
Mascot	Y	N	N	-------	RT

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Object-Oriented Methods

Summary of OO methods

Table 3. Summary of structured methods` object-oriented features

Method	Object model	Data + activity	Encapsulation	Types + instances	Classification
IE	Poss	N	N	Y	N
ISAC	Y	N	N	N	N
SASD	Y	N	N	N	N
SSADM	Y	N	N	Y	N
SADT	Y	N	N	N	N
JSD	Y	Y	Y	Y	N
NIAM	Poss	Poss	N	Y	Y
Mascot	Y	Y	Y	Y	N

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Review Object Orientedness of Systems Develoopment Methods

- IE(Information Engineering)
- ISAC(Information systems activity and change analysis)
- SA/SD(Structured Analysis/Structured Design)
- SSADM(Structured Systems Analysis and Design Method)
- SADT(Structured Analysis and Design Technique)
- JSD(Jackson System Development)
- NIAM(Nijssen`s Information Analysis Method)
- Mascot-3

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Review Object Orientedness of Systems Develoopment Methods

IE(Information Engineering)

- IE encourages conceptual modelling of business process leading towards object orientation.

- But IE separates during analysis of processing from data and emphasis on functional decomposition.

Review Object Orientedness of Systems Develoopment Methods

ISAC(Information systems activity and change analysis)

- This method advocate top-down functional decomposition for processing and data in separate specification as activity data diagrams.

- A network model of processes and data structures is produced.

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Review Object Orientedness of Systems Develoopment Methods

SA/SD(Structured Analysis/Structured Design)

- SA/SD uses top-down functional decomposition to analyses systems in terms of a network of process connected by dataflow messages.

- The method does not support any OO concepts separates data and process specification and encourages specification of functionally based system component.

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Review Object Orientedness of Systems Develoopment Methods

SSADM(Structured Systems Analysis and Design Method)

- SSADM is a composite method derived from structured analysis, structured design and design and data analysis.

- As with IE, data analysis encourages object orientation.

- It forms a major theme within the overall specification and hence encourages OO specification.

Review Object Orientedness of Systems Develoopment Methods

SADT(Structured Analysis and Design Technique)

- Use top-down decomposition to analysis systems in successively increasing levels of detail.

- SADT does not support type-instance concepts.

- The separation of process specification from data makes this method unsuitable for an OO approach.

Review Object Orientedness of Systems Deveeloopment Methods

JSD(Jackson System Development)

- JSD produces system models based on networks of concurrent communicating process.

- JSD does advocate alternative views on an object, called entity roles.

NIAM(Nijssen`s Information Analysis Method)

- NIAM support type instance concept.

- So, NIAM cane be said to possess some OO properties, although it does not support inheritance.

Review Object Orientedness of Systems Develoopment Methods

Mascot-3

- Mascot advocates functional decomposition of systems.

- Mascot has a type-instance concept for implementing many instances of software modules from one template 'type'.

- But it does not explicitly support classification procedures.

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Review Object Orientedness of Systems Develoopment Methods

Summary of method evaulation

- Current structured methods using an entity-modelling and entity-life-history approach have potential to evolve towards object orientation.

- Classification and encapsulation are suported, but separately in different methods.

- Inheritance is not supported, although data-oriented methods could incorporate these features, as illustrated by the evolution of OOSA and OOA.

Conclusion and Review

- It is possible to transfer system developments methods from structured methods to OO methods

- OO methods may need to move in the direction of semantic data modelling

- System development methods will have to pay more attention to OO concepts and approaches.

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