

OCD II
Domain Description, System
Analysis I, Prototypes (maybe)

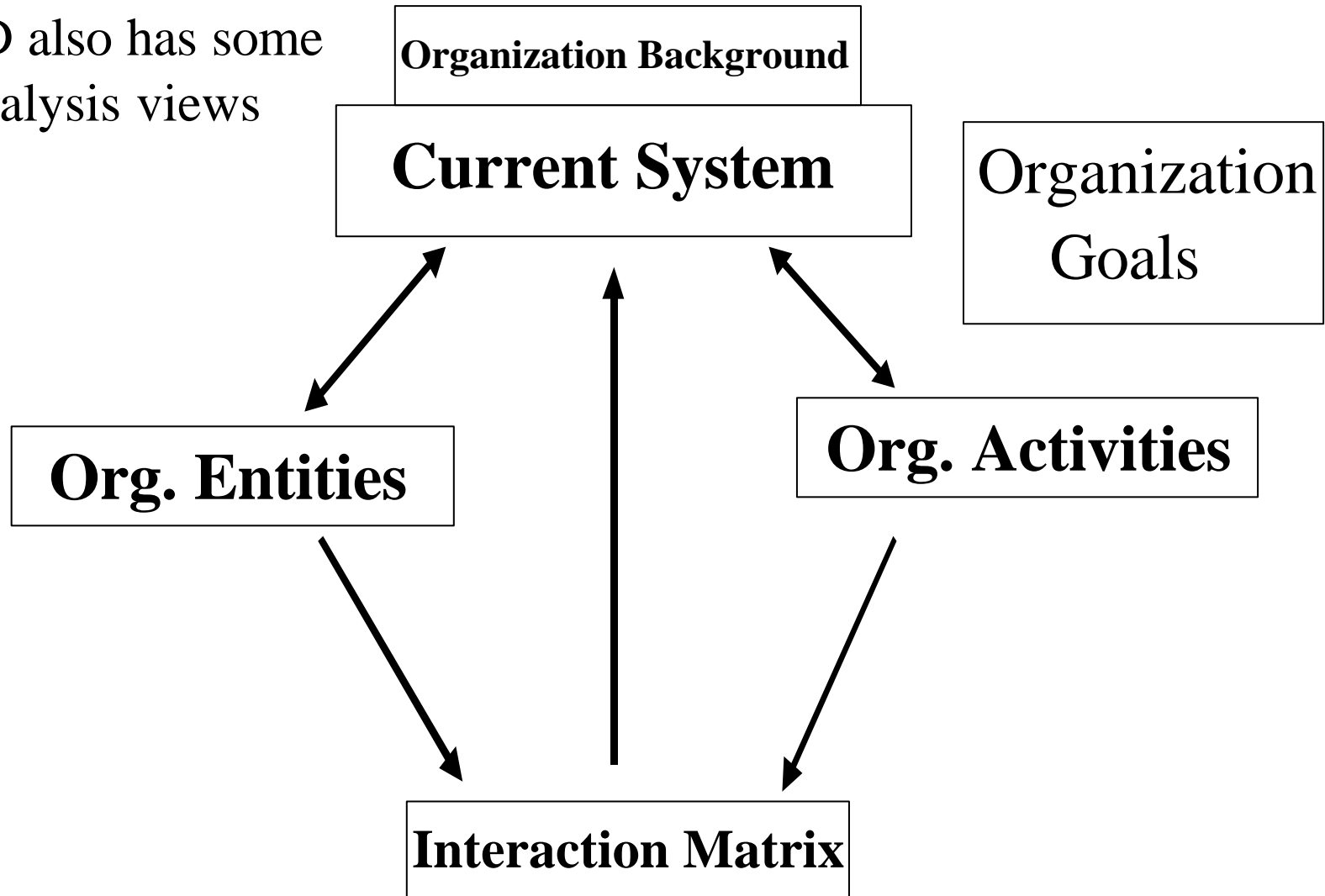
CS577a

Sept 18, Fall 2000

Domain Modeling and The OCD

Domain Description Views

Note: OCD also has some System Analysis views



OCD 3.1 Organization Background

(Product Model)

- Good organization's background description. Only talks about existing organization, not in context with proposed system. It should give organization description in a large context, not too specific .

Example from team 6-1 Butler Stack Locator CS3156 Fall 1999:

3.1 Organization Background

The Butler stacks houses two million volumes of the University's collections in the humanities, with particular strengths in history (including government documents and social science materials published before 1974), literature, philosophy and religion, in addition to one of country's most extensive collections of materials pertinent to the study of Greco-Roman antiquity. The stacks has 12 levels with the entrance on the third floor of Butler near the Circulation Desk. The purpose of the Butler Library is to provide access to a variety of resources for patrons of Columbia University.

(from <http://www.columbia.edu/cu/libraries/indiv/under/tour/butlertour.html>)

OCD 3.2 Organization Goals

(Success Model)

3.2 Organization Goals

1. Ease the workload on the patrons and staff affiliated with Butler Library by providing user-friendly and useful assistance via computers to facilitate the searching of books in the library stacks

M: number of people who still seek assistance in finding a book with the BSL

R: the BSL wants to offer a plausible alternative to searching to searching for a book totally on one's own or through the assistance of the Management

2. Increase efficiency for the management through the creation of a system that facilitates categorization and grouping of books

M: time it takes to re-shelve and relocate books with the proposed system

R: maximizing efficiency allows the Management to concentrate their energies on other matters

3. Increase quality of service by allowing the management to focus their time and energies on those patrons that really need help

M: number of patrons who still seek assistance with the BSL

R: increased quality of service will book public image of the Butler Library Management

OCD 3.3 Organization Activities (Product Model)

3.3 Organization Activity Model

The current organizational activities of Butler Library are relatively simple. The system relies heavily on the limited activities of the Staff, since no computer system has been designed to alleviate Staff from performing these mundane tasks. The following is a description of the current activities of the Butler Library.

1. Search for Collection Materials
 1. User Searches for the Book.
 1. User uses CLIO or Card Catalog to find the call number, the size, and the collection type of the book.
 2. Inexperienced User asks questions on how to search for book.
 3. User refers to list of call numbers and stack levels called the Stack Directory.
 4. User proceeds to corresponding stack level and reads off a floor plan present at the elevator on each level to find the general location of the book.
 5. User scans through each range for correct call number intervals.
 2. User iterates through the above procedure
 3. User cannot find book
 1. User fills out formal request for a Staff to locate the book.
 2. User requests assistance from Staff (informal request)

OCD 3.4 Description of Current System

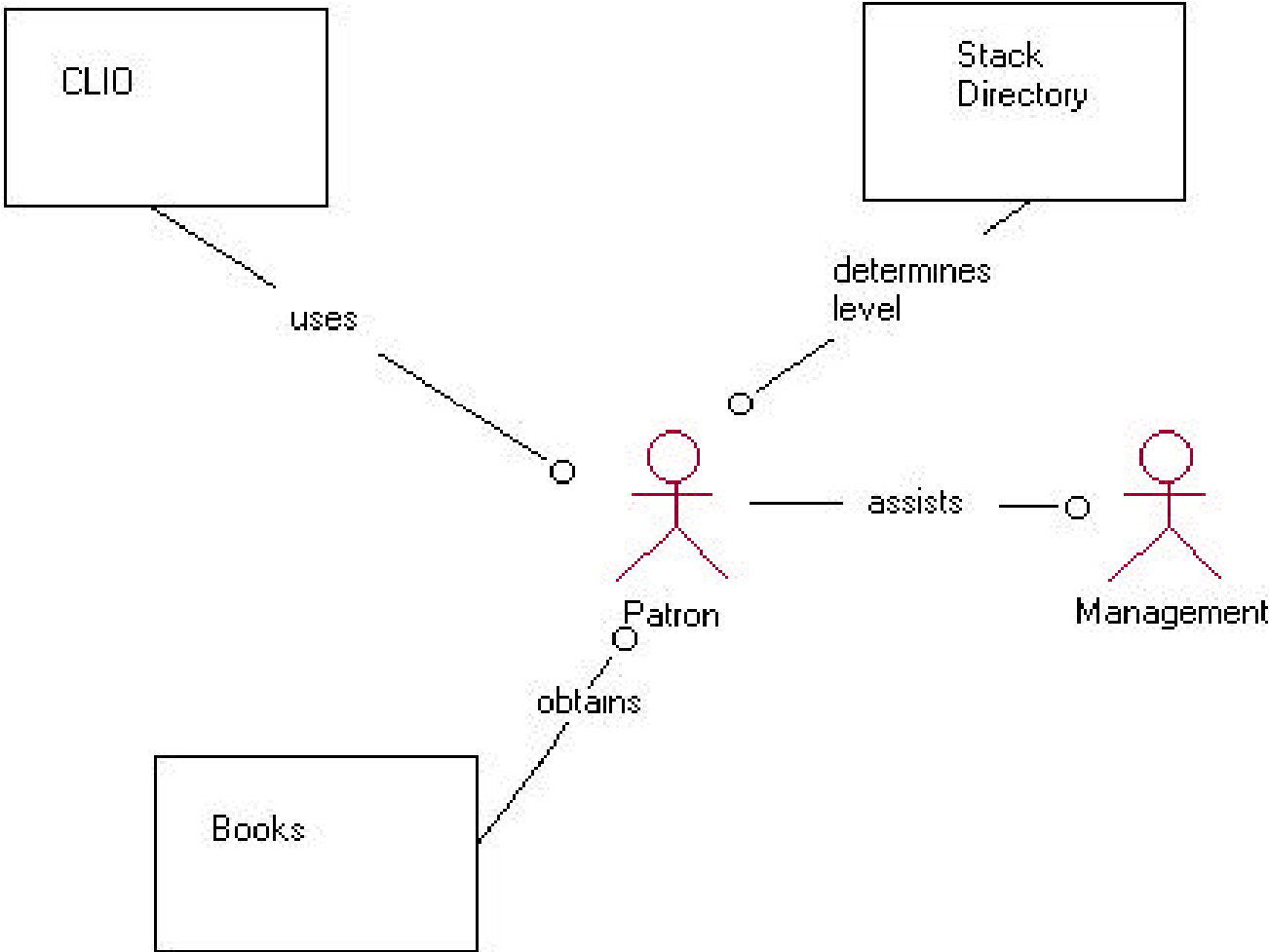
(Product Model)

Good description of operation of current system. The description is associated with *block* diagrams.

3.4 Description of Current System

- Patron
 - The patron determines the call number of the desired book through the Columbia's online catalog, CLIO.
 - The patron will then approach the circulation desk to acquire a copy of the stack directory (a document that maps the call number prefix with the corresponding stack level), with which he/she will determine the stack level of the book.
 - The patron will then proceed to the destination level and reference with the map that is posted on each stack level.
 - With this information, the patron is ready to approach the aisle that contains the desired book.

OCD 3.4 Description of Current System (Product Model)



OCD 3.5 Entity Model: Possible Entities

(Product Model)

3.5 Entity Model

- Entities of the proposed system:
 - Patron
 - Management
 - CLIO
 - Books
 - Butler Library
 - Stack Level

E-01

Identifier - E-01

Description - a user affiliated with Columbia University who utilizes the resources of Butler Library

Name - Patron

Properties - Student, Staff, Employee, or any affiliated person of Columbia University.

Activities

- Uses CLIO
- seeks assistance and checks out books from Management
- uses books as resources
- affiliated with Columbia University

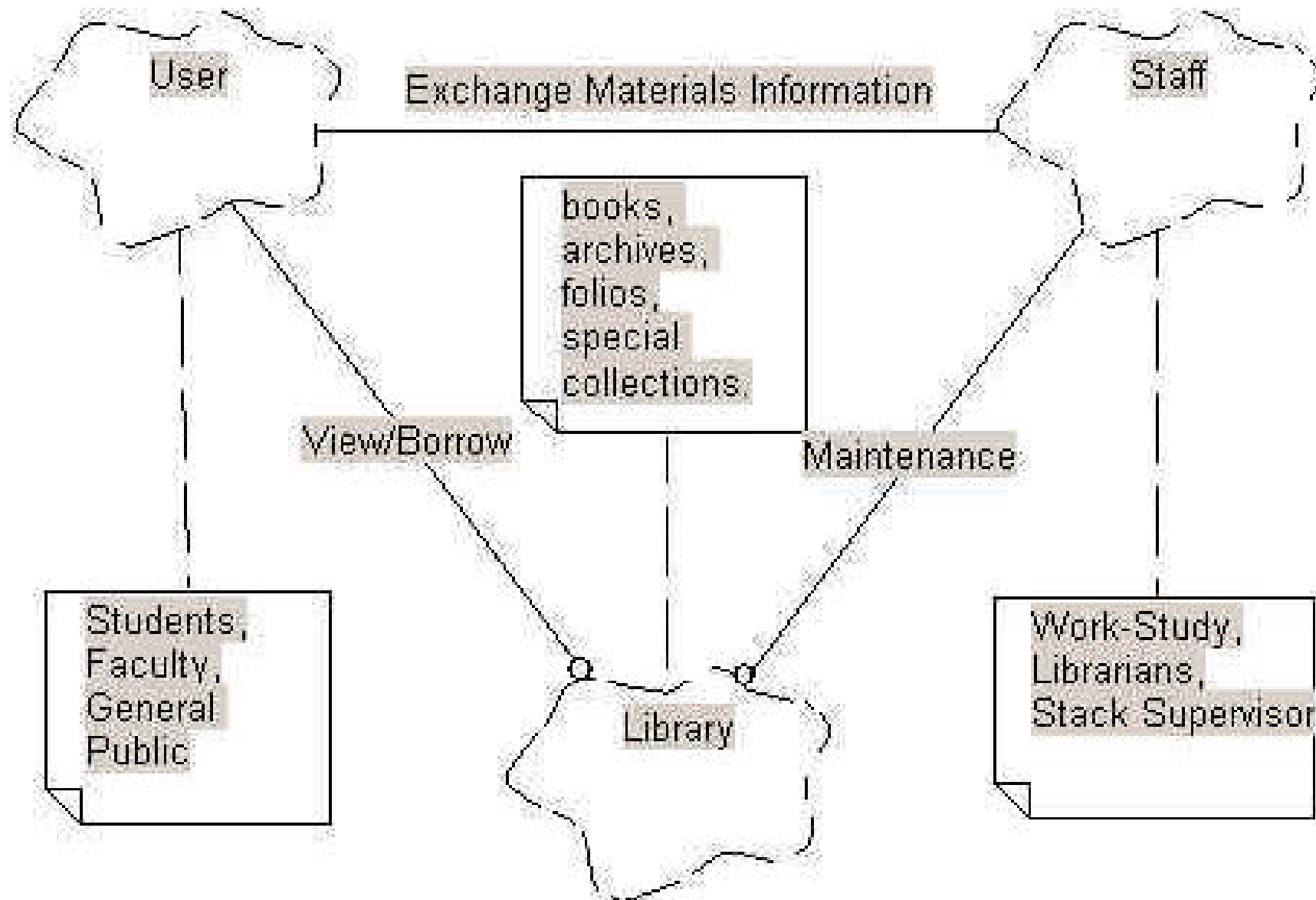
Connections – ENT-01

OCD 3.5 Entity Model: Entity Specifications (Product Model)

Example from team 16-1 CS3156 Fall 1999

Identifier	E-01
Description	People who utilize the library system and the services that the Butler Stacks provide. This includes faculty, students, researchers and the general public.
Name	User
Properties	<ol style="list-style-type: none">1. Name2. Level of Priority (Student or Faculty)
Activities	<ol style="list-style-type: none">1. Inquires about stack materials2. Requests stack materials3. Views stack materials4. Borrows stack materials
Connections	<ol style="list-style-type: none">1. Users receive information about stack materials from Staff2. Users borrow stack materials from the Library

OCD 3.5 Entity Model Diagram



OCD 3.6 Interaction Model (Product Model)

	<i>Patron</i>	<i>Management</i>	<i>Stack Level</i>	<i>Book</i>	<i>CLIO</i>	<i>Stack Directory</i>
<i>Uses CLIO</i>	X	X			X	
<i>Seeks Assistance</i>	X					
<i>Uses Stack Directory</i>	X	X				X
<i>Gets Stack Directory</i>	X					X
<i>Gives Stack Directory</i>		X				X
<i>Goes to Stack Level</i>	X	X	X			
<i>Finds Book</i>	X	X		X		
<i>Relocates Book</i>		X		X		
<i>Searches for Book</i>	X	X				

OCD 3.7 Current System Shortfalls (Product Model)

- Good description of current system shortfalls. It should not give advantage or improvements will be done by proposed system.

3.7 Current System Shortfalls

1. User

1. Users have to go through several look-up tables, which makes book searching a very time-consuming task. User has to search stack directory, locate range on stack map, and search through range numbers in order to locate a specified book. If all else fails, the User must go to Staff for assistance.
2. Not all the call numbers are in the same format so inexperienced users can get easily confused with the various collections available.
3. User is not directly provided with a map. The sole map for each stack level is located at the entrance to the level, so it is difficult for Users to find their way around the stacks.

System Analysis I:
SOP, Goals and Constraints,
System Capabilities
and the
Operational Concept Description
(OCD)

4. Proposed System (Analysis of)

- System Analysis involves several steps
 - Components - models, attributes, relationships, constraints, roles, and states
 - Behavior models
 - Engineering - Abstraction, enterprise class engineering
- This section is an overview of Analysis for OCD 4.0
- Details follow in later sections for SSAD

System Analysis

- The creation of precise, consistent description of a conceptual system in terms of its high-level components
- Description is within the organization domain, independent of implementation
- Analysis goes beyond simple checklists and pictures
- Analysis ties the domain description to the system design and implementation

Analysis Defined

- A separation of a whole into its component parts
- An examination of a complex system, its elements, and their relations
- A statement of such an analysis
- A method in philosophy of resolving complex expressions into simpler or more basic ones

Analysis Goals

- Quantify *what* we want to represent, not *how* it is done
- Formalize and refine the specific parts of the organizations capabilities, entities, activities, and interactions described in the domain description that are to be automated
- Capture the high level architectural information that will represent (I.e. model) the conceptual system

Analysis Audience

- The Domain Description is for all constituents of the project
- Analysis is for Domain Experts - the high level leaders who understand the domain, know what they want, and have the authority to make decisions
- Not for implementers, who prefer design and implementation details (“hows”)

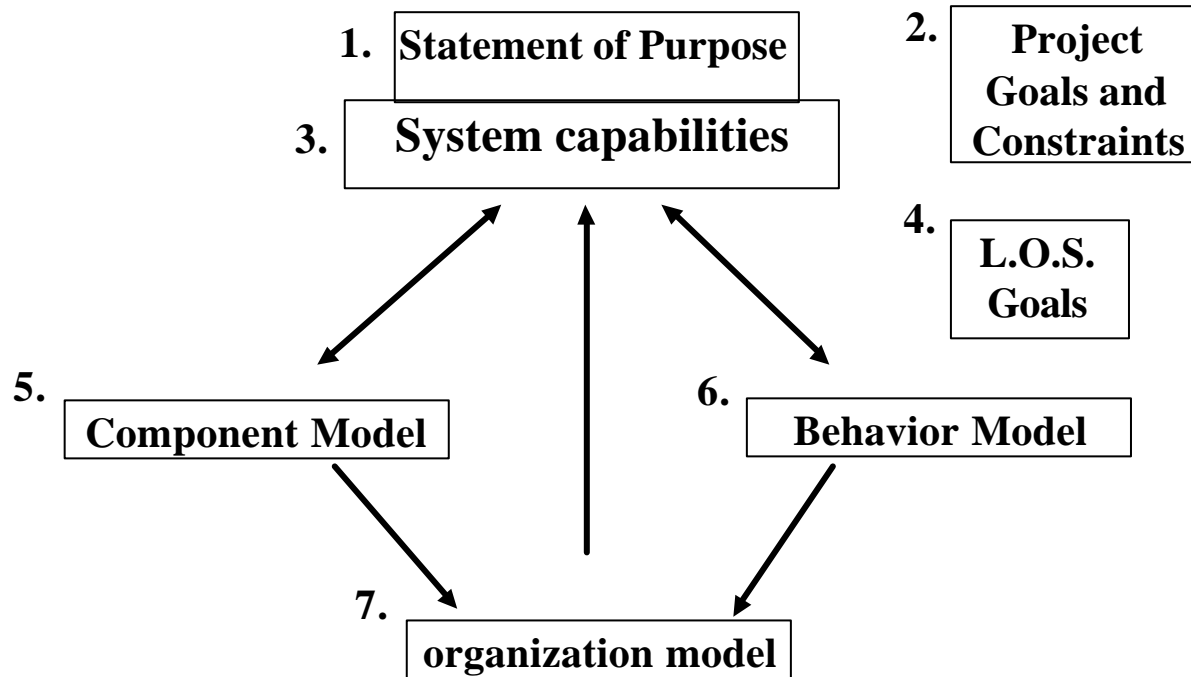
Touring OOA concepts

- This section introduces OOA concepts via extended examples
- The example will illustrate a few issues that can arise and how they are handled
- Notation, terminology, etc. not as important as awareness of issues
- Further study will be required

Analysis Overview

- Analysis CDL
- Statement of Purpose - (focal point)
- Project Goals - (influences)
- System capabilities - (conceptualize)
- L.O.S. Goals
- Models
 - Component Model
 - Behavior Model
 - Enterprise Class Model

Analysis Deliverables



Classifying Last

- Classification should be done after establishing Components and their behaviors
 - need things to classify before creating classes
 - intent is very important here
- This provides well named structures that will flow into the final implementation
- Accordingly, requirements should be delayed until later (design)

4.1 Statement of Purpose (Focal Point)

- Describe the general purpose of the proposed system
- A brief synopsis of the overall capabilities
 - Compare with OCD 3.7 Current System Shortfalls
- Should be consistent with
 - System Boundary and Environment (OCD 2.3)
 - Domain Description (OCD 3)

Creating a Statement of Purpose

- A brief overview of the proposed system: what the system is supposed to accomplish or be responsible for
- Contrast with current system and shortfalls
- More general than a problem statement: doesn't need to identify a problem, just what is desired
- May change between LCO and LCA

Example:
Statement of Purpose

4.1 Purpose of Proposed System

We will provide a system to access the large number of Boeckmann Center materials in an attractive and simple fashion, concurrently the collections will be organized into a unified cataloging system within the archive. Access will take the form of searching the digital archive resulting in meaningful and salient search results as well as viewing items in the archive. Access also includes browsing information about the Boeckmann Center, the collections, and a limited subset of the archive, in addition to requesting materials, offering feedback, and receiving help. The system will also allow quick and easy entry and maintenance of the material information by inexperienced library personnel after an authentication process. Administration users will also have help available. The librarian will have access and authority to ensure the integrity of the data before entry into the archive. References are made from [OCD 2.1] and [OCD 2.2].

The Hispanic Digital Archive will be the portal to the Boeckmann Center collections. The collection materials are represented in the HDA. The users will view items and search for items. The operators and librarians will maintain the HDA. A context diagram using entity model elements can be seen in Figure 4.

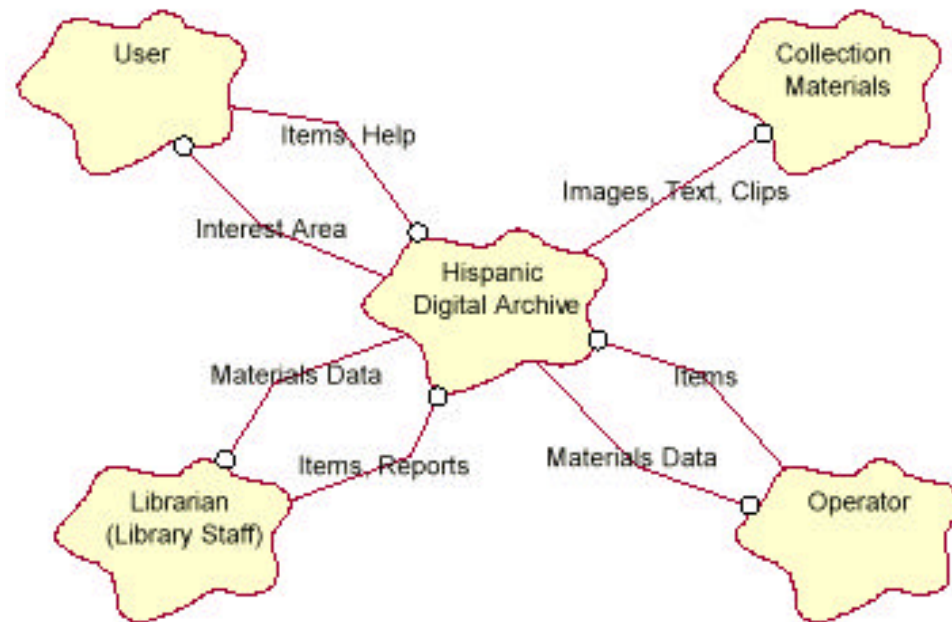


Figure 4 Proposed System Context Diagram

OCD 4.2 Project Goals and Constraints (Influences)

- Project Goals have global effects, whereas System capabilities have more local and specific effects
- Project Goals should be consistent with Win conditions and agreements
- M.R.S. (Measurable, Relevant, Specific): Initially, one may specify desirable and acceptable levels of capability
- Use a simple enumerated list

OCD 4.2 Project Goals and Constraints (Influences)

- *Work* with Domain Experts to translate from Organization Goals
- *Ask*, what needs or desires for the system are not directly part of the system yet contribute to or affect it?
- Factors, project-level constraints and assumptions that influence or contribute to the eventual outcome of the project, but are not part of the system
- Are used to manage complexity and project constraints

Project Goals: M.R.S.

- Should be Measurable, Relevant, Specific (M.R.S.)
 - M: "How is the goal measured with respect to the proposed system?"
 - R: "Is this related to any Organization Goal or external project constraints?"
 - S: "What specific parts of the system is this relevant to?"

Specifying OCD Goals

Organization Goal:	<<give a reference number and name>> such as “OG-1: Increase Sales and Profits”
Description:	<<describe the goal within the relevant organizations>> This may be deleted if the title describes it adequately, as above
Measurable:	<<indicate how this goal is measured, perhaps within the results chain OCD 2.1>> such as “Since sales and profits normally vary by quarter, increases will be measured with respect to the corresponding quarter in the previous year.
Relevant:	<<describe how this goal is relevant to the organizations success factors OCD 2.4 and background OCD 3.1>> such as “Increased sales improve profits via increased economies of scale.”

Project Goal:	<<give a reference number and name>> such as “PG-1: Limited Schedule”
Description:	<<Describe this project goal>> E.g., “Achieve Initial Operational Capability (IOC) in 24 weeks”
Measurable:	<<indicate how this goal can be measured with respect the specific elements it addresses>> E.g., “Achieving IOC means passing a Release Readiness Review”
Relevant:	<<describe which organization goals and activities (OCD 3.2, 3.3) or major project constraints (OCD 2.4) this goal is relevant to>> E.g., “Compatible with rapid completion constraint (OCD 2.4)”
Specific:	<<describe what in particular within the organization goals and activities (OCD 3.2, 3.3) this goal addresses>> E.g., “24 weeks”. There is no need to repeat such information if it is absolutely obvious from the above information.

Specific Project Goals

- S: "What specific parts of the system is this relevant to? What are the specific acceptable levels or thresholds with respect to the measures used? What specific parts of the system are to be measured?"

Example: Project Goals

OCD 4.2 Project Goals Example (1)

The main goals of the project:

1. Achievable system given schedule constraints

The system must be built in 12 weeks by a small group of student developers. The system must be implemented, tested, and installed in this highly constrained time period. The system must have the necessary capabilities to meet the customer and user requirements while remaining small enough to be built in the short amount of time. This is relevant to the project because, if the project is not completed, none of the organization goals with respect to the proposed system can be fulfilled.

[Organization Goal 8] [sdy-WINC- 12]

2. Demonstrable functionality to meet IOC guidelines

The system should be able to display the required functionality to the customer. It should provide some demonstrable functionality and sufficient examples of live data and images. This would allow the capability of the system to be easily demonstrated. This would help in determining if the system needs to be implemented. [Organization Goal 1, 3, 4, 5, 6, 8] [bhansali-WINC-13]

3. Multiplatform/global access system

To ensure the general public will have access to the digital archive it needs to run on most platforms using any browser. Distributed researchers may need access to the archive without visiting the library. Also, access is possible at any time during the day or night. A multiplatform language will be utilized and testing will take place with both browsers. The current versions of Java and the browsers will be used. [Organization Goal 1] [fakharza-WINC-1, fakharza-WINC-2, bhansali-WINC-1, bhansali-WINC-4]

4.2 Project Goals Example (2)

4. Minimize cost and time of system deployment

Deployment time and costs should be minimal. Deployment time should take no longer than 3 years, and no more than \$300,000, which were the maximum amounts given by the customer. The estimates can be found in the FRD. [Organization Goal 4]

5. Reuse ISD licensed and supported software

Reuse of this software would result in less coding for the team. This would be highly beneficial given the tight schedule constraints, also if ISD supports the software there is less need for technical people in the Boeckmann Center to perform support tasks. The project is a fairly large undertaking so software reuse would be one of the best ways to ensure the project can be completed. In order to achieve the numerous organization goals, the project must reuse as much as possible. [Organization Goal 8]

4.3 System Capabilities

- Broad, high-level system behaviors.
- *What* the user should expect from the system
- Should be in line with Organization Goals (OCD 3.2) and Activities (OCD 3.3)
- Outline the desired modifications to the current systems entities and activities (OCD 3.3, 3.5)
- “**Just Do It**” approach. Work with what you know and flush out SR’s later.

OCD 4.3 System Capabilities

- Relation to WinWin : priorities, rationale
- For each system responsibility, indicate:
 - Name
 - Description
 - Priority
 - Rationale
 - Reference to WinWin artifact [if one exists]
- Forward consistency with Capability Requirements (SSRD 3.)

Example: System Capabilities for the University Intranet

1. Provide distributed access to student admissions list (see OCD 2.5.1)
2. Manage asynchronous collaborations on admission evaluations (see OCD 2.5.4)
3. Provide auto-updated list of current research areas (See OCD 2.5.2)
4. Manage secure access to and from the intranet (See OCD 2.2.3)
5. ...

4.3 System Capabilities

- High level overview of broad categories of system behaviors
- Not an operational breakdown (provided by System Requirements)
- System capabilities realize high-level activities in the Organization Activity Model (Reference as appropriate).

4.3 System Capabilities (cont.)

- Describe a few system capabilities and work with domain experts to clarify them.
 - Think about “What in our domain description do we want represented with technology?”
 - Look at organization wide goals and consider what is required to carry them out.
- Each system responsibility may require several iterations: Consistency and redundancy are not issues at this point

4.3 System Capabilities(cont.)

- “Just do it” approach eliminates the pressure to get it all right on the first pass
 - “Go with what you know” and plan to iterate back through it.
 - Multiple iterations of SR’s reduce complexity through balanced partitions, promote focus, remove redundancies and contradictions
- As more capabilities are documented, architects get a better idea of how the domain experts are viewing the proposed system
- Allow tangents to continue, even if they cross perceived system boundaries.

Example:
System Capabilities

4.3 System Capabilities

The system capabilities are the high-level system behaviors described according to broad categories of system behaviors.

Responsibility: SC-01

Name: Find/Search Material

Description: Once the archive is accessed the user needs to find the materials desired or if there are materials of interest.

Priority: Very High

Rationale: Once at the site the user must be able to search for an item in the archive. This is deemed a basic requirement.

Relates to: I.A [OCD 2.5]

WinWin reference: eballew-WINC-4, eballew-WINC-9, eballew-WINC-3

Responsibility: SC-02

Name: View Material

Description: Materials in the archive can be viewed using the system.

Priority: Very High

Rationale: This is basic required functionality for the customer and user.

Relates to: II.C.3 [OCD 2.5]

WinWin reference: eballew-WINC-6, eballew-WINC-7, eballew-WINC-16, eballew-WINC-2, eballew-WINC-13

Finding System Capabilities

- Ask Constructive Questions
- Avoid counter productive questions
- Don't obsess over issues that are addressed as part of the process (e.g. consistency, redundancy, completeness, soundness)

Constructive Questions

- Some constructive, informal questions that may be useful in gaining clarity (organized brainstorming)
 - “What does this mean?”
 - “Can you give me an example of this?”
 - “What do you need to do this?”
 - “What is involved with this?”

Construction Question 1

“What does this mean?”

Useful to define words and phrases

(document in CDL)

Construction Question 2

“Can you give me an example of this?”

Useful to draw out scenarios of desired
system operations

Construction Question 3

“What do you need to do this?”

To find out information required to carry out a responsibility

Construction Question 4

- *“What is involved with this?”*
- To discover sub-capabilities and the steps required to fulfill them
- This question is important as it is used to continue the process.

Counterproductive Questions

- Avoid Counterproductive Questions:
 - *“Didn't we already cover this?”*
 - *“How can we possibly implement that?”*
 - *“Do we really need this?”*
- Begin by discovering what is actually wanted
- The modeling process answers these “save it for later” questions

Counterproductive Question 1

“Didn't we already cover this?”

☞ Don't worry about overlapping capabilities:
these will be cleared up as we build the model

Counterproductive Question 2

“How can we possibly implement that?”

- ☞ Stay focused: this is not relevant to domain experts, only to implementers

Counterproductive Question 3

“Do we really need this?”

☞ Don't challenge feasibility or relevance:
relevance is determined by domain experts
(you can send them the bill later!)