Requirements engineering and use cases

Nigel Goddard

School of Informatics
University of Edinburgh

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In large systems, much harder – need to budget (time and money), negotiate scope; difficulty of resolving questions; significant effort needed before anything can be demonstrated and checked.

Inadequate requirements capture is the major source of project failure (e.g. according to Standish CHAOS reports).

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You may be aiming to

- replace/out-compete existing software that does a similar job
- automate a process that is currently done manually
- introduce novel functionality.

Regardless, you need to know who wants the software to do what.

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All these people are likely to be stakeholders: they have a legitimate interest in influencing the software, and you need their input. They may find it difficult to articulate their requirements, however.

Requirements elicitation techniques

(More detail in SWEBOK Ch2)

- Interviews

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Requirements analysis is the process of getting to a single consistent set of requirements, classified usefully, that will actually be implemented.

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- a use case model with supporting text
- a formal specification in a mathematically-based language.

Probably reviewed, may be contractual.

Requirements classification

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Functional requirements: What the system should do.

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Some projects will have several requirements documents for different purposes, e.g., one written in the domain's (customers') terms, one in developers'. Names for these documents vary.

User Stories

Used in "agile" (low ceremony, lightweight) development processes e.g. Extreme Programming (XP) – more on process later, but for now note the

Assumption: there is a single person empowered and able to make decisions on the spot about the requirements and their prioritisation, and that person ("the customer") is always available to the developers.

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User stories are brief, written by the customer on an index card. E.g.

`10. User A leaves the office for a short time (vacation etc.) and assigns his access privileges to user B, so B can take care of A's tasks while A is gone.` *Source: user; Risk: M*

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Cons:

- May be incomplete, inconsistent
- Only work in conjunction with good access to the customer
- Not suitable to form the basis of a contract

Now we go on to medium-ceremony approaches.

The Unified Modeling Language

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Often used just for documentation, but in model-driven development, a UML model may be used e.g. to generate and update code and database schemas automatically.

Many tools, including free ones, support UML. In this course you are not required to use any, but you might want to (e.g. the very basic UMLet, or fully-featured ArgoUML, or Eclipse UML2 tools).

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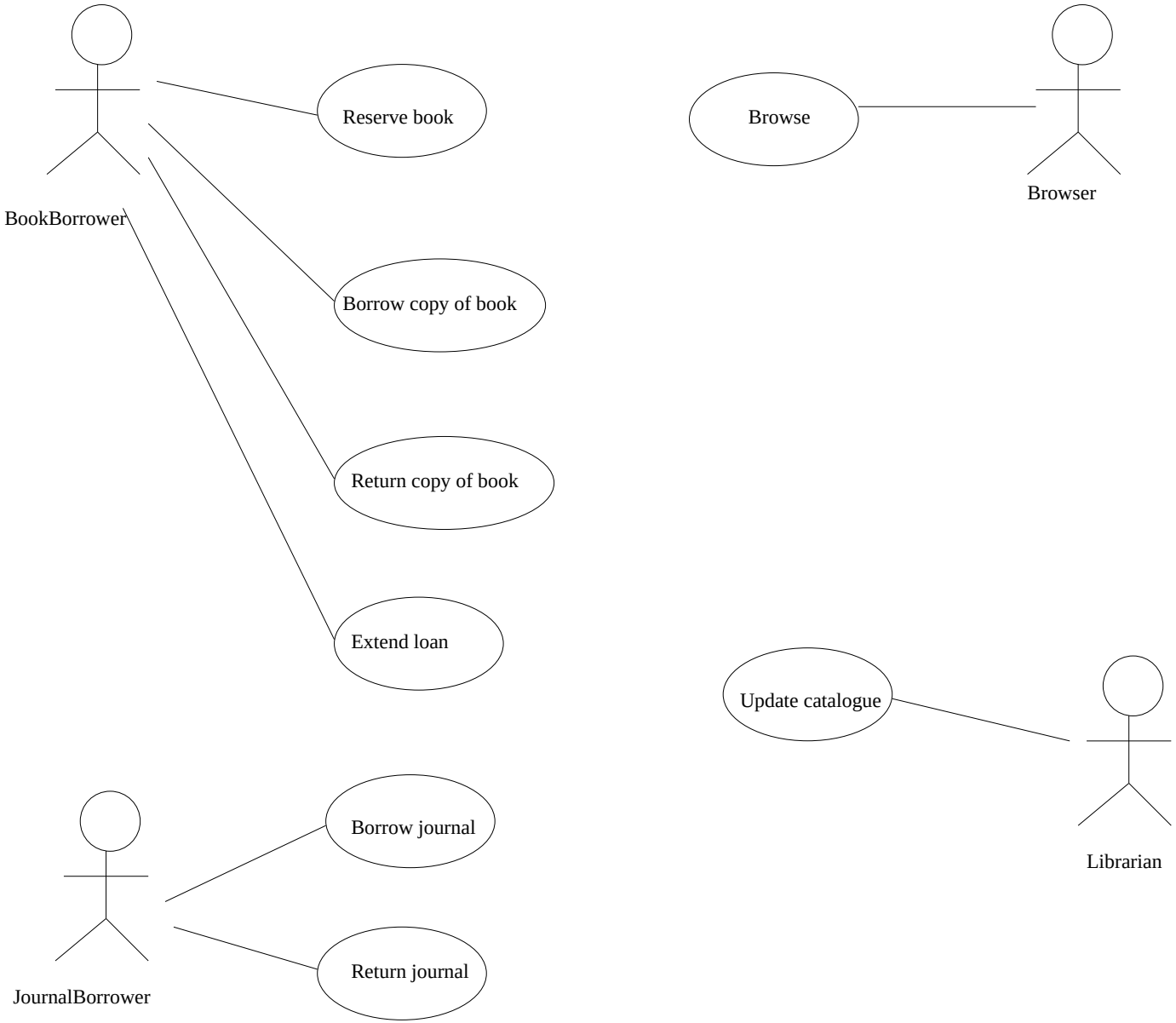
First introduced by Ivar Jacobson (early '90s), developing from *scenarios*. Independent of OO – strength or weakness??

A set of use cases is *summarised* in a UML use case diagram.

Simple use case diagrams are easy to understand: can be useful for communication between customers and developers.

A simple use case diagram



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More specifically, a particular *kind* of user. E.g., bank has many customers, but we only show one Customer actor on the diagram.

The same human user or external system may interact with the system in more than one rôle: he/she/it will be (partly) represented by more than one actor. (e.g., a bank teller may happen also to be a customer of the bank).

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There may be aspects of system behaviour that don't easily show up as use cases for actors.

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Connection between use case descriptions and other forms of requirements documentation is rather controversial.

Use cases: scope and connections

A use case:

- may include logic to handle unusual or alternative courses, e.g. "if the `BookBorrower` has the maximum number of books on loan already, refuse this loan" *even though these may result in the actor being unsatisfied*;

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- may be associated with other UML models which show how it is realised;
- includes text which may reference other requirements documentation.

A use case diagram summarises all the tasks performed by the system (or subsystem, etc.)

Multiple Choice Question (from previous exam)

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E I wasn't paying attention

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Make sure system delivers added value:

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Result: the project isn't cancelled. Supposedly...

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For example, consider a `FindBook` use case of a library, in which the user enters details of a book and wants to end up with a copy of it. Maybe the system will give the user directions to where the book is on the shelf. Maybe it will alert a librarian to go and fetch it. In the latter case, should the librarian be shown as actor? In some sense, the choice is a design decision.

Using use cases in development

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Use cases are not limited to documenting the whole system: they may describe any classifier, e.g. subsystem, class, component.

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For example, UML does not permit associations between actors: you cannot legally use a use case diagram to show an interaction between two humans followed by one of them using a system. (E.g. can't legally show librarian and library member as separate actors in Borrow Book, if only the librarian interacts directly with the system.)

There are extensions to UML to allow business process modelling, not considered here.

Reading

Required: SWEBOK 2004, Chapter 2, Software Requirements.

Suggested: Somerville chapters on requirements.

Suggested: Stevens Chapter 7.