Chapter 2:
TRANSFERRING DESIGN KNOWLEDGE



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SOFTWARE DESIGN CHALLENGES

- Requirements volatility
- Inconsistent development processes
- Fast, and ever-changing technology
- Ethical and professional practices
- Managing design influences

DESCRIBING A DESIGN SOLUTION

- A lot of discussion that focus on the action that involved in the process of design.

- There is 3 ways to find a design solution.
  - Representing abstract ideas
  - Design viewpoints for software
  - Forms of notation

REPRESENTING ABSTRACT IDEAS

- Abstraction plays an essential role in the design process.
- **How?**, by allowing the designer to concentrate on those features problem or solution.
- So, the designer will need ways to represent the abstract ideas of the problem and design object.

REPRESENTING ABSTRACT IDEAS

- **Representation** is used to provide a particular abstraction of the characteristics of the system.

- Its typically needed for such purpose as :
  - Capturing the designer idea's for solution
  - Explaining the designer ideas to others
  - Checking for consistency and completeness in a solution

DESIGN VIEWPOINTS

- Software is **NOT ONLY** an abstraction , it is also the description of a process.
- A designer need to use a set of description forms that are able to describe both the static and dynamic properties of a system.
- To describe system oriented properties, the designer needs form that describe the dynamic behavior of the system.
- Form features:
  - ✓ flow of data / information around a system.
  - ✓ sequencing of operations.

DESIGN VIEWPOINTS

- **Behavior**
  Describing the Causal Links Between External Events and System Activities During Execution
- **Functional**
  Describing What the System Does
- **Structural**
  Describing the Interdependencies of the Constructional Components
- **Data Modelling**
  Describing the Relationships that Exist Between the Data Objects Used

DESIGN REPRESENTATION

- Forms of Design Representation
  - Textual
  - Diagrammatical
  - Mathematical
- Models created to further learning process, reduce complexity, communicate with team members, and document requirements

TEXTUAL DESCRIPTION

- Used as a means of summarizing information
- "Structured" forms such as ordered lists and tables provide a ready means of referring to information
- Text is often most effective in conveying information when it is used in small blocks or table
- Use of bold and italic can help to highlight items
- Textual forms rarely used as the sole means of providing information about design ideas
- Use of standard form provides the structured needed to overcome the problem of producing and reading free text

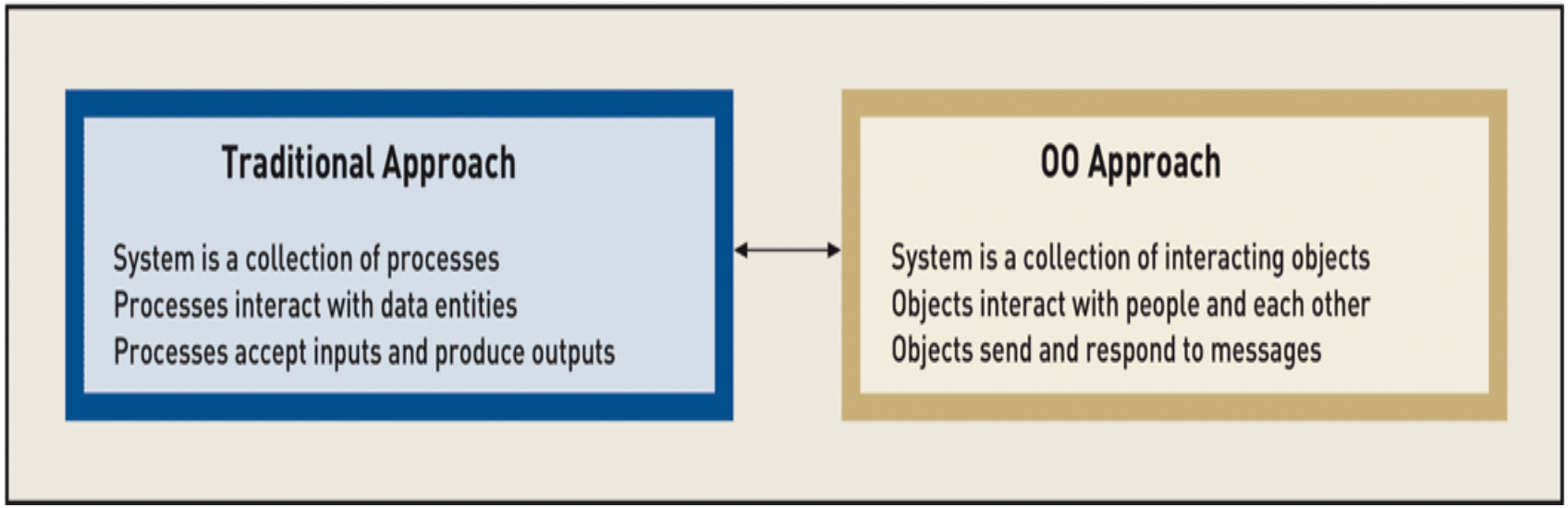
DIAGRAMMATICAL DESCRIPTION

- Diagrams have been used to illustrate concepts about :
  - Hierarchy
  - Position
  - Flow of information
  - Other form of relationship between abstract object
- "Natural limit" to the number of items in information that can be easily assimilated when reading diagram
- Advantages :
  - Diagrams can be layered into levels of abstraction
  - Avoiding large & complex diagrams and so aiding comprehensive

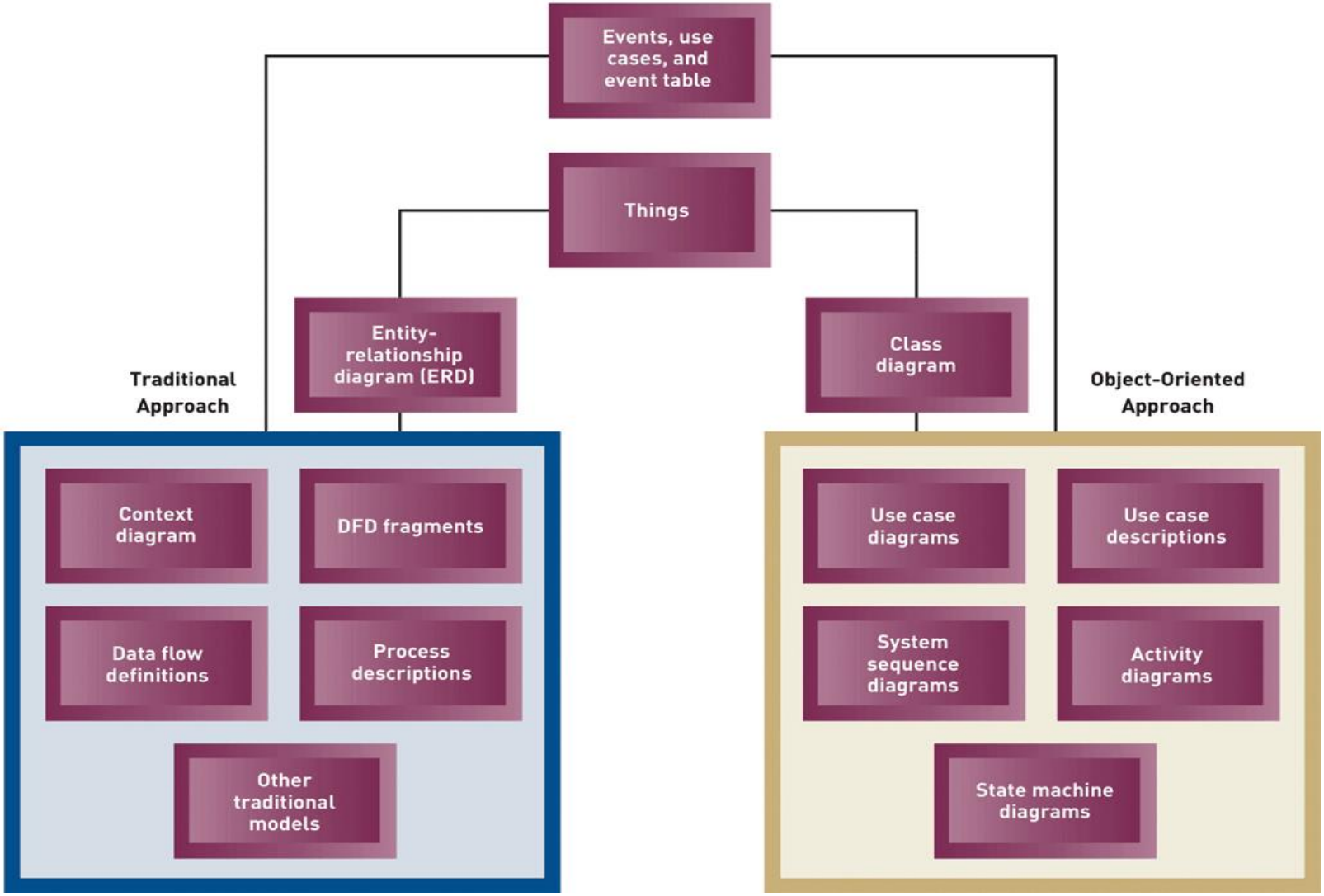
MATHEMATICAL

- Using mathematical forms to provide abstract description. (Formulas, Statistics, Algorithms)
- Computer are discrete machines, with finite word size and many states, form of mathematics most use for needs of software design which describing discrete structure.
- Mathematical forms have particular strengths in describing system behaviour, and in handling some of the issues of time dependency.
- Advantage :
  - Able to combine abstraction with a lack of ambiguity
- Disadvantage :
  - The need for additional staff training and education, often at quite advance levels

DESIGN REPRESENTATION

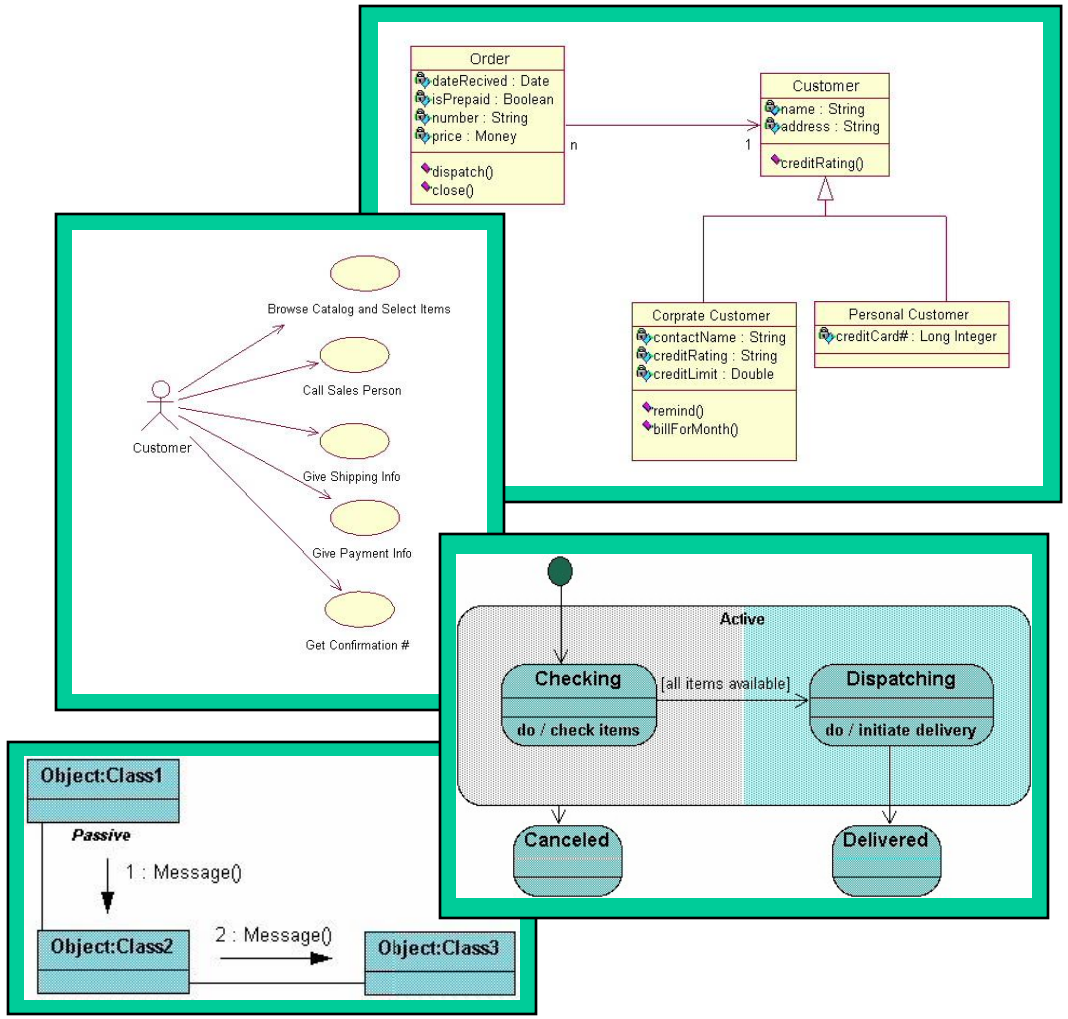


DESIGN REPRESENTATION



CURRENT DESIGN REPRESENTATIONS

- **UML Diagrams**
  - Class
  - Use Case
  - Collaboration
  - Sequence
  - Statechart
  - Component
  - Activity



DESCRIBING A DESIGN SOLUTION

- The roles of representations in capturing, explaining and checking design information.
- The concept of viewpoint of design model, as a means of capturing a particular set of design properties and as projected through the use of representation.
- The principal of direct design viewpoint – the behavioural, functional, structural and data modelling forms.
- The use of text, diagrams and mathematical expression as the three basics forms in constructing design representations.

TRANSFERRING DESIGN KNOWLEDGE

- Codifying and exchanging experiences about the processes involved in design and resulting design features that have proved effectively gaining design knowledge.

- The characteristics of an exceptional designer:

  1) Familiarity with the application domain
  2) Skill in communicating technical vision to other project members.
  3) Identification with project performance

TRANSFERRING DESIGN KNOWLEDGE

- Factors of transferring Design Knowledge:
  - **Invisibility of the medium**
  - **Influence of implementation**
  - **Domain factors**
  - **Process versus product**

The Ways In Gaining Design Knowledge

1. Software Architecture
2. Design methods
3. Design patterns

TRANSFERRING DESIGN KNOWLEDGE

1.Software Architecture

- **A solution to address a particular need**
- **The physical concept of architecture is more a reflection of common patterns than something that is itself design**

The Role of the architectural concept in knowledge transfer

- **Providing a framework and vocabulary**
- **Determining the choice of design strategy**
- **Assisting with later changes**

TRANSFERRING DESIGN KNOWLEDGE

2.Design Method

- **Design method provide a procedural description of how to set about the task of producing a design solution for a given problem.**
- **A method describes the task that designer is to perform and the order in which they should be performed.**

3.Design Patterns

- **The concept of the design patterns is very much associated with object-oriented architectural style.**
- **But in the principle there are no reason why patterns could not be employed with other styles.**

Q & A

THANK YOU FOR YOUR ATTENTION