Modelling Enterprise Requirements

Why Enterprise Modelling?

Traditional Approaches to Enterprise Modelling

SADT
IDEF0

"... Requirements definition is a careful assessment of the needs that a system is to fulfill.
It must say why a system is needed,
   based on current and and foreseen conditions,
   which may be internal operations or an external market

It must say what system features will serve and satisfy this context.
And it must say how the system is to be constructed ...

[Ross77]

ёт .Enterprise requirements
for "context analysis" - the reasons why the system is to be created.
(e.g., why IS for BPR, organizational structure, agents, goals)
constraints on the environment in which the system is to function
(e.g., airplane running beyond runway, AT&T Internet service)
the meaning of system requirements
(symbols, relationships, ontology, vocabulary)

ёт (System) functional requirements
a description of what the system is to do;
what information needs to be maintained?
what needs to be processed?

ёт (System) non-functional requirements
(global) constraints on how the system is to be constructed and function.
E.g., -ilities and -ities
{bcf(h(f(I) -> O))}
**Why Enterprise Modelling?**

**Order Processing**

- Buyer
- Dealer
- Invoice Shipment
- Transportation
- Financing (Loan Officer)
- Factory
- Customer Support
- Accounting

Person power: several hundreds
Processing time: long enough to invite complaints
Errors: annoying and significant

*Why should a system be created? goals/objectives*
*Whose work would the system support? agents, activities/operations*
*How would the info. in the system help run the enterprise? information flow*
*What's the role of the system for cross-functional activities? workflow*

**Traditional Approaches to Enterprise Modelling**

**SADT (Structured Analysis and Design Technique)**

**Background**
- trademark of Softech, Inc. (Ross)
- in use since the mid-seventies
- inspiration for many commercial tools (DFD?)

**View**
- "System" refers to any enterprise/organization, physical, manufacturing, and sw system

=> system FRs! => Course Project

**Context Analysis should involve**
- technical assessment: feasibility of system architecture
  - Are the components and inter-relationships technically realizable?
- operational assessment: system performance in a working environment
  - Can the system perform task X in less than a week of time?
- economic assessment: costs & impacts of system implementation & use
  - Can the system be built with $20M, 1000 SEers, in 2 yrs?
SADT (Structured Analysis and Design Technique)

C Requirements definition
encompasses all aspects of system development prior to actual system design

Current or Foreseen Conditions

Management Objectives

Operational Concepts
 Define system functions and allocate

- Personal Functions: loan evaluation
- Software Functions: warning of low inventory level
- Hardware Functions: destroy confidential info.

- Current or Foreseen Conditions: similar customer base, similar dealerships, similar interest rates
- Management Objectives: order processing max. 1 week, error rate 0.1%, low factory inventory level
- Operational Concepts: define system functions and allocate

C SADT Primitives

Diagrammatic!

Input

Label

Output

Control

Mechanism

- Boxes "composed" into a diagram and interconnected through arrows
- Each diagram is decomposed into up to "six" other diagrams
- Informal documentation (as with DFDs)
- Two types of diagrams
  - Actigrams: boxes: happenings - activities, operations, processing, events, box label: start with a verb
  - Datagrams: boxes: things - entities, objects, data, information, substances, box label: noun

Lawrence Chung
Traditional Approaches to Enterprise Modelling

SADT (Structured Analysis and Design Technique)

SADT Primitives

Diagrammatic!

- Box annotation: represents a trace of stepwise refinement/decomposition
  - Box number: optional, usually level of nesting
- Semantics of Arrows
  - In an actigram:
    - Inputs are data that are consumed by the activity
    - Outputs are produced by the activity
    - Controls influence the execution of an activity but are not consumed
    - Mechanism is a processor (machine, computer, person) which makes the activity happen

Example: Modelling Software Process for the development world

Controls influence the execution of an activity but are not consumed

Inputs are data that are consumed by the activity

Mechanism is a processor (machine, computer, person) which makes the activity happen
Traditional Approaches to Enterprise Modelling

SADT (Structured Analysis and Design Technique)

Example: Modelling Software Process for the development world

Design Requirements

Preliminary Design Data

Separate Data Structure From Algorithm

Perform Algorithm Design

Recommended Detailed Design

A0

Design Engineer

PA

DS

Recommended Detailed Design

Handle Normal Cases

Handle Exc.

A3

Design Engineer

Lawrence Chung
Traditional Approaches to Enterprise Modelling

SADT (Structured Analysis and Design Technique)

SADT Primitives

Diagrammatic!

Control

Input

Label

Output

Mechanism

Semantics of Arrows

In an actigram

Inputs are data that are consumed by the activity
Outputs are produced by the activity
Controls influence the execution of an activity but are not consumed
Mechanism is a processor (machine, computer, person) which makes the activity happen

In a datagram

Inputs are activities that produce the data
Outputs consume the data
Controls influence the internal state of the data
Mechanism is a device for storage, representation, impl., etc.

Preliminary Design

Perform

Preliminary Design

Data

Perform

Detailed Design

Repository disk

Traditional Approaches to Enterprise Modelling

IDEF0 (Integration Definition for Function Modelling)

Background

released in Dec., 1993
the "reference model" for system/enterprise function modelling
also in use for software process modelling
Federal Information Processing Standard
maintained by Dept. of Commerce,
NIST (National Institute of Standards and Technology) &
Computer Systems Laboratory
based on ICAM (Integrated Computer-Aided Manufacturing)
from the US Air Force Wright Aeronautical Laboratories
supported by Composer for enterprise modelling
closely resembles "actigrams" of SADT
Information Modelling (IDEF1X) uses ERD + generalization/specialization

Stringent rules

E.g., Boxes shall be sufficient to insert box names

rectangular in shape with square corners
drawn with solid lines

Arrows that bend shall be curved using only 90 degree arcs
shall be drawn in solid line segments
vertically or horizontally, not diagonally
Traditional Approaches to Enterprise Modelling

IDEF0 (Integration Definition for Function Modelling)

C ICOM codes (variations of arrows)
E.g., tunneled arrows: provide information at a specific level of decomposition that is not required for understanding at some other levels

- **I1, O1, C1, M1 are not shown on child diagram**

```
  +-------------------+
  |                   |
  |                   |
  +-------------------+
       ^               ^
       |               |
       C1             C1
  +-------------------+
  |                   |
  |                   |
  +-------------------+
       ^               ^
       |               |
       C1             C1
  +-------------------+
```

- **I1, O1, C1, M1 are not shown on parent diagram**

```
  +-------------------+
  |                   |
  |                   |
  +-------------------+
       ^               ^
       |               |
       C1             C1
  +-------------------+
  |                   |
  |                   |
  +-------------------+
       ^               ^
       |               |
       C1             C1
  +-------------------+
```

Lawrence Chung

---

Traditional Approaches to Enterprise Modelling

IDEF0 (Integration Definition for Function Modelling)

C Diagram syntax rules
E.g.,
- **control feedbacks shall be shown as “up and over”**

```
  +-------+
  |       |
  |       |
  +-------+
       ^   ^
       |   |
       1   2
```

- **input feedbacks shall be shown as “down and under”**

```
  +-------+
  |       |
  |       |
  +-------+
       ^   ^
       |   |
       1   2
```

- **mechanism feedbacks shall be shown as “down and under”**

```
  +-------+
  |       |
  |       |
  +-------+
       ^   ^
       |   |
       1   2
```

Lawrence Chung
Ambiguities
- Informal documentation (as with DFDs)
- Boxes inside a box may represent specializations, instances, aggregations
- Temporal relationships not clear
  - When are inputs produced? as a chunk or in a piece-meal manner
  - When are outputs produced? on receiving inputs, anytime afterwards, instantaneously
  - How are activities related? sequential, concurrent, overlap, during
- Cardinality, mandatory/optional
- Attributes of data
- Constraints on arrows

SADT/IDEF0 for a high-level system functional model