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Goals for a New Paradigm of Behavior Modeling

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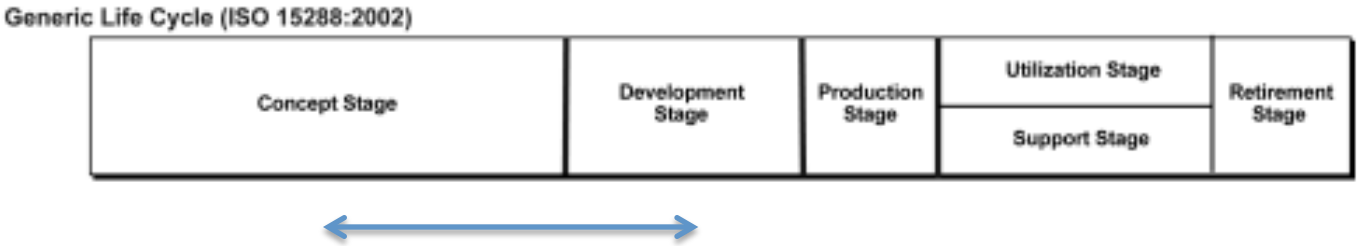
Background: Systems Development Process



- Modeling used in early stages to better define system and its use
- Early stage modeling focuses on behavior

Behavior

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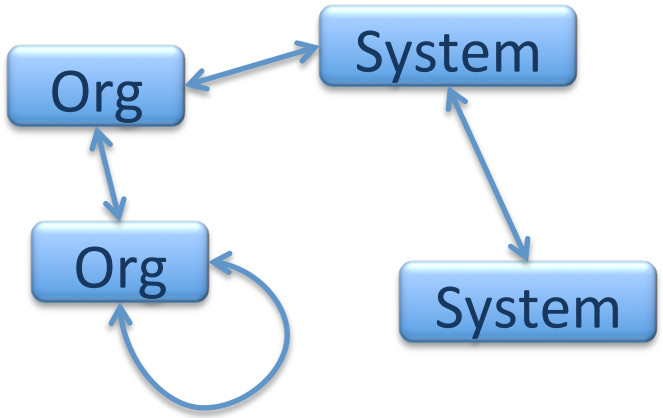
- Behavior of organizations and systems is modeled in various ways
- *Behavior* refers to the activities of organizations and technological systems, and their interactions
- What is referred to as *behavior* here has also been described as:
  - Organizational behavior
  - Business processes
  - System functional flow
  - Activity Flow
  - Task procedures
  - Use case flow of events
  - Operational scenarios
  - Concept of Operations (CONOPS)



Two Paradigms

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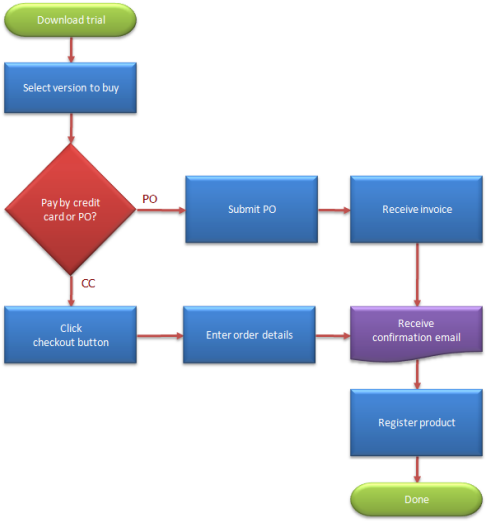
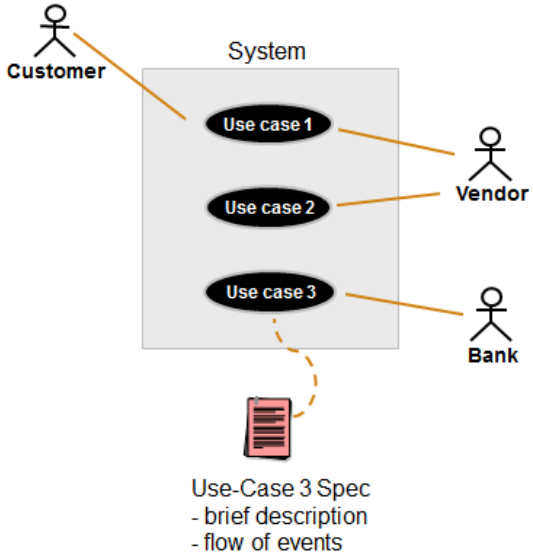
- Two primary paradigms, the *process* paradigm and the *systems* paradigm.
  - Process paradigm: behavior is described in processes, which consist of sequences of activities.
  - Systems paradigm, behavior is described as sequences of activities and interactions between systems, sub-systems and users, in order to achieve a user goal





New Energy Policy

Process Claim Form

Detect Target

Order a Book Online

Brighten Screen in Sunlight

Levels of Abstraction

Current Practice Approaches 1/3

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	Advantages	Disadvantages
Business process modeling only	• Captures business process • Facilitates agreement on as-is and to-be processes	• Omits specifics on how systems support business process • Impossible to derive system requirements or use cases from business processes
Use case modeling only	• Describes specific interaction between users and system • Foundation for systems design • Shows requirements in context • Facilitates agreement on how system will work for users	• Does not show how system works in business process so system may not meet real business needs • Important input from business users may be missed

Current Practice Approaches 2/3

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	Advantages	Disadvantages
Business process modeling followed by *use case modeling*	• Captures both business process and use case information • Facilitates broad general understanding of both business process and system usage	• Need to capture similar information twice adds redundancy and expense • No integration between business process and use case paradigms, allowing for contradiction and ambiguity • Not clear how system supports business process—two model paradigms are separate
Hybrid approach considering business processes to be groupings of use cases	• Captures business process and use case information together	• May not meet needs of business and/or system stakeholders since perspectives are conflated

Current Practice Approaches 3/3

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	Advantages	Disadvantages
Hybrid approach using use cases to model business processes (business use cases)	• Uses consistent use case paradigm to capture both business and system perspectives • No widely accepted approach to modeling multiple levels of use cases	• Treating organizations as a system may be foreign and confusing to business users • Use cases are not widely used to describe business processes since they require an initiating actor outside the business

BACKGROUND AND CASE STUDIES

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"I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail."

(Maslow, 1962)

- **Ennervation.** Large scale utility-like company, providing services to homes. They were beginning a broad-based effort to change from one way of managing their service deployments to customers to another.
- **National Benefits Agency (NBA).** NBA is a large government agency that provides benefits to citizens. In attempting to modernize and automate its work, NBA contracted for the development of a comprehensive new technological system.
- **Benefisto.** Benefisto is a company that provides medical claims processing.

Conclusions from Case Studies

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- Business process models do not provide a sufficient base upon which to build use case models, despite the common assumption that they do
- A business process model is intended to capture the business process, not to specify how some technology will enable the process
- It is likely that some technology is involved or even essential to most business processes used today, thus technology can't be omitted from business process models

Example based on case studies

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Airline's business processes

- Business process model would include an activity such as "Passenger makes reservation"
- Use case model would also include a use case such as "Passenger makes reservation"
- In the "passenger makes reservation" use case, the roles of the passenger and agent (called actors) interact with the technological system (computer and software) to accomplish the reservation.
- Use cases are not derivable from the business process flow, so the analysis process, including interviewing subject matter experts, reduction, analysis and synthesis, is repeated using the use case paradigm.

A Personal Example

A complex system

Complex system interaction

Complex systems using technology

- How to model a life?
  - Processes?
    - A day in the life
    - Career, family, hobby processes?
  - Use Cases?

"The unexamined [unmodeled?] life is not worth living"
- Socrates

Goals for a new paradigm

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The new modeling approach should be able to show:

- **Flows of Events.** Flows of events, including conditional branching, exceptions, interrupts, simultaneous activities, looping and compound
- **Goals**. Achieve some goal for a stakeholder or user of a system. Capturing the goal of a given activity or sequence is also important to the possibility of re-use.
- **Rationale**. Rationale behind any choice made in requirements derivation or design, and in fact behind even stakeholder requirements.
- **Risks**. Directly connected to elements in a process model, including system elements, activities and perhaps goals and rationale.
- **Decision Alternatives**. Show alternatives, perhaps in a decision tree style with valuations and cost pathways assigned to the various choices per decision theory.
- **Probabilistic Branching**. Probabilistic branching could show alternatives that occur based on chance, and this could even become part of an executable architecture.
- **Relative Temporality**. The ability to show how various processes and activities correspond in absolute or relative time, much as tasks appear on a GANTT chart aligned in time.

Design goals for the new paradigm

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1. Represent business process and use case flows in an integrated model
2. Be able to represent any scope of complex behavior (e.g. a machine, an organization, a city), over any time scale, or mix of time scales (e.g. microsecond weapon timing, insurance claims processing, national energy strategy development)
3. Avoid duplicate elements that represent the same behavior (no copies or proxies)
4. Eliminate the need for unnecessary or unnatural paradigms (e.g. force an organization to think of itself as a “system” rather than an organization).
5. Allow for all normal forms of behavioral patterns including simultaneous action, asynchronous and synchronous behavior, invocation, return, event triggering and continuous action.
6. Models should be understandable and readable by untrained readers using only the aid of legends, labels and the like.

Secondary design goals

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1. Use familiar modeling semantics, syntax, notations, etc. such as SysML/UML, IDEF, BPMN, etc.
   - May need new modeling semantics not provided by these modeling languages
   - Tailoring or extending these languages may be possible
2. Use familiar conventional notations such as timelines, flowcharts, block diagrams, etc.
   - Models developed in the new paradigm can be read without training
   - *The model should not be harder to understand than the thing being modeled*
3. Allow for “fuzzy” definitions of responsible entities or actors, time scales and interactions, as may be appropriate to express limited or evolving knowledge levels.

Survey

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