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# Foundation of Service Science

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## Modeling Services – A Business Process Modelling Perspective

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# **Part I: Introduction to Business Process Modeling**

# References

- “Business Modeling with UML - Business Patterns at Work”, H-E Eriksson, M. Penker, John Wiley & Sons, 2000
- “Essential Business Process Modeling”, M. Havey, O'Reilly, 2005
- “Object-Oriented Analysis and Design with Applications”, G. Booch, R. Maksimchuk, M. Engle, s.a., Addison-Wesley, 2007
- “Service Modelling, Principles and Applications”, Vilho Raisanen, John Wiley& Sons, 2006

# Goal

- **business modeling** helps you understand by modeling the actual business and *goals*, *processes* (activities), *resources* (such as people, machines and material) and *rules* in an organization
  - to identify the proper requirements on the software systems is not the only reason to do business modeling

Business modeling creates an abstraction of a complex business and establishes a common understanding that can be communicated to the business's stakeholders (e.g. owners, management, employees, and customers)

# Definition - business

- **business** = **economic system** in which **goods** and **services** are exchanged for one another and **money**, on the basis of their perceived **worth**;
  - every business requires some form of **investment** and a sufficient number of **customers** to whom its **output** can be sold at **profit** on a consistent basis

[www.businessdictionary.com](http://www.businessdictionary.com)

- here we use the word **business** as a broad term, i.e.
  - 1) any type of ongoing operation that has or uses resources and has one or more goals can be referred to as **business**
  - 2) e.g business that are not profit making (relief organizations for the homeless or for war victims, etc)

# Definition - business

- how we describe the business - steps:
  - 1) the **owner** of the business sets the goals and allocates resources to make the business run
  - 2) the **business modeler** then creates the structure, designs the processes, and allocates the resources in order to achieve the goals
  - 3) the **system developer** then adapts, designs, or develops appropriate information systems that support the running of the business

**Business** = a context capturing relationships between customers and suppliers

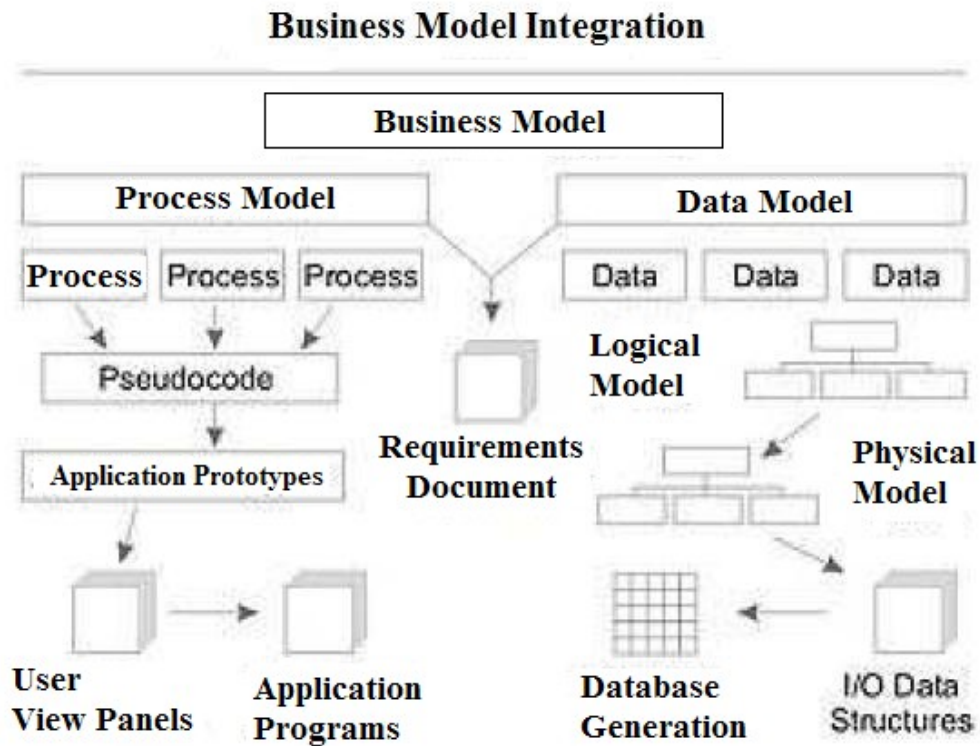
# Business model

- **business model** = a framework for creating economic, social, and/or other forms of value
  - the term **business model** is thus used for a broad range of informal and formal descriptions **to represent core aspects of a business**, including
    - purpose,
    - offerings,
    - strategies,
    - infrastructure,
    - organizational structures,
    - trading practices, and
    - operational processes and policies
- a business model is the method of doing business by which a company can sustain itself.
  - that is, generate revenue



# Business Model

- a business model typically shows business data and business organizations as well as business processes



# Why Modelling?

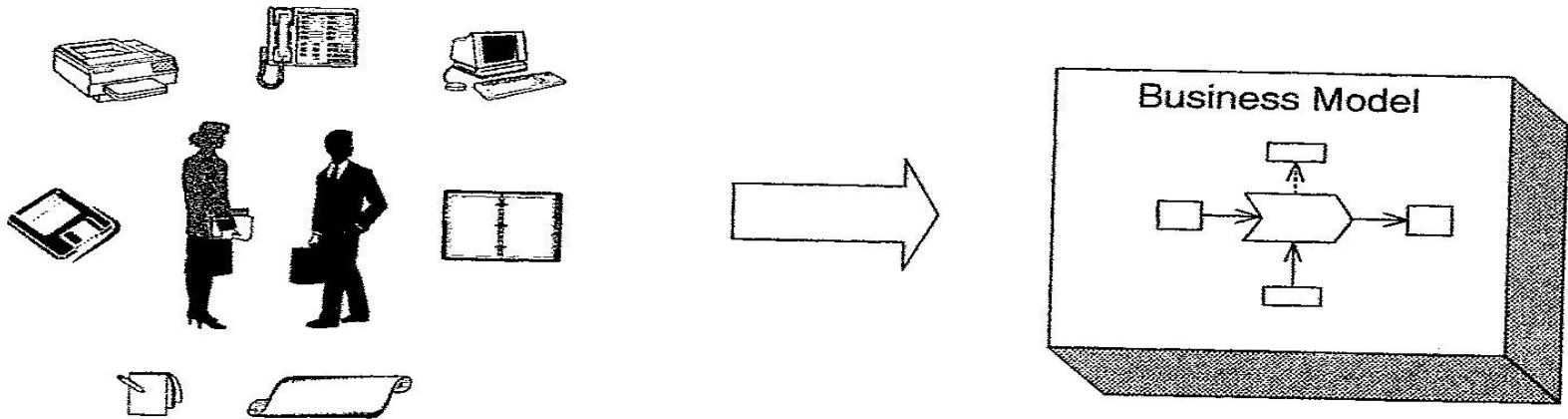
- in today's marketplaces, information systems no longer merely support businesses
  - increasingly, they are an integral part of them

The “business” is what defines the **requirements** of the **information system**

- *how can we use **business models** to identify the correct requirements for the software that support the business ?*

# Definition – business model

- a **business model** is an abstraction of *how a business functions*
  - it is a *simplified view of a business* (complex reality)



# More definitions

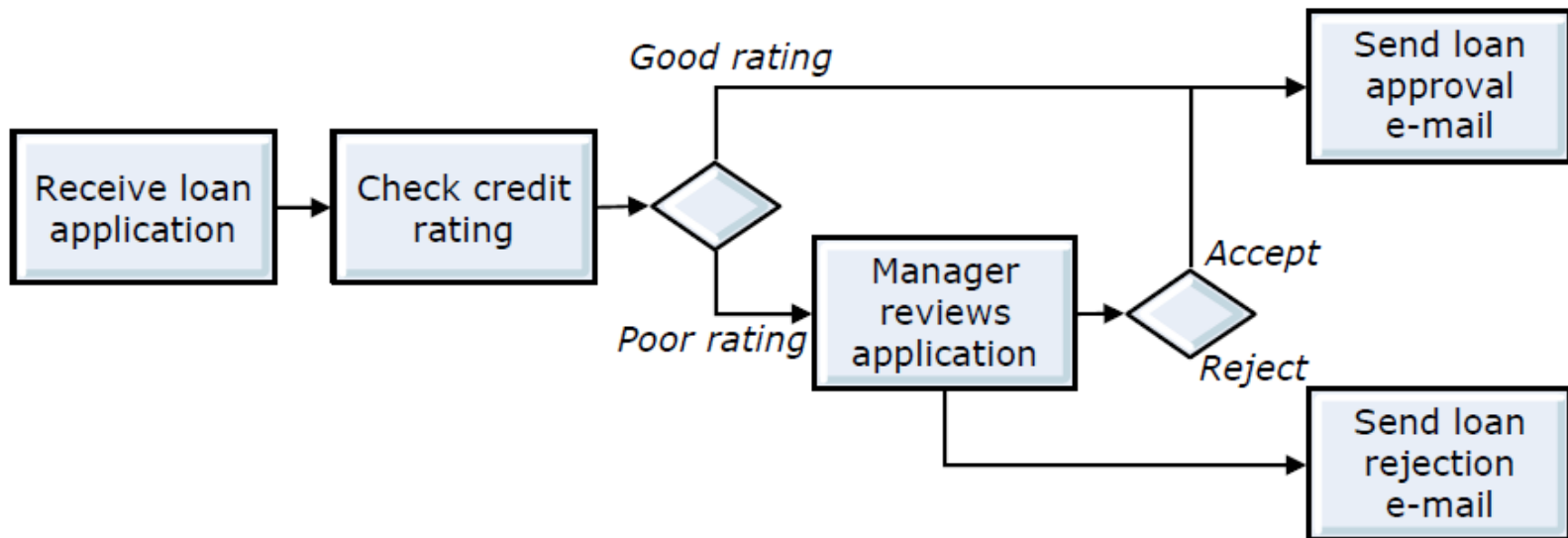
- **goal-problem modeling** = definition of the goals of a company
- **business process** = a description of a set of related activities that, when correctly performed, will satisfy an explicit business goal
- **business rules** = statements that constraint, derive, and give conditions of existence
  - are used to specify allowed states of affairs, including allowed business object states
- **resources** = the objects within the business, such as people, material, information, and products, that are used in the business

# Process Modeling

- process models are core concepts in the discipline of process engineering
- process model – we give this term different meanings
  - e.g., for **business process modeling** the **enterprise process model** is often referred to as the **business process model**

# Example – business process

- business processes support business goals
  - a **business process** is a **set of linked activities that create value by transforming an input into a more valuable output**
    - both input and output can be artifacts or information, or both
    - the transformation can be performed by human actors, machines, or both



# Definition - Business process

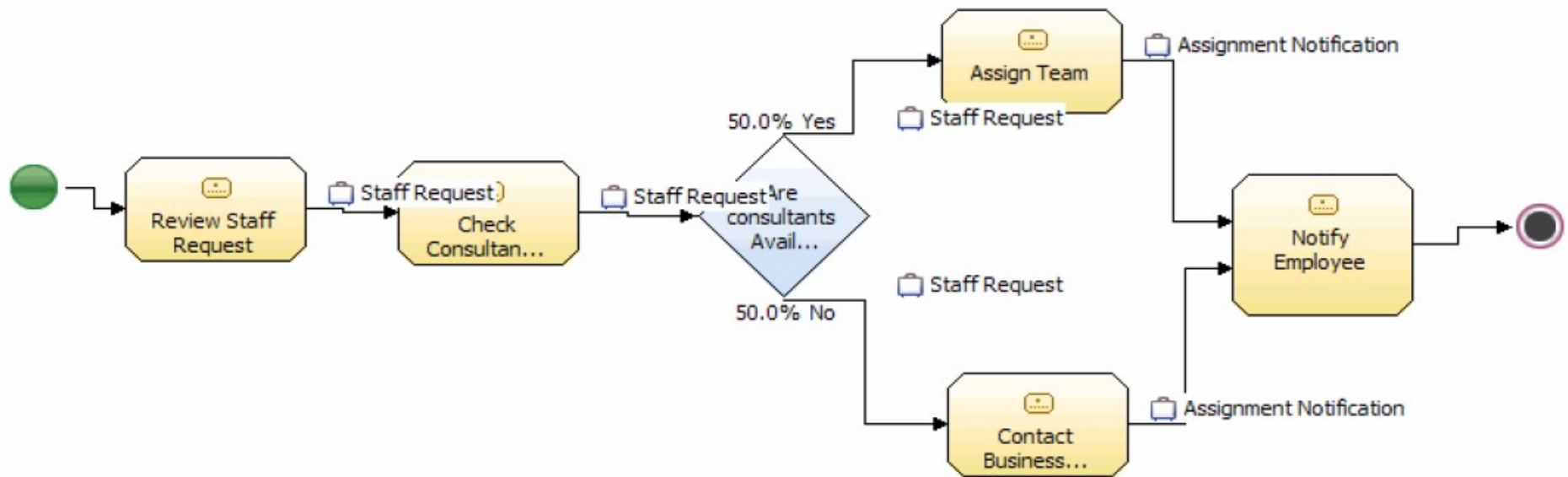
- a **business process** is a collection of related, structured activities or tasks that produce a specific **service** or **product** (serve a particular goal) for a particular customer or customers
- there are three main **types of business processes**:
  - 1) **Management processes**, the processes that govern the operation of a system. Typical management processes include "Corporate Governance" and "Strategic Management";
  - 2) **Operational processes**, processes that constitute the core business and create the primary value stream. Typical operational processes are "Purchasing", "Manufacturing", "Marketing", and "Sales";
  - 3) **Supporting processes**, which support the core processes. Examples include "Accounting", "Recruitment", "Technical support".

# Example – business scenario

- The Big Apple Consulting is an IT consulting service company. Big Apple Consulting assigns their consultants or technicians to help the customers on engagements. The process model that will be created will document how a project manager assigns consultants to different engagements. Based on a simple decision, the project manager will determine where to place resources to fill the staff request. If consultants are available to work, then the project manager can assign them. However, if none are available, the project manager will have to contact a business partner to locate external resources to fill the request.
  - create a project called **Staffing Project** and
  - a *process model* called **Fill Staff Request**
- (vezi laborator)



# Example – business scenario



# Why modeling processes?

- Need to *understand business processes*
  - **existing** business process
    - to understand the problem
  - **potential changes** to the business process
    - to investigate alternative solutions
- Need to *understand organizational interdependencies*
  - how people depend on one another to achieve their goals
  - how goals relate to tasks

The activity of modeling a business process usually predicates a need to change processes or identify issues to be corrected.

This transformation may or may not require IT involvement, although that is a common driver for the need to model a business process.

# Vision on Business Process Modeling

The activity of modeling a business process usually predicates a need to change processes or identify issues to be corrected.

This transformation may or may not require IT involvement, although that is a common driver for the need to model a business process.

- with existing IT technologies:
  1. Change Management programmes to put the processes into practice.
  2. Business Process Models (BPM) to become fully executable (and capable of round-trip engineering)
    - supporting technologies include **Unified Modeling Language** (UML), **Model-Driven Architecture** (MDA), and **Service-Oriented Architecture** (SOA)

# Business Processes – why using?

- **Business Process Automation**
  - Leave existing business processes as they are
    - *Look for opportunities to automate parts of the process*
  - Can make an organization more efficient; has least impact on the business
- **Business Process Improvement**
  - Make moderate changes to the way the organization operates
  - e.g. improve efficiency and/or effectiveness of existing process
    - *Techniques: Duration analysis; activity-based costing; benchmarking*
- **Business Process Re-engineering**
  - Fundamental change to the way the organization operates
  - Techniques:
    - *Outcome analysis - focus on the real outcome from the customer's perspective*
    - *Technology analysis - look for opportunities to exploit new technology*
    - *Activity elimination - consider each activity in turn as a candidate for elimination*

# Modeling business processes

- Business processes involve:
  - multiple actors (people, business units,...)
  - concurrent activities
  - explicit synchronization points
    - e.g. some task cannot start until several other concurrent tasks are complete
  - end-to-end flow of activities
- Choice of modeling language:
  - UML Activity diagrams
    - ... based on flowcharts and petri nets
    - not really object oriented (poor fit with the rest of UML)
  - Business Process Modeling Notation (BPMN)
    - New (emerging) standard, loosely based on pi calculus

# Business process modeling

- *Business process modeling (BPM) is the activity of representing processes of an enterprise, so that the current process may be analyzed and improved*
- BPM is typically performed by **business analysts** and managers who are seeking to improve process efficiency and quality

# Models and Modeling

- **model** = an abstract description of a system
  - a model is expressed with diagrams (graphs) and the diagrams are expressed in a modeling language
  - a model is an expression of something (a business, etc) and always has objectives
  - it is possible to model the same thing with different objectives and to model different things with the same objectives
  
- **modeling** helps to combat the “three evils” of life:
  - complexity
  - lack of understanding
  - communication problems
- impossible to eliminate, but essential to minimize

# Modeling techniques

- many techniques for BPM exist, e.g.
  - flow charts
  - RACI (Responsibility Assignment Matrix) matrix tables (and variations)
  - BPML – Business Process Modeling Language
  - BPEL – Business Process Execution Language
  - etc.
- technique we will be looking at is the UML and BPMN



# Business model

- the **business model** functions as the plan for conducting business
  - it acts as the basis for decision-making and affects decisions about prioritizing goals, obtaining the right resources, or negotiating with subcontractors
  - it serves as an up-to-date description of how business is performed, and allows for changes and improvements in the process, such as cutting costs, improving quality, or shortening time-to-market
  - it can anticipate and forecast changes that are necessary to maintain an edge on the competition

A model is motivated by objectives.

# Representing a business model

- ideally, a business model would consist of a single diagram that included all the important aspects of a business
  - but business is so complex and has many aspects that a single diagram can't capture all that information
- instead, a business model is composed of the following:
  - views
  - diagrams
  - objects and processes

# Representing a business model

- **business view** = a way of looking at or studying a business
  - a business model is illustrated with a number of different views, each of each captures information about one or more specific aspects of the business
  - each view has its own purpose, advantage, and disadvantage
  - e.g. are organizations, human capital, business ideas, business goal models, business processes, workflow models

# Representing a business model

- **business structure view** = the structure of the resources in the business, such as the organization of the business or the structure of the products created
- **business vision view** = the overall vision of the business;
  - it describes a goal structure for the company, and illustrates problems that must be eliminated to reach those goals
- **business process view** = describes the business processes that represent the activities and value created in the business
  - the processes interact with resources to achieve the goal of each process and to show the interaction between different processes
- **business behavior view** = depicts the behavior of each important resource and process in the business, so they can be modeled individually

# Representing a business model

- each view consists of a number of **diagrams**
  - each diagram shows a specific part of the business structure or a specific business situation

Each type of diagram has a different purpose and express one important aspect or mechanism within the business model view.

- e.g. a diagram can show a structure (e.g. the organization of the business) or some dynamic collaboration (a number of objects and their interaction to demonstrate a specific process)

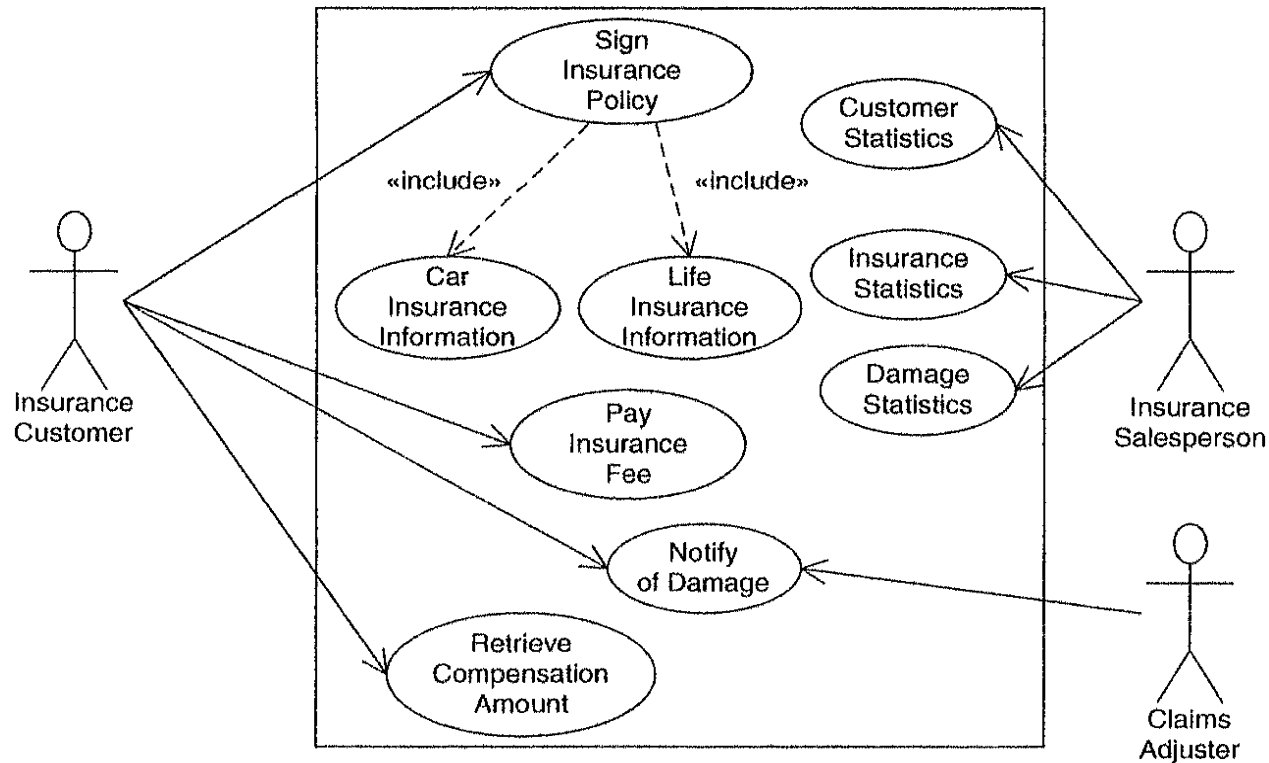
The diagrams contain and express the **objects**, **processes**, **rules**, **goals**, and **visions** defined in the business situation.

# Representing a business model

- concepts are related in the diagrams through the use of different **objects** and **processes**
  - **objects** are the “things” in the business, they may be physical (e.g. people, machines, products, material) or more abstract (e.g. debts, instructions, services)
    - objects can also represent other objects by containing information about other things in the business
  - **processes** are the functions in the business that consume, refine, or use objects to affect or produce other objects

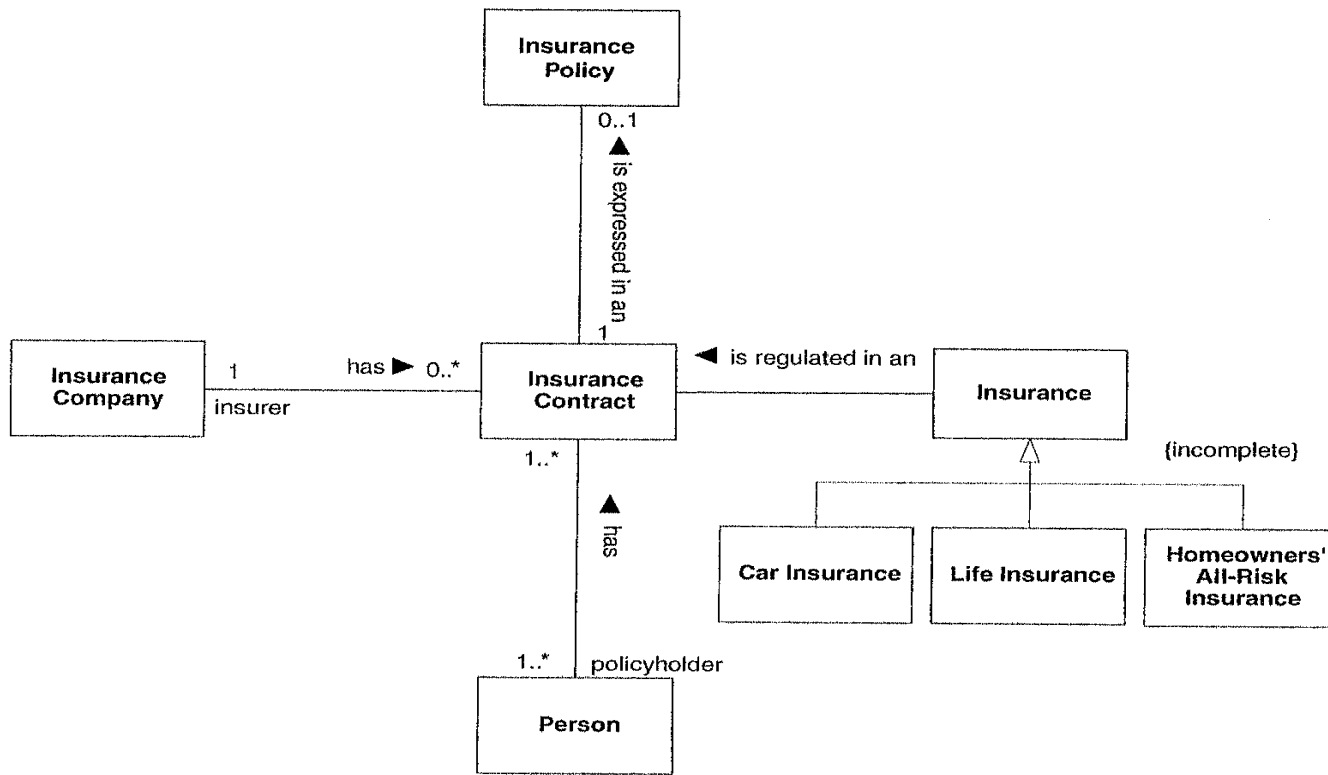
# Example - modeling with UML

- capturing the functional requirements of a computerized insurance system – use case diagram



# Example - modeling with UML

- the class diagram of a small system for insurance companies – capture and describe information within an information system





# Arguments – producing business models

- to better understand the key mechanisms of an existing business
- to act as the basis for creating suitable information systems that support the business
- to act as the basis for improving the current business structure and operation
- to show the structure of an innovative business
- to experiment with a new business concept or to copy or study a concept used by a competitive company (e.g. benchmarking on the model level)
- to identify outsourcing opportunities

# Understand business key mechanisms

- the models give a clear picture of the roles and tasks in the overall organization, therefore they can be used to train people
  - the model is a current snapshot of how modelers currently view the business
  - the model will change and evolve either as modelers better understand the business or as the business changes

# Information system support

- descriptions of the business are used to identify necessary information systems support
- the models are also used as a basis for specifying the key requirements of those systems
  - ideally, large sections of the business model can be mapped directly onto software objects
  - therefore, the systems may become more business-driven and developers can concentrate more on functionality that support business rather than solving technical incompatibilities

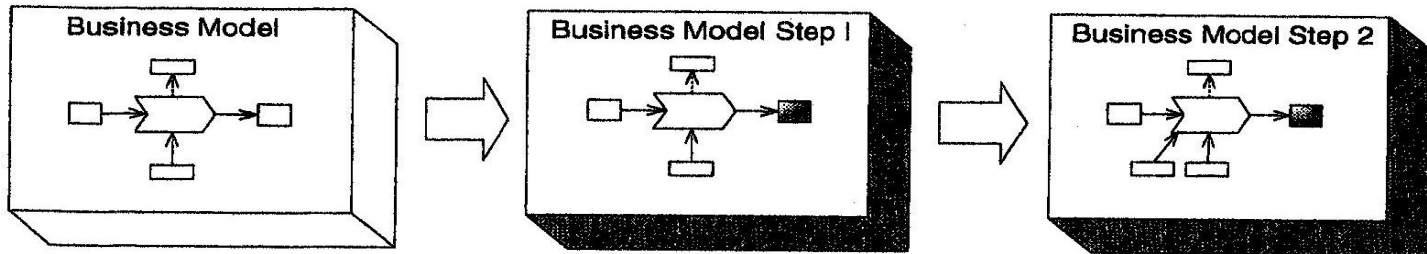
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# Aspects:

1. Improvement
2. Innovation

# Improvement

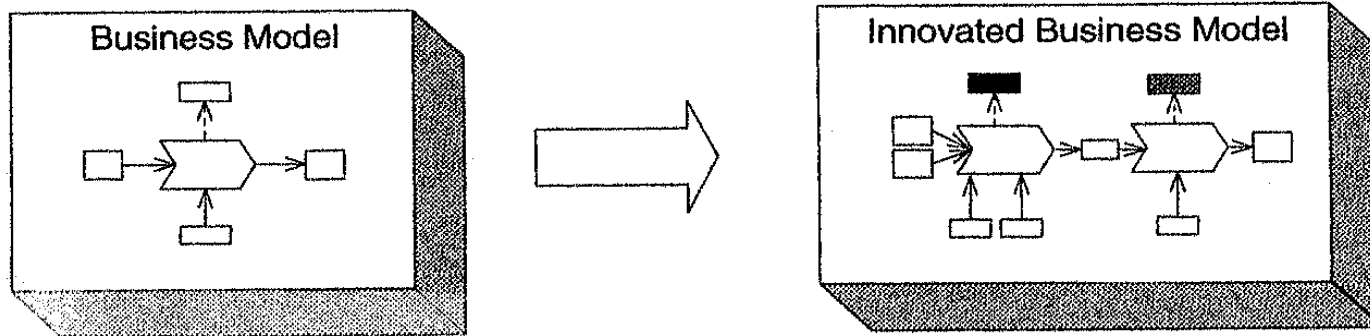
- **Business Process Improvement (BPI)** = techniques in which a business model can be used to improve the current business
  - the business is changed incrementally rather than through immediate and radical means



- activities to change the business and implement the new business model:
  - describe new routines and create administrative support for these routines
  - train the people affected by the changes; teach them the new processes and motivate them to become a part of changes
  - change the information systems that participate in the business to better support and enhance the operation of the business
  - negotiate with subcontractors and other partners who will need to adapt to the changes

# Innovation

- involves analyzing the current business and searching the model for new ways of doing things
- the business model and its processes are changed significantly to create different and improved processes



- extreme form = **Business Process Reengineering (BPR)**
  - radical changes to the business processes – everything about the current way of running the business is questioned and often substantially changed

# Design new process

- business modeling can be used to create new models, not previously part of the business, in order to experiment how the new business concepts fit into the current model
  - models are used to determine if the current organization, resources, and information systems can be easily used in or adapted to the new process
  - Business models are used to benchmark a business, i.e. to copy or study business processes used by competitors in order to measure one's own business against the competition

# Outsourcing

- common practice today – focus on the core business, fundamental processes at the company excels and give them the competitive edge
- processes that not part of the core business will be good candidates for outsourcing
  - business modeling can be used to identify and define the core processes, and to define the processes that are candidates for outsourcing

- The model = a resource for the supplier and becomes a valid specification for how these processes should be performed and integrated with the core processes
- The business model = a map that integrates the processes with each other, indicating where the processes are run by different companies and subcontractors



# Example – Websphere Business Modeler

- WebSphere Business Modeler uses several different models to represent the different aspects of a business process. Together, the different models provide a complete representation of the business process.
  - **Process model:** Work being performed. Provides a pictorial representation of the process model
  - **Data model:** Information used in the work. Provides a view of data and objects used in a business process
  - **Resource model:** Who performs the work. Defines the resource types and instances associated to the model
  - **Organization model:** How process participants are organized. Definition and structure of the organization and associated resources

# Example – Websphere Business Modeler

- WebSphere Business Modeler uses additional models for other process modeling related work.
  - **Analysis model:** What is analyzed. Definition of key process metrics and attributes analyzed in both a static and dynamic manner
  - **Collaboration model:** How analysts share work. Allows for model and deployment collaboration on process models
  - **Business measures model:** What is to be monitored. Definition of key performance indicators (KPIs) and metrics to measure system and process performance triggers

# Ce este un serviciu – business perspective

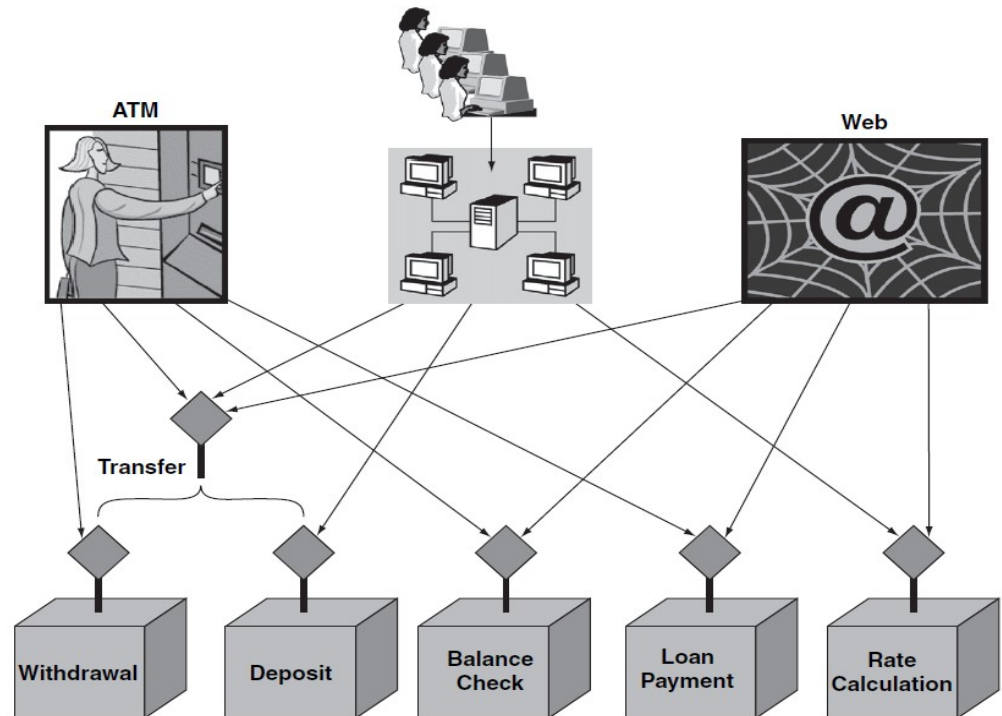
- exemplu - servicii oferite de catre functionarii de la banca pentru clientii bancii (functionarii pot fi specializati pe anumite servicii sau pot oferi diverse servicii diversilor clienti)
- servicii tipice:
  - gestionarea conturilor (deschidere si inchidere);
  - credite (procesarea aplicatiilor, intrebari asupra termenilor si conditiilor, acceptarea platilor);
  - retrageri, depozite, transferuri;
  - schimb valutar;
- procesarea unei tranzactii poate necesita deplasarea clientului la mai multe birouri (ghisee / functionari) – rezulta un *flux de procese (operatii / taskuri / activitati) de lucru*
-

# Ce este un serviciu – business perspective

- sistemele IT aflate in spatele ghiseelor **automatizeaza** serviciile bancare
  - serviciile sunt furnizate clientilor prin intermediul functionarilor
  - serviciile implementate de sistemele IT trebuie sa corespunda si sa sustina serviciile furnizate de catre functionari
  
- *cum putem gandii implementarea acestor servicii, astfel incat indiferent de modul in care sunt accesate – prin intermediul unui functionar, de la ATM sau prin intermediul Internetului (servicii Web) – rezultatul de fie acelasi?*

# Exemplificarea unui “serviciu”

- un serviciu bancar poate fi accesat de catre utilizator prin intermediul ATM-ului, prin intermediul unui ghiseu / functionar aflat in retea bancii, sau prin intermediul Internet-ului, de la propriul calculator de acasa
- in acest context, nu ne intereseaza mediul de implementare al serviciului; este important doar serviciul in sine
- de exemplu, doua servicii pot fi combinate pentru a crea un nou serviciu
- *serviciile software se aliniaza cu serviciile de business ale organizatiei pentru a indeplini scopuri strategice (e.g. sa furnizeze acces prin ATM si Web la servicii bancare care sunt disponibile si la ghiseu)*



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## **Part 2: Modeling digital services**

# Requirement

- digital services have reached sufficient maturity to achieve mass-market acceptance, and consequentially, also an increasing number of providers.
  - as a consequence of these developments, effective ways of providing services is becoming increasingly important;
  - the situation can be likened to improvements in manufacturing industry, resulting in higher productivity for complex products such as automobiles
    - references to “Service science”
- modeling digital services connects to:
  - Service Oriented Architecture (SOA)
  - Web Services
  - Service Oriented Development (SOD)
  - related technologies
  - etc ...
- we are focusing on **IT-enabled business services**

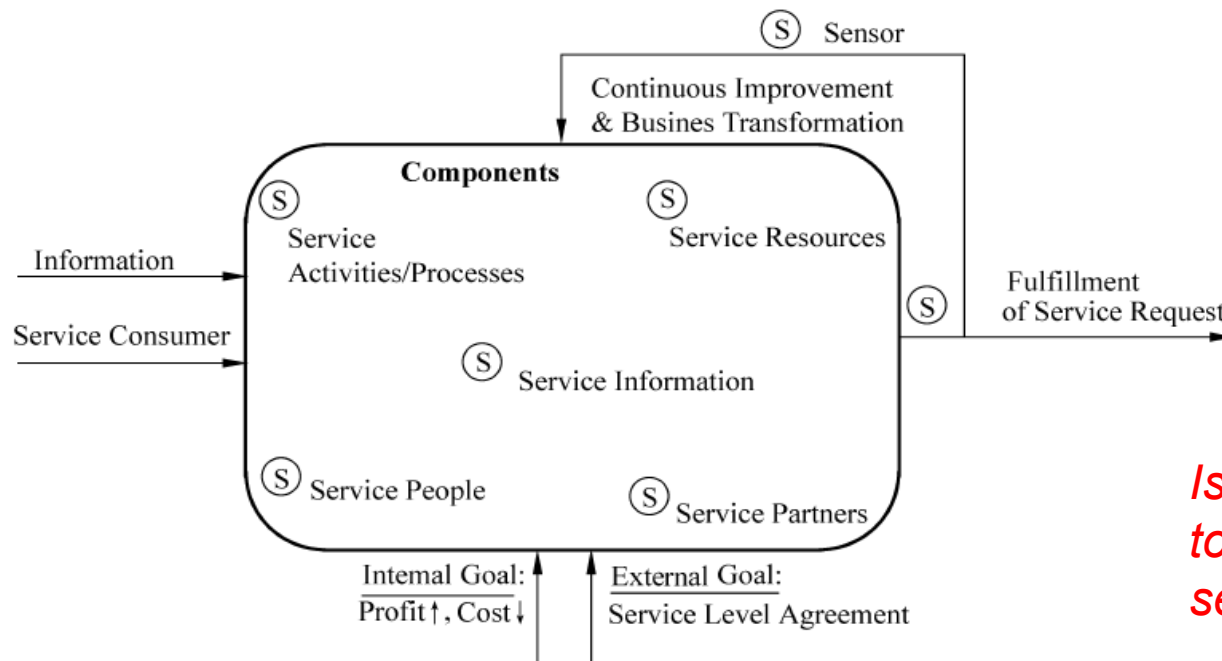
# IT-enabled business services

- **Services** (definition) = a type of relationships-based interactions (activities) between at least one service provider and one service consumer to achieve a certain business goal or solution objective (“Services Computing”, Liang-Jie Zhang, Jia Zhang, Hong Cai, Springer, 2007)
- IT-enabled business services – features:
  - the *service operation model*
    - defines how service is delivered – services can be realized in different ways
      - end-to-end service operation model (traditional)
      - hosted service model, business process outsourcing, data-centered outsourcing, services through online broker agency (novel approaches based on IT)
  - the *service charge model*
    - specifies how the delivered model is to be charged
      - free-of-charge models
      - fee-based models
      - government service models



# IT-enabled business services

- we approach business services realized by IT software systems
- we call them “service systems”
- example: a service system hosted by a service provider can be described as a self-contained encapsulated system providing some services to the outside world



*Is there any connection to the educational service system?*