

# Business Informatics 2 (PWIN) SS 2017

## Information Systems I IS Basics

**Prof. Dr. Kai Rannenber**

Deutsche Telekom Chair of Mobile Business & Multilateral Security  
Johann Wolfgang Goethe University Frankfurt a. M.

- Information Systems in a Nutshell
- Examples of Information Systems
- Introduction to Enterprise Modelling
- Excursus: Research on Information Systems

# Information System and Application System

- **Information System (IS):**

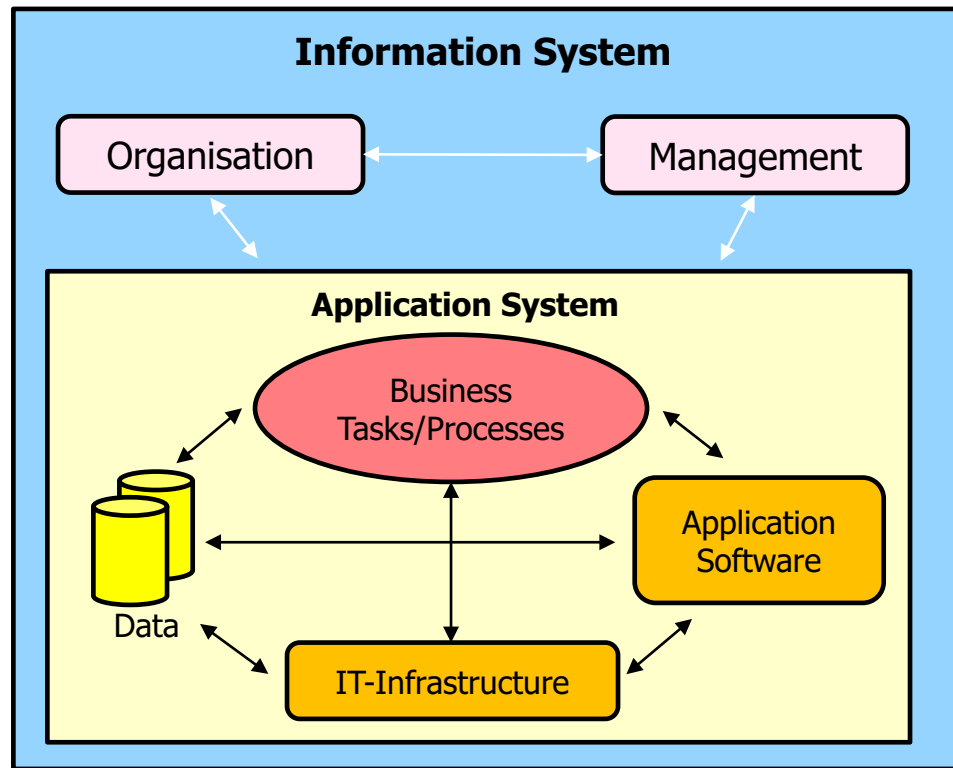
A system which was built to be used in a part of an enterprise. It contains all relevant application systems and is embedded into the organisation and management of an enterprise.

- **Application System (AS):**

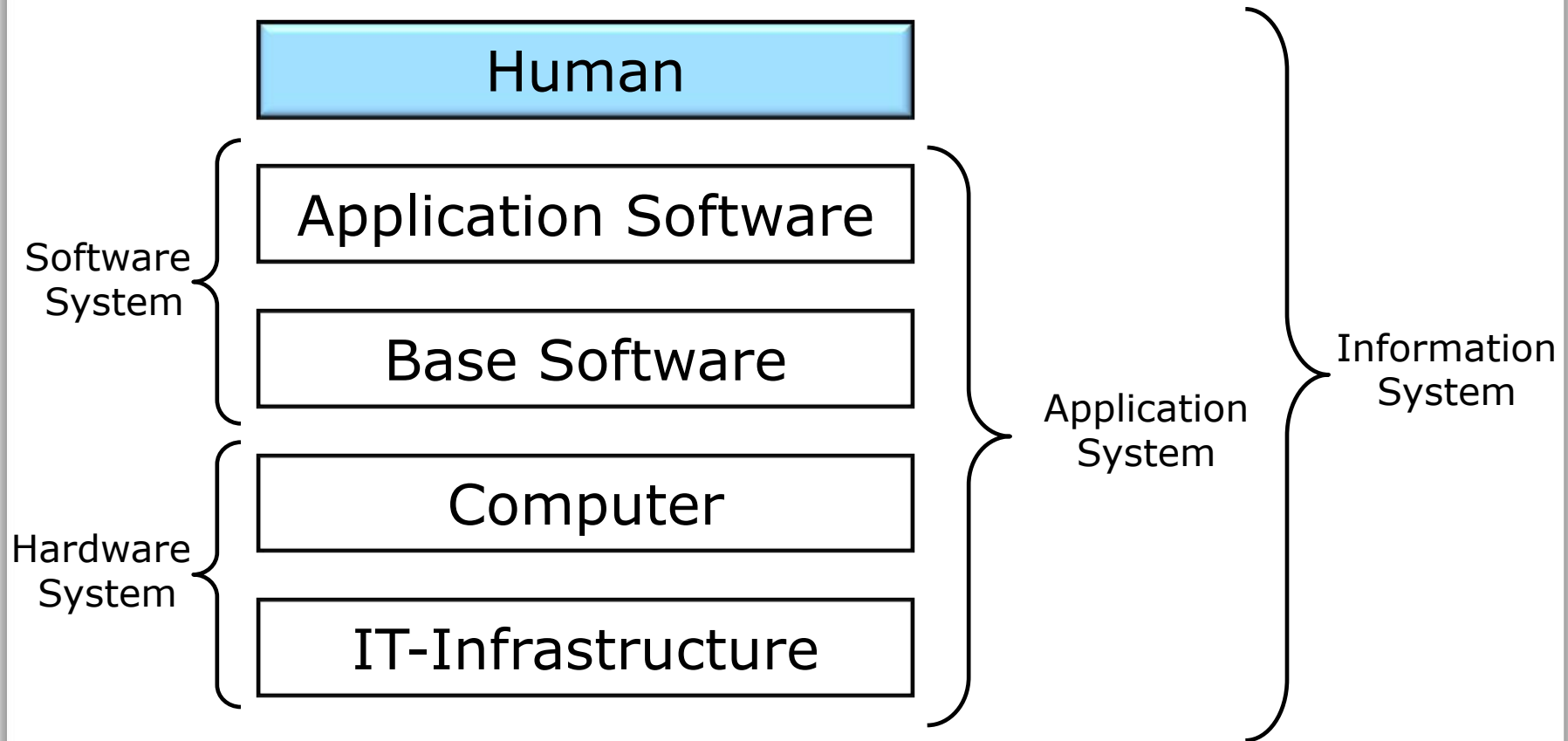
A system, which consists of business tasks and processes it supports, the underlying IT-infrastructure, the application software and the data it required in order to accomplish its objectives.

# Information System

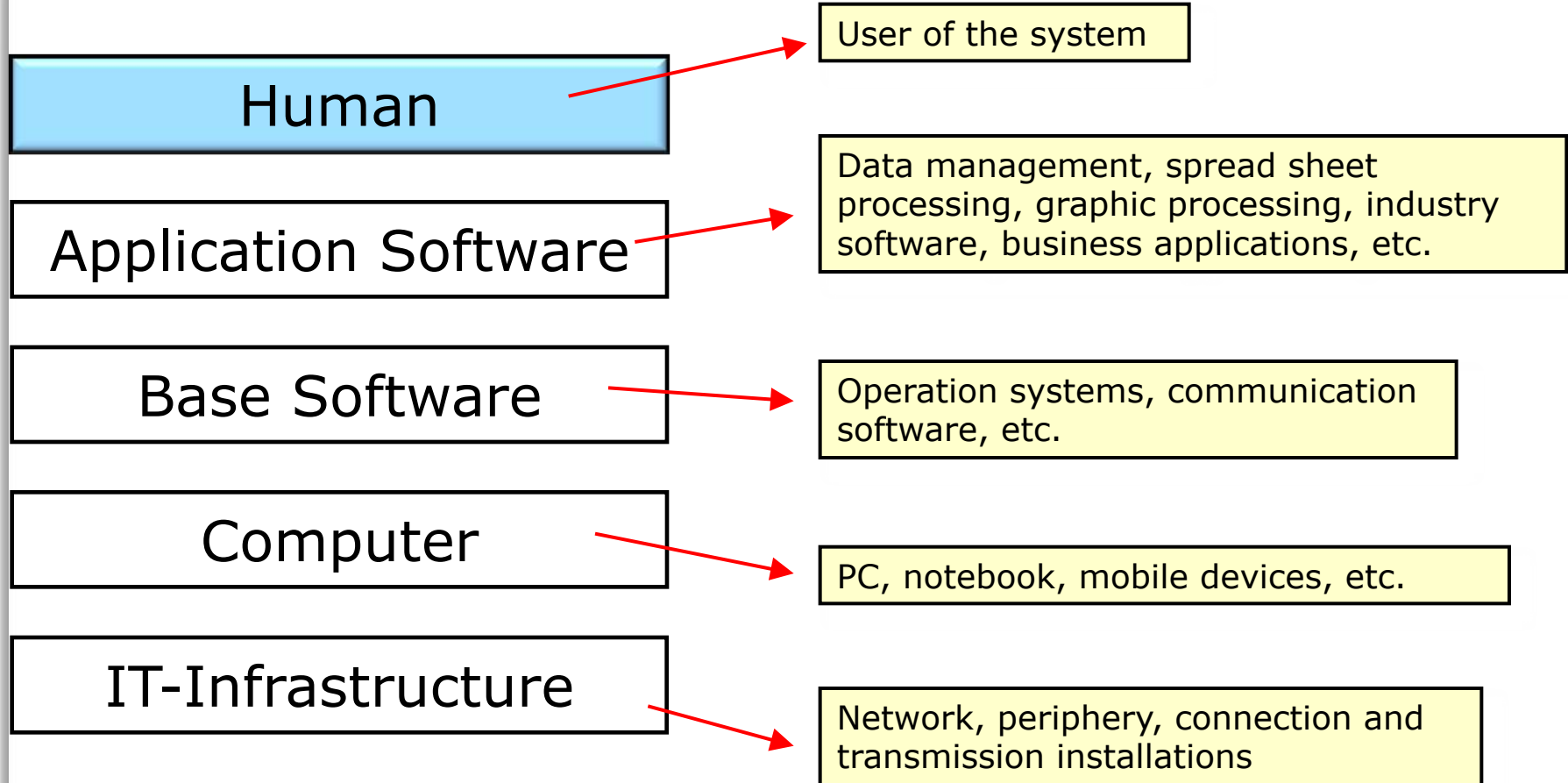
Source: Laudon, K.C., Laudon, J.P., Schoder, D. (2010), p. 18.



# Information and Application Systems (different perspective)



# Information and Application System



# Data and Information

- **Data:** Characters (symbols), which are based on mutual agreements, represent information in an electronically processable manner.
- **Knowledge:** Contents containing the beliefs about the truth of statements (Wittmann, 1959).
- **Information:** Explicit (in the form of language expressed) knowledge, which is used by humans in order to accomplish business objectives → purposeful knowledge (Wittmann, 1959).
- **Communication:** Exchange of information between humans as well as the exchange of data between machines.

## Data

**- MINUS -** *Die großen Preise..*

Adalbertstr. 44  
60486 Frankfurt

Region

Pos.		MwSt.	EUR
1	3,5% Milch 1L	E	0,55
2	Maultaschen	E	1,19
3	Maultaschen	E	1,19
4	Korkenzieher	V	4,99
5	Gerieb. Käse	E	0,99
Summe EUR			8,91
BAR EUR			10,00
Rueckgeld EUR			1,09
MwSt 7% (E) von 3,92			0,26
MwSt 16% (V) von 4,99			0,69
NETTO-UMSATZ			7,96

Price

Item No

Payment Method

Cashier ID

Time & Date

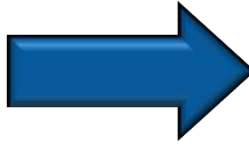
Kasse: 002/0018 Bon: 0639PE01Z

Datum: 08.03.2006 Zeit: 14:25:00

Invoice No

Time & Date

1 Monat Rückgaberecht gegen Vorlage des Kassenbons!



## Information for „Distribution Controlling“

Distribution Section:  
Frankfurt West

Market:  
Supermarket -MINUS-

Item No.:  
12223

Description: Pasta Squares

Sold Quantity: 7.156

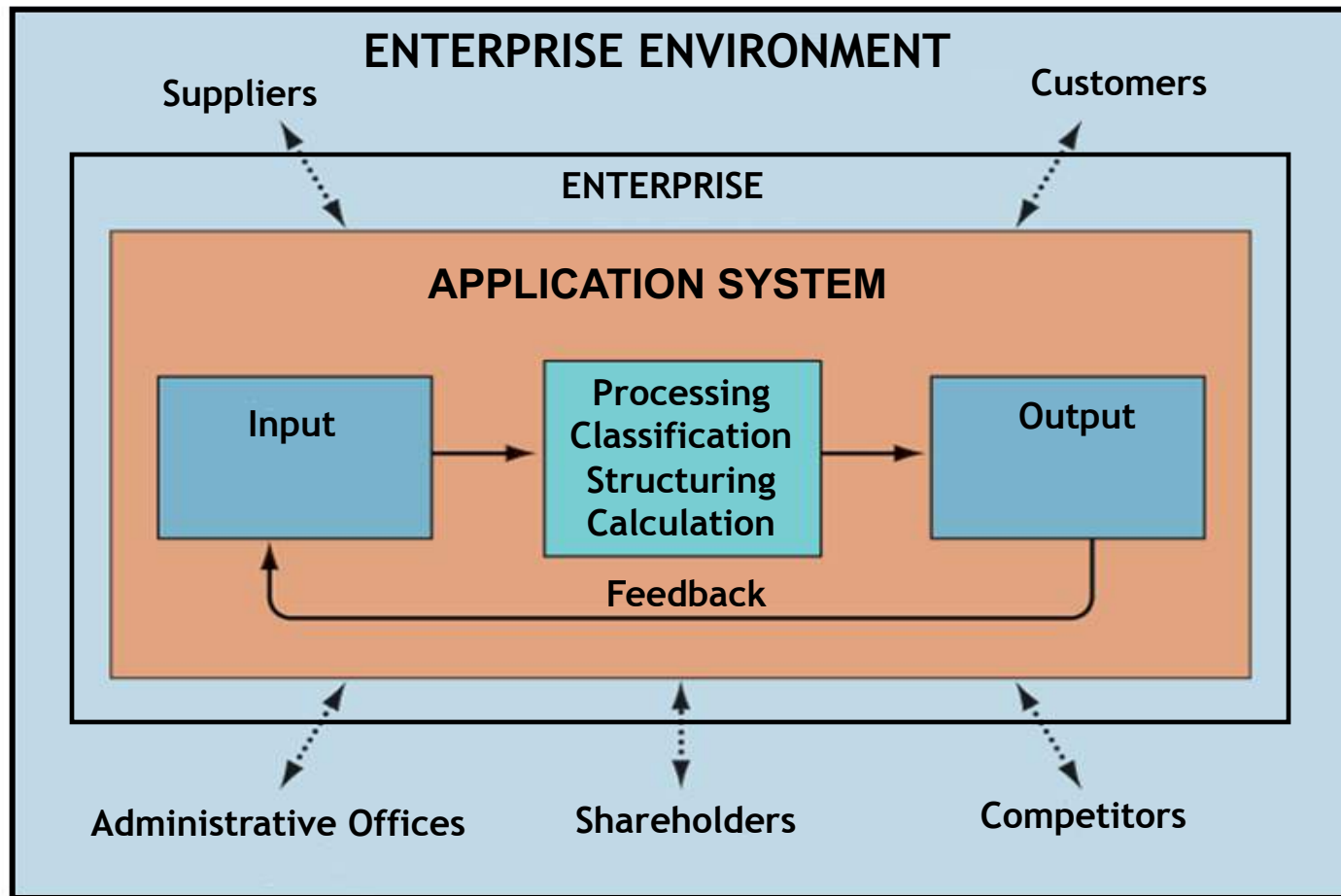
Total Revenue:  
€ 8515,64



# Elementary Functions of Application Systems with regard to Data and Information

- **Input:** Entering or gathering of raw data → E.g. item ids for shirts, sold units, code for department store
- **Processing:** Transformation of data into a form comprehensible for humans → E.g. which shirts have to be produced? For which department stores? Which department stores generate the highest revenue? ...
- **Output:** Distribution of processed information to the respective persons in charge → E.g. transmission to TAL, J.C. Penney, shirt producer ...
- **Feedback:** Output is sent back to persons in charge for the purpose of evaluation / correction

# Features of an Application System



Source: Laudon, Laudon, Schoder (2010), p. 20.

- **Formal System:** A system which is based on accepted and fixed definitions for data and processes and works based on predefined rules.
- **Program:** A processing specification (algorithm) consisting of a series of commands, expressed in the machine code of the respective executing computer.
- **Software:** Program written in a programming language
- **Hardware:** Physical devices used for the purpose of input, processing and output in information systems.

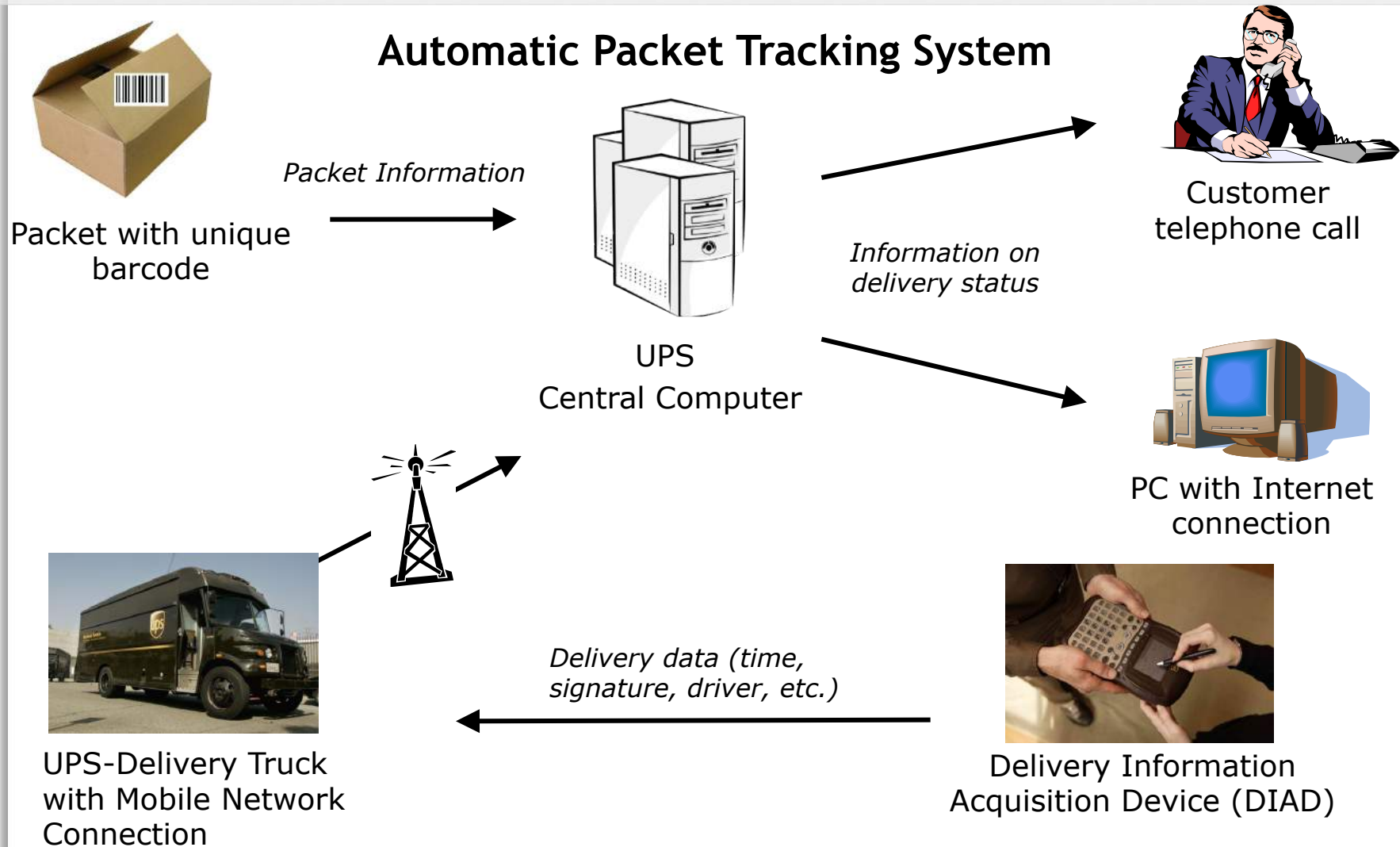
- Information Systems in a Nutshell
- Examples of Information Systems
- Introduction to Enterprise Modelling
- Excursus: Research on Information Systems

# State-of-the-Art IS: UPS Packet Tracking System

*Using a handheld computer called a Delivery Information Acquisition Device (DIAD), UPS drivers automatically capture customers' signatures along with pickup, delivery, and time card information. UPS information systems use these data to track packages while they are being transported.*



# State-of-the-Art IS: UPS Packet Tracking System



# IS Dimensions of UPS Packet Tracking System

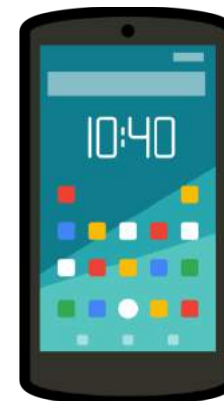
- **Organisational:**
  - Procedures for tracking packages and managing inventory and provide information
- **Management:**
  - Monitor service levels and costs
- **Application System**
  - Handheld computers, bar-code scanners, networks, desktop computers, etc. (Hardware)
  - Bar-code scanner firmware, desktop operating systems, Delivery Status software, etc. (Software)



# Future IS: Travelling Assistance for Frequent Flyers

## Mobile Customer Relationship Management System

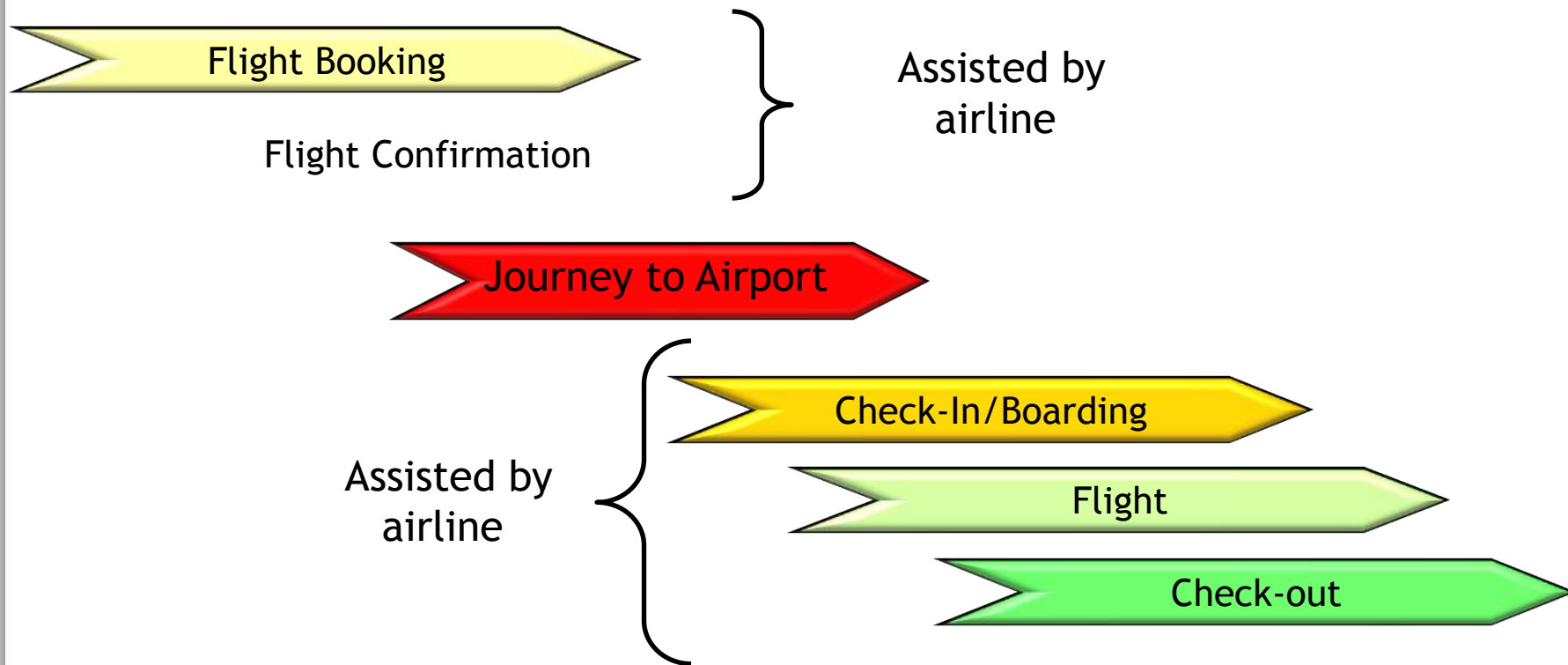
- Passengers get assistance during their journey (e.g. by car) to the airport from their airline.
- If delays for the journey are detected (e.g. caused by traffic jam), the passengers are contacted by the airline.
- The passengers will be offered personalised services via their mobile device. (e.g. parking service at the airport)
- Depending on the delay, these services can reduce the risk of passengers actually missing their flight.







# Motivation for Travelling Assistance for Frequent Flyers

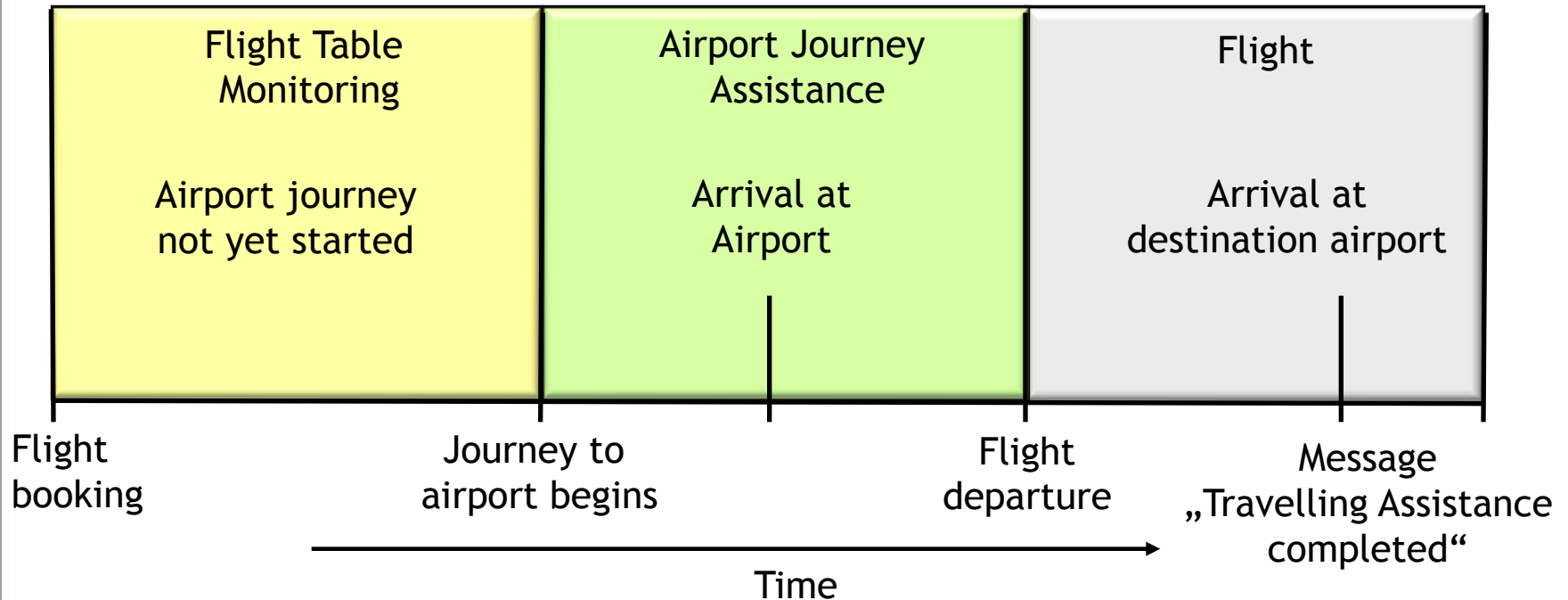


Disruption in Flight Travelling Service Chain

# Why Frequent Flyers?

- High-profit customers of an airline
  - Customer loyalty through service provision
- Frequent Flyers are typically business people
  - Reaching flight = reaching business appointment
  - Costs for service are not relevant
- Preferences of target group are well-known
  - High personalisation of services possible

# Phases of Travelling Assistance



The Travelling Assistance can be divided into 3 phases:

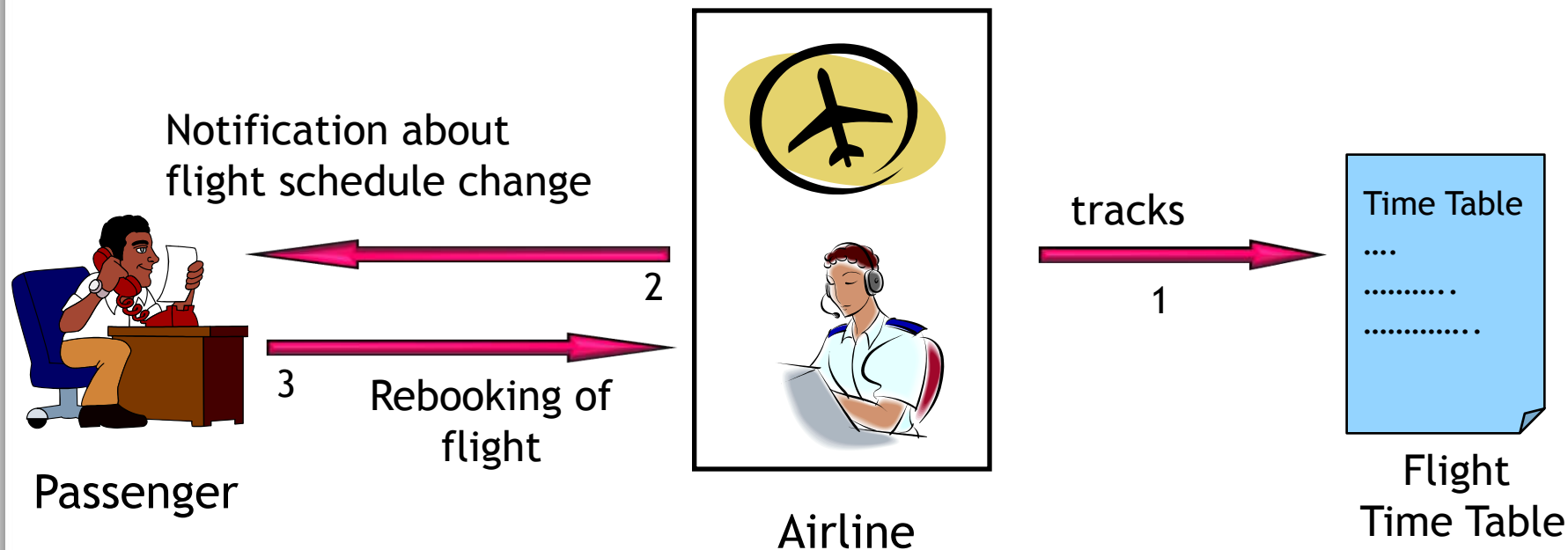
- Flight time table monitoring until departure to the airport
- Assistance during journey to the airport
- Flight to till arrival at destination airport



# Booking of Travelling Assistance

- Travelling Assistance is offered subsequently to the flight booking.
- Passenger has to submit their prospective luggage type (travel or carry-on luggage) and their means of transport (e.g. by car or train).
- Passenger provides airline with preferred communication channel in case of delays (Voice, SMS, etc.).
- Passenger books support services in advance:
  - Parking service at the airport
  - Transfer from parking garage to gate
  - Live traffic and travel information

# Flight Time Table Monitoring



Airline tracks flight time table changes until passenger begins journey to the airport.

# Begin of Journey to the Airport

## Passenger

- Check of current service configuration
- Check of current traffic situation
- Check of status journey status (e.g. delayed, on time, etc.)



Passenger



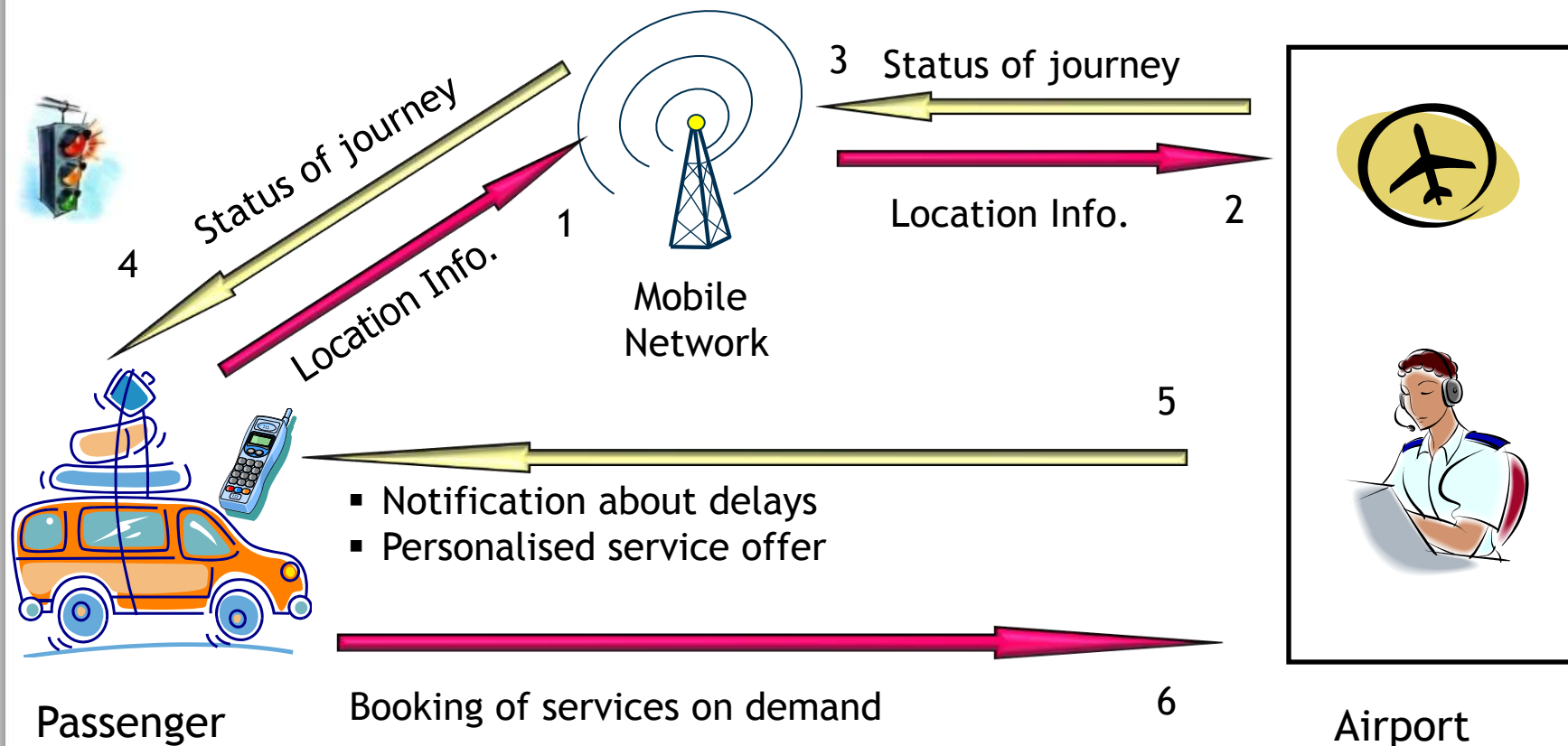
Explicit activation of assistance for  
the journey to the airport



Airline

Shortly before a passenger leaves for the airport, they activate the assistance.

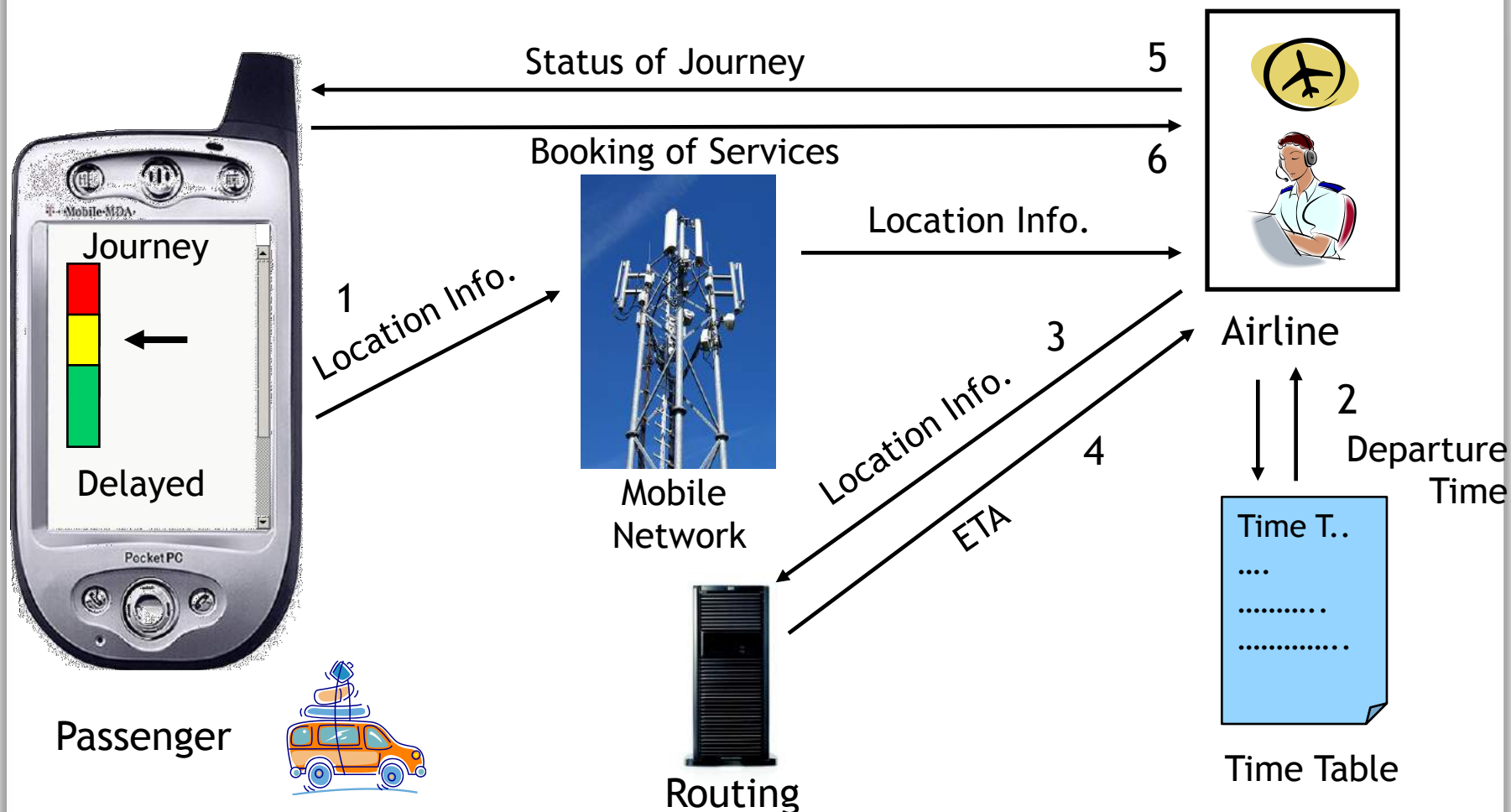
# During the Journey to the Airport



The airline monitors the location of the passenger's mobile device and thereby calculates their ETA.



# Underlying technological Concept of the Travelling Assistance





# Arrival at the Airport

Execution of booked services by airline

- Parking Service
- Transfer to Gate
- Priority Check-In
- Accelerated luggage transportation
- ...



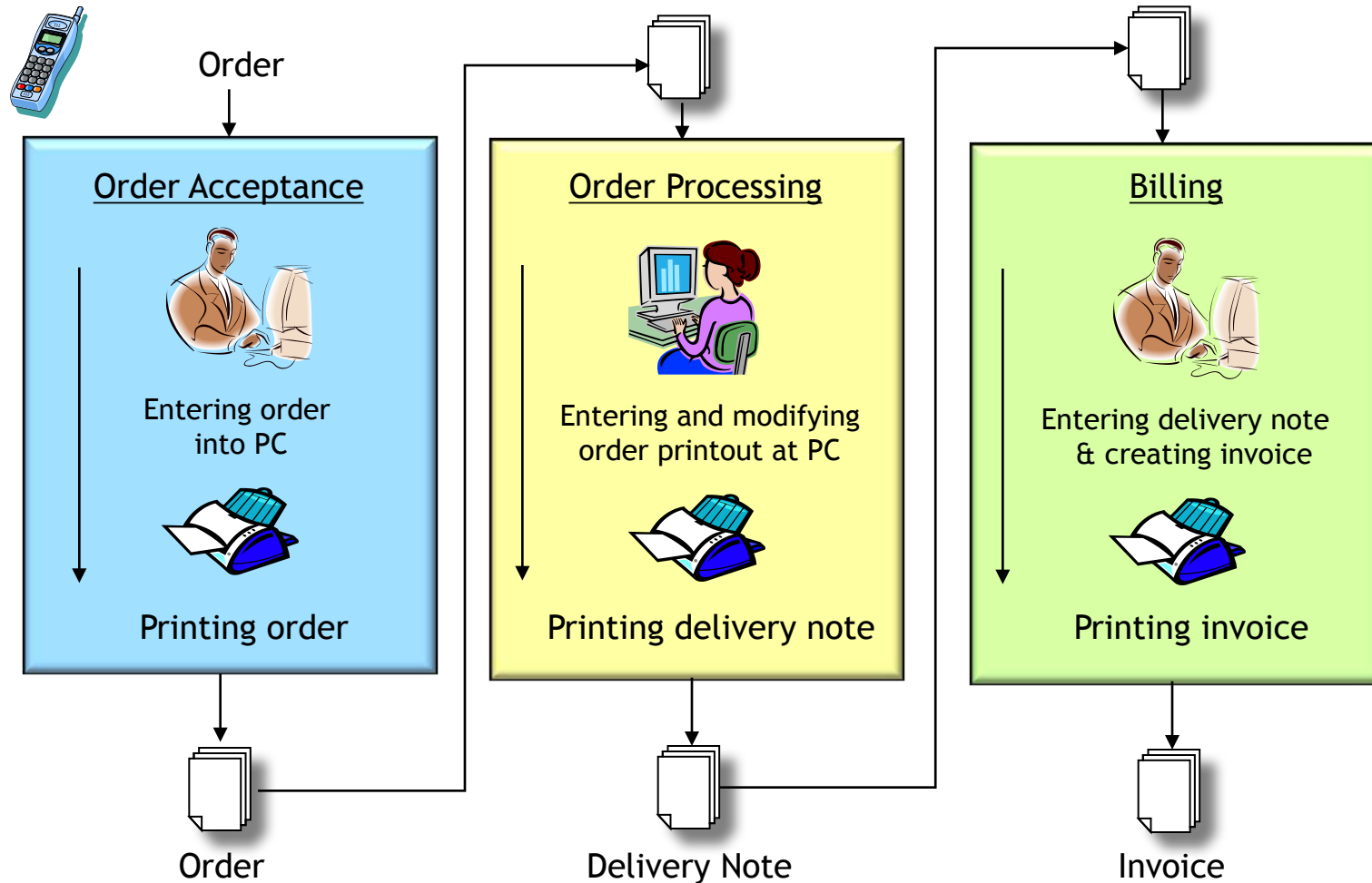
Compensation of delay during journey to the airport allows passenger to reach their flight.

After the arrival at the destination airport, the passenger receives the notification that travelling assistance is completed.

- Information Systems in a Nutshell
- Examples of Information Systems
- Introduction to Enterprise Modelling
- Excursus: Research on Information Systems

# Isolated Information Systems

Business process in an enterprise (example)



# Problems of isolated Information Systems

Due to media disruptions between Information Systems, isolated Information Systems are

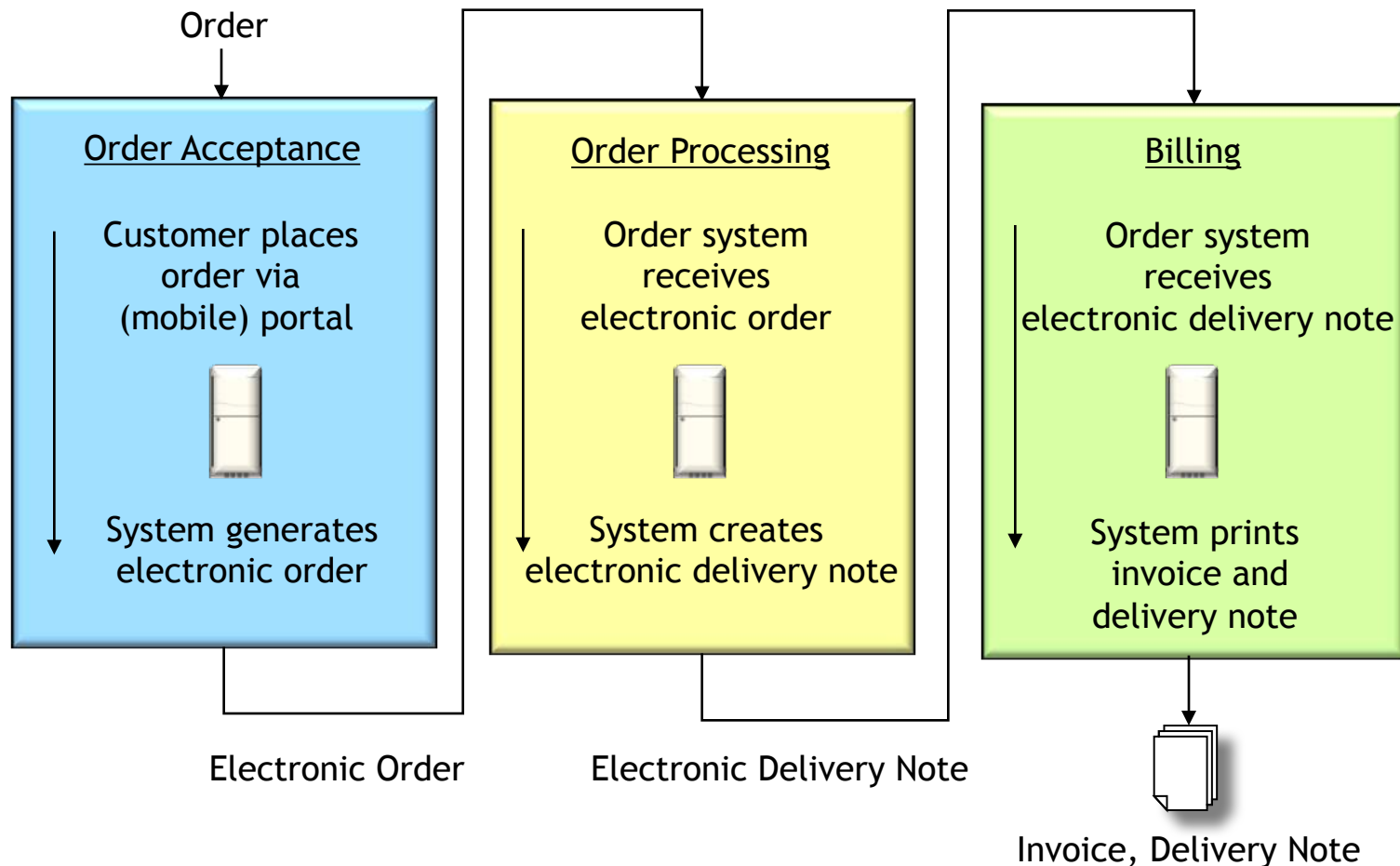
- prone to errors,
- personnel-intensive,
- cost-intensive,
- and inflexible (e.g. regarding order modifications).

Further, media disruptions also lead to



- long processing times and
- complex controlling due to lack of common data basis.

# Connected Information Systems

## Business process in an enterprise (example)



# Connected Information Systems

- Requirements for the development of connected Information Systems
- 
- Holistic view on an enterprise and its organisation, management, business processes, resources, etc.
- 
- Enterprise Modelling as approach

- Enterprise Modelling

- Enterprise modelling is the abstract representation, description and definition of the structure, processes, information and resources of an identifiable business, government body, or other large organization.

(Source: Leondes and Frymuth Jackson 1992)

- Enterprise Model

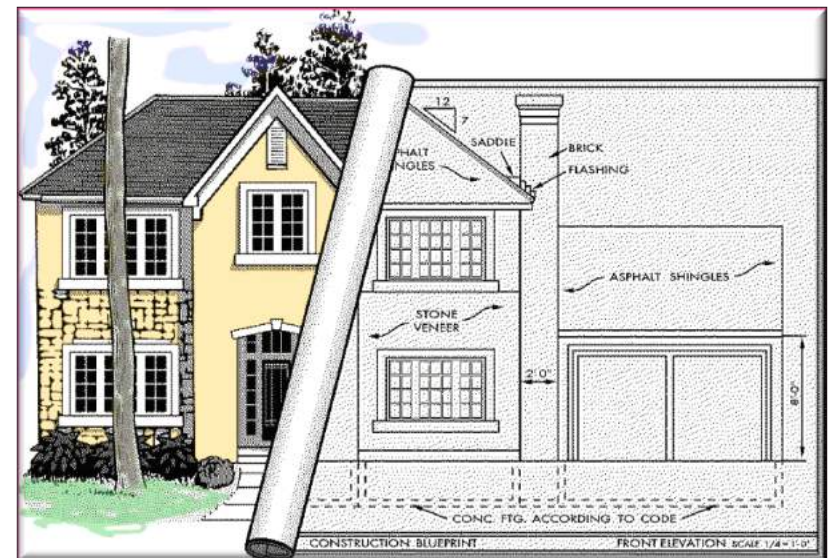
- An enterprise model is a representation of the structure, activities, processes, information, resources, people, behaviour, goals, and constraints of a business, government, or other enterprises.

(Source: F.B. Vernadat 1997)

# What is a Model?

- A model is a representation of a the real world with the following properties
  - **Representation:** A model is always representation of natural or artificial objects, which themselves can be models.
  - **Abstraction:** Models are typically an excerpt of reality.
  - **Pragmatism:** The contents of a model are relativized through the following questions: For whom? Why? For what?

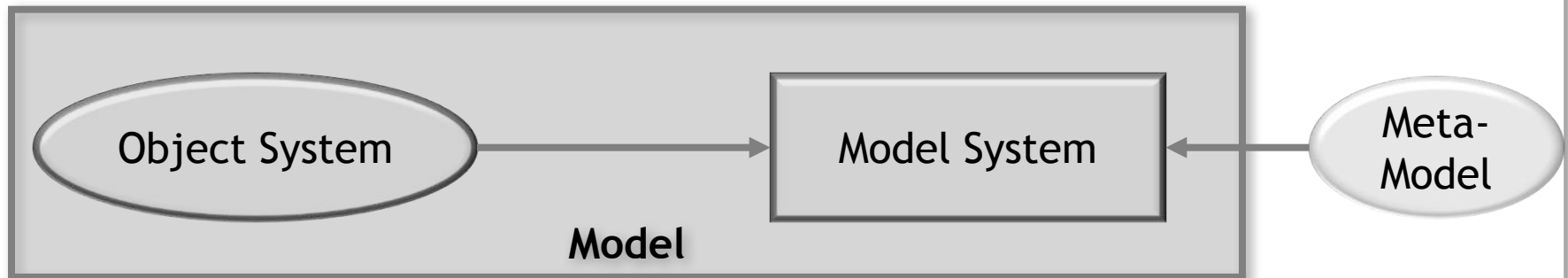
- *Example:*
  - Building vs. Build Plan





# Modelling according to the „Rules“

- **Consistent correspondence of structure and behaviour** between model and original required
- Consequently, the modelling function has to be a **homomorph** transformation
- The “language” for the definition of a model system is provided by a meta-model.



# Abstraction Mechanisms of Models

- Models are built for the purpose of **simplification and complexity reduction**
- Abstracting mechanisms for modelling are:
  - **Aggregation** (vs. Disaggregation): Several different objects are combined to a new object.
  - **Generalisation** (vs. Specialisation): Similar objects are abstracted to become a new high-level object.
- Example
  - **Aggregation**: Keyboard, Display, Antenna, Case  
→ Mobile Device
  - **Generalisation**: Mobile Phone, Smart Phone, Notebook →  
Mobile Device

# Enterprise Modelling Concepts

**There are several techniques for modelling the enterprise such as**

- Active Knowledge Modelling
- Enterprise Modelling Methodology/Open Distributed Processing (EMM/ODP)
- Design & Engineering Methodology for Organizations (DEMO)
- Dynamic Enterprise Modelling
- ...

**More enterprise modelling techniques are developed into Enterprise Architecture framework such as**

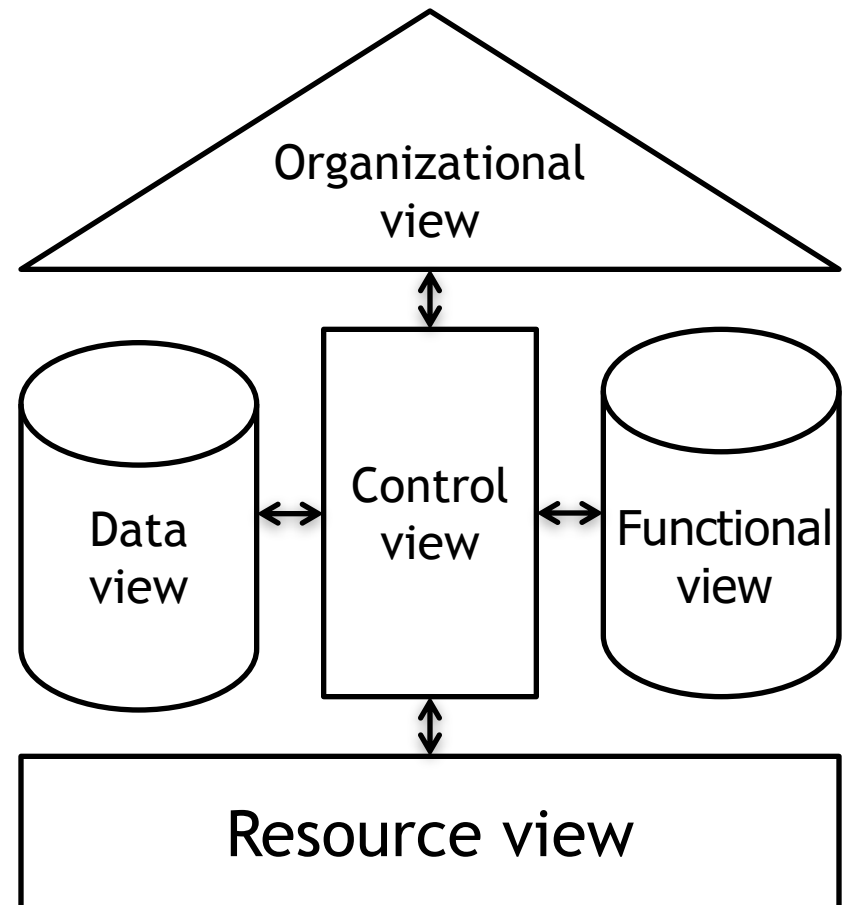
- ARIS - ARchitecture of Integrated Information Systems
- DoDAF - the US Department of Defense Architecture Framework
- OBASHI The OBASHI Business & IT methodology and framework
- ...

# ARIS - Architecture of Integrated Information Systems

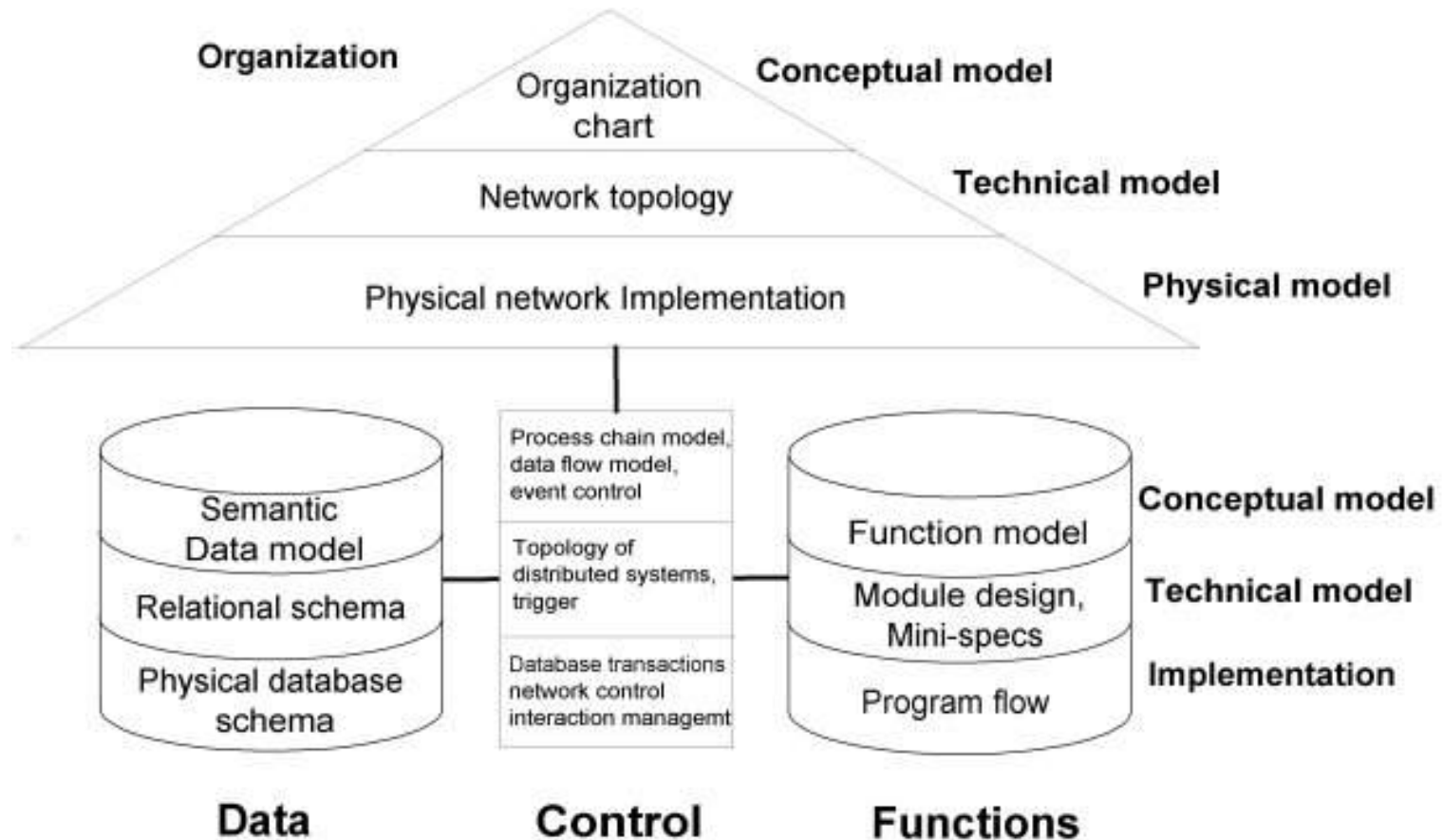
- Enterprise Modelling Framework
- Offers methods for analysing (business) processes
- Provides a holistic view of process design, management, work flow and application processing
- Originally developed by Prof. Dr. August-Wilhelm Scheer in the 1990es

# ARIS Views on the Enterprise

- **Organisational View**
  - Resources (humans, machines, hardware, etc.)
  - Organisational Chart
- **Functional View**
  - All processes generating output as well as their relation to each other
  - Function Tree
- **Data View**
  - All events generating data (e.g. documents, e-mails, etc.)
  - Entity-Relationship Model
- **Control View**
  - Integration of all other views into a logic process
  - Event-driven Process Chains
- **Resource View**
  - Services, Products and Financial Assets
  - Product Tree



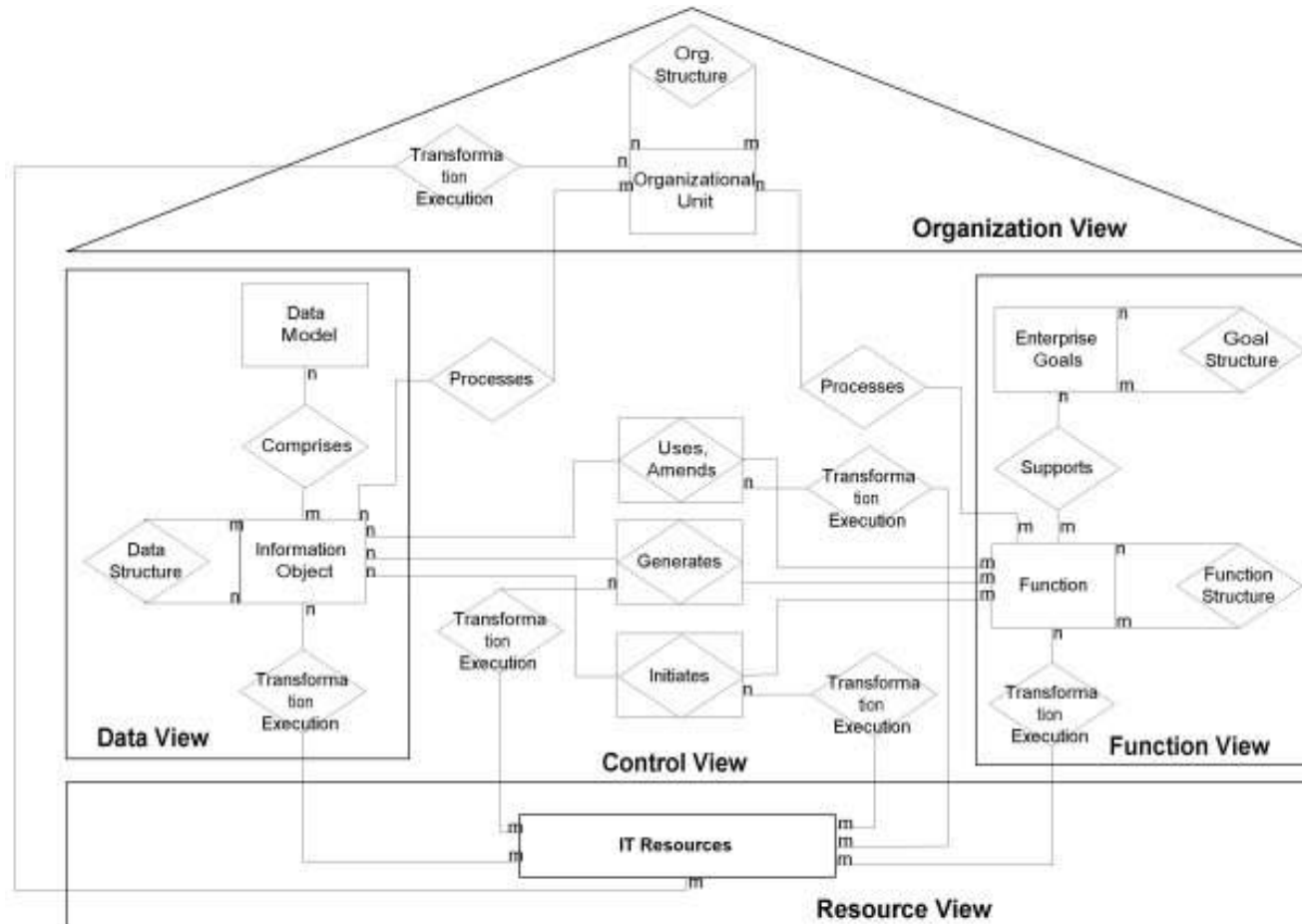
# ARIS - Description Layers



## ARIS Architecture

Source: pera.net, 2011

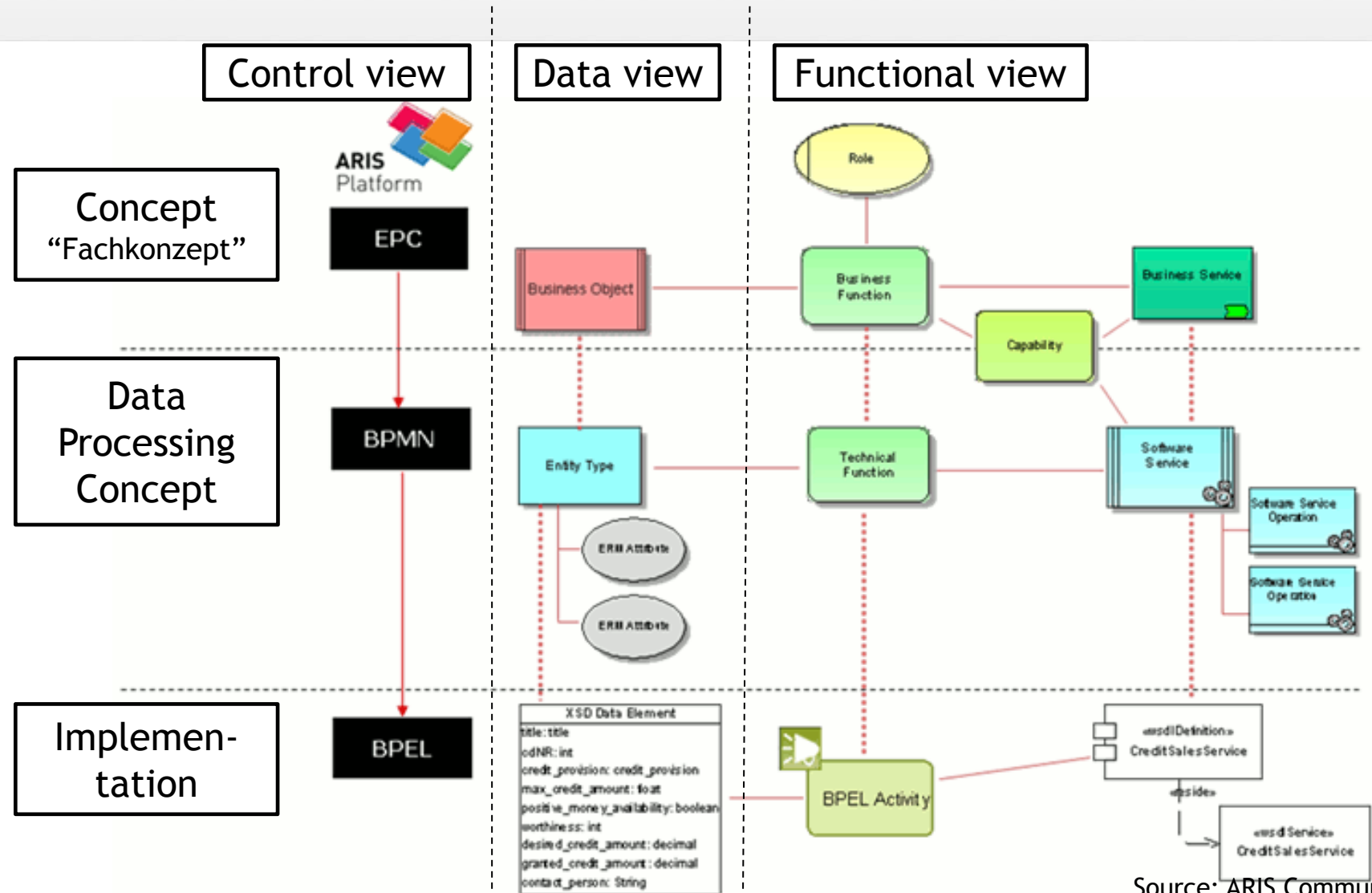
# ARIS - Information Model Example



Information model of the ARIS architecture

Source: pera.net, 2011

# ARIS Layer Example



Source: ARIS Community



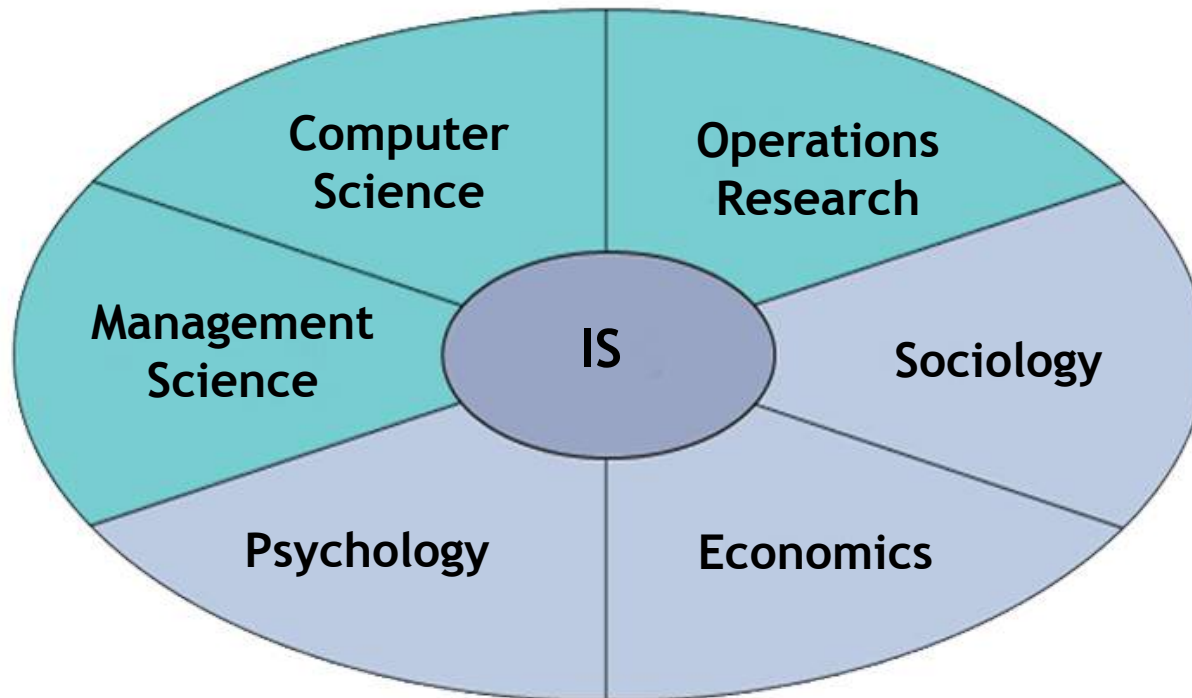
- Information Systems in a Nutshell
- Examples of Information Systems
- Introduction to Enterprise Modelling
- Excursus: Research on Information Systems

# IS Research vs. Business Informatics Research

IS Research  
vs.  
Business Informatics Research

# IS Research Areas

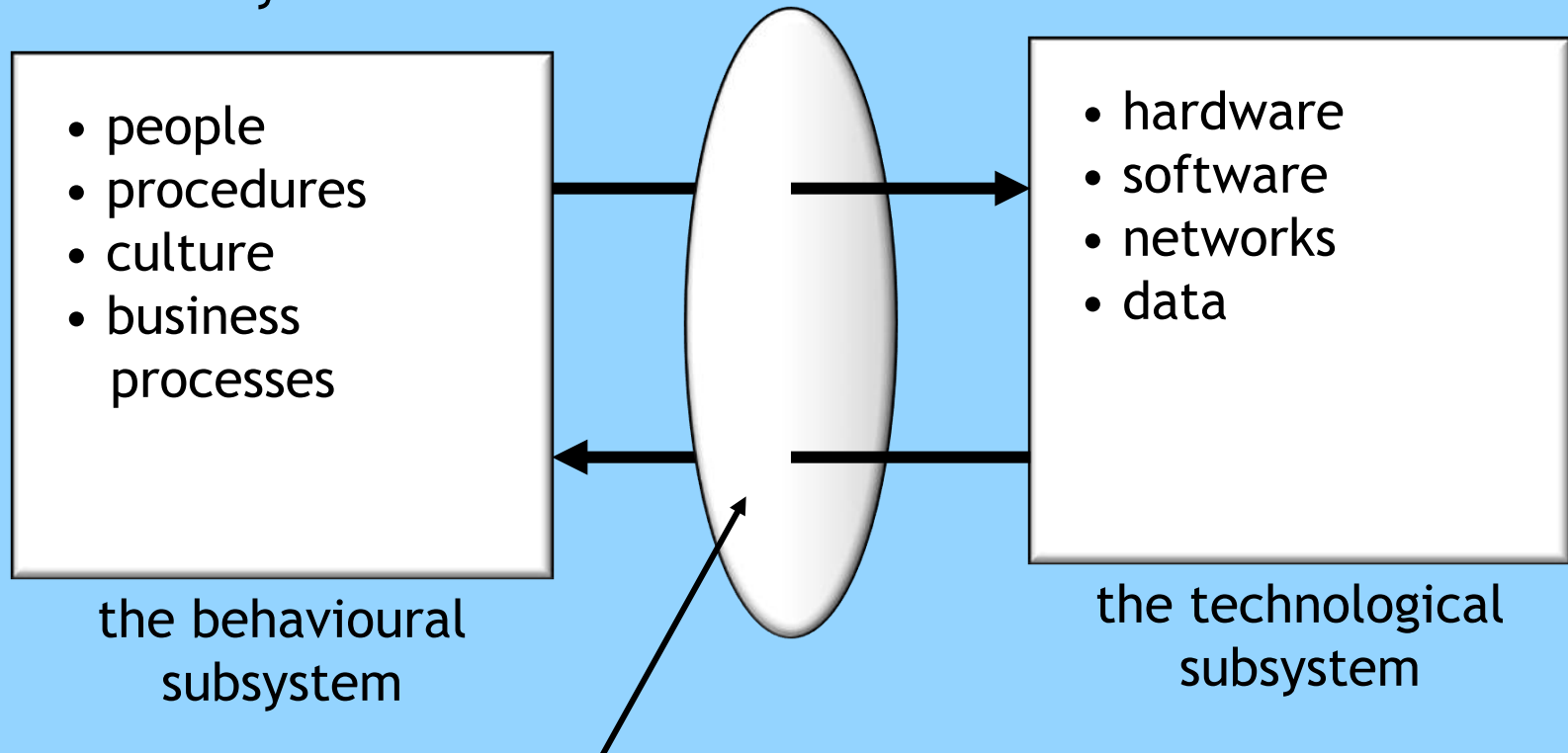
Technical Approaches



Behavioural  
Approaches

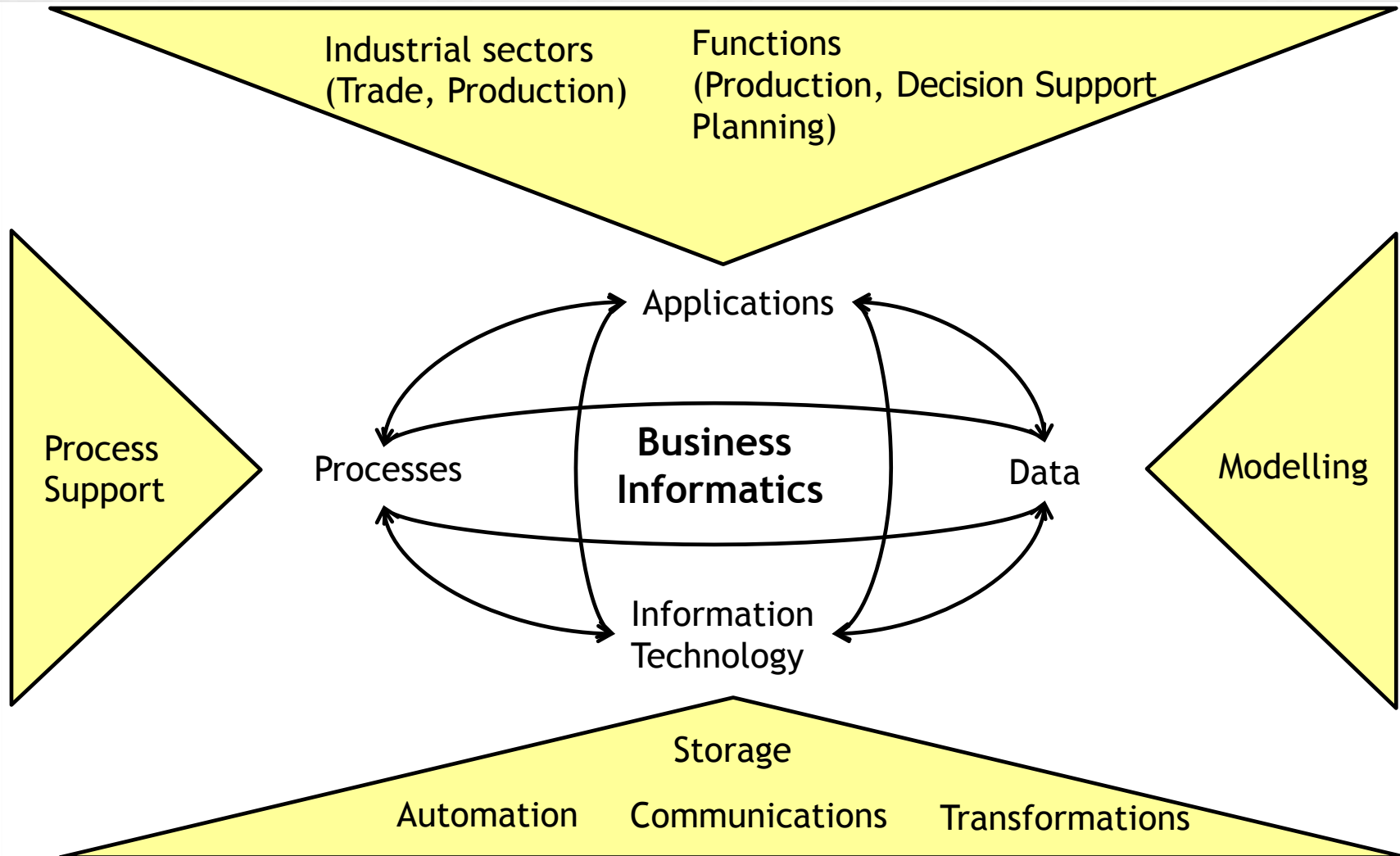
# "Systems thinking" in IS Research

information system



the emergent interactions between the behavioural subsystem and the technological subsystem

# Business Informatics Research Areas



# Business Informatics Research Objectives

	Knowledge Objective	Design Objective
<b>Methodological Task</b>	Comprehension of methods and techniques of information systems design	Development of methods and techniques of information systems design
<b>Content &amp; function-driven Task</b>	Comprehension of information systems and their application fields	Provision of IS reference models for enterprises and industries

Source: Becker et al. (2001), S. 11; Laudon, Laudon, Schoder (2010), p. 63.

- Becker et al. (2001) „Konstruktion von Methodiken“, Institut für Wirtschaftsinformatik. Universität Münster. 2001
- Hars, A. (2002) „Wissenschaftstheorie für Wirtschaftswissenschaftler“, Tutorial im Rahmen der Multikonferenz Wirtschaftsinformatik 2002 (2003)
- Holten, R. (1999) „Entwicklung von Führungsinformationssystemen“, Wiesbaden 1999.
- Laudon, K. C.; Laudon, J. P. (2013): *Essentials of Management Information Systems*. 10. Edition., Pearson Education Limited, Kendallville.
- Laudon, K. C.; Laudon, J. P.; Schoder, D. (2010) „Wirtschaftsinformatik - Eine Einführung“.
- Lee, A.S. (2000) „System Thinking, Design Science, and Paradigms“, Keynote at the 11th National Conference on Information Management, Kaohsiung, Taiwan, 20.05.2000.
- Leondes, Cornelius, T.; Jackson, Richard Henry Frymuth (1992) *Manufacturing and Automation Systems: Techniques and Technologies*. Academic Press, 1992. ISBN 0-12-012745-8, p. 97.
- Pera Enterprise Integration Website - ARIS (2011)  
<http://www.pera.net/Methodologies/ARIS/ARIS.html>
- Schwickert (2015) IT Management Vorlesung SS 2015 [http://wiwi.uni-giessen.de/dl/download/open/Schwickert/06c574b29971a1a030aa57adf47a41fb0a7494d3ac992f75baf1e4528e6d6877b6f447868f35ecafd89f3ed12da84c22/BWL\\_VL\\_ITManagement\\_SS\\_2015\\_VorlesungScriptum.pdf](http://wiwi.uni-giessen.de/dl/download/open/Schwickert/06c574b29971a1a030aa57adf47a41fb0a7494d3ac992f75baf1e4528e6d6877b6f447868f35ecafd89f3ed12da84c22/BWL_VL_ITManagement_SS_2015_VorlesungScriptum.pdf)
- Teubner, R. A. (1999) *Organisations- und Informationssystemgestaltung. Theoretische Grundlagen und integrierte Methoden*. Informationsmanagement und Controlling. Gabler – DUV. 1999
- Vernadat, F.B. (1997) *Enterprise Modelling Languages ICEIMT'97 Enterprise Integration - International Consensus*. EI-IC ESPRIT Project 21.859.
- Wittmann, W. (1959) „Unternehmen und unvollkommene Information“, Köln u.a., 1999.