Lecture 02

Business Informatics 2 (PWIN)
WS 2023/24

Information Systems I

IS Basics

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- **Information Systems in a Nutshell**

- **Examples of Information Systems**

- **Introduction to Enterprise Modelling**

- **Excursus: Research on Information Systems**
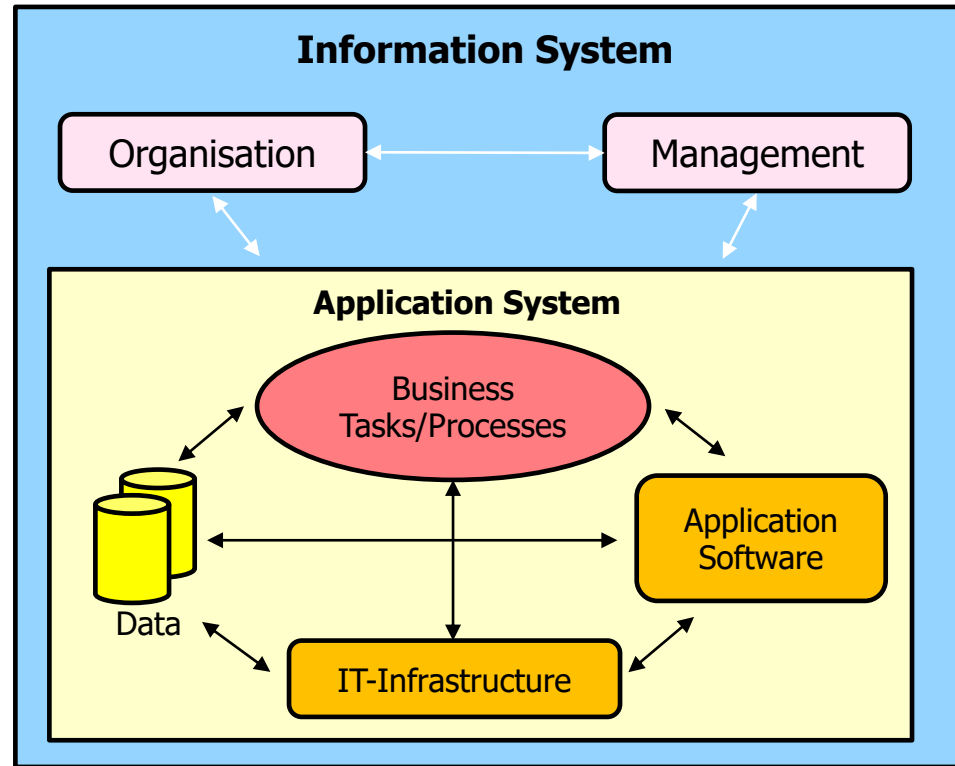
- **Information System (IS):**
  A system which was built to be used in a part of an enterprise. It contains all relevant application systems and is embedded into the organisation and management of an enterprise.
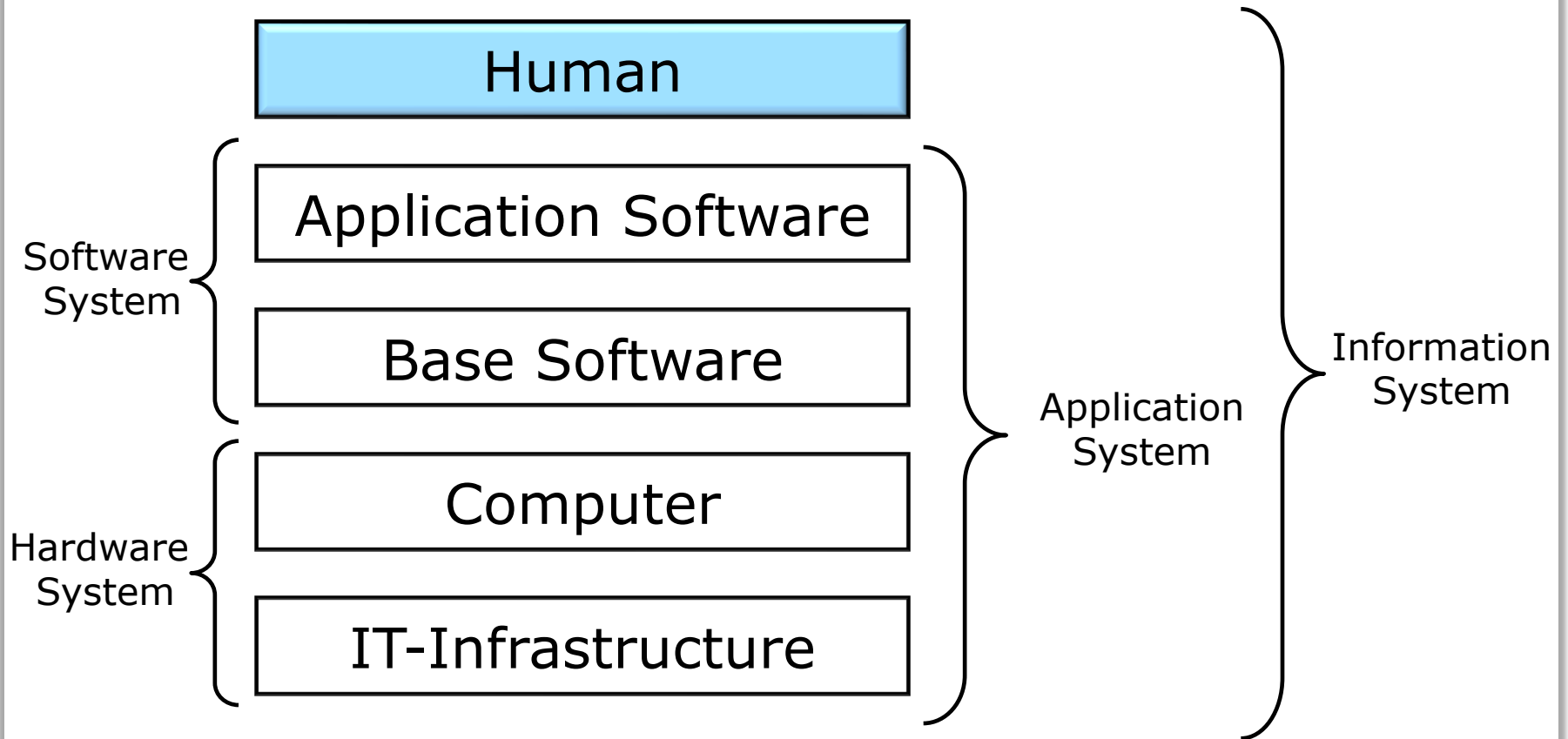

- **Application System (AS):**
  A system which consists of business tasks and processes it supports, the underlying IT-infrastructure, the application software and the data it required in order to accomplish its objectives.

Information and Application System (one perspective)
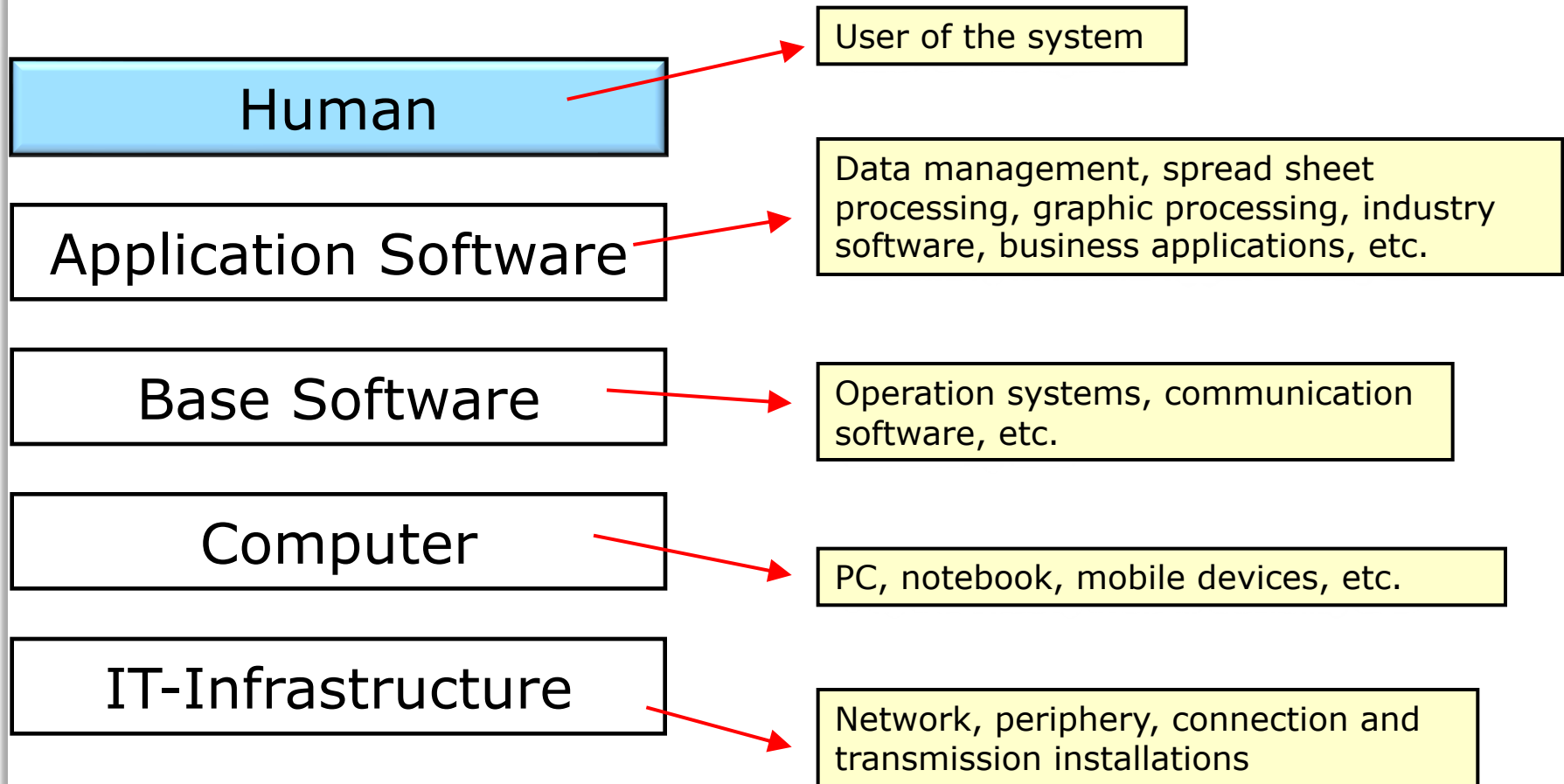

Source: Laudon, K.C., Laudon, J.P., Schoder, D. (2010), p. 18.

Human

Application Software

Base Software

Software System

Computer

IT-Infrastructure

Hardware System

Application System

Information System

Source: Teubner (1999)

mobile business

|	
Human	→ User of the system
Application Software	→ Data management, spread sheet processing, graphic processing, industry software, business applications, etc.
Base Software	→ Operation systems, communication software, etc.
Computer	→ PC, notebook, mobile devices, etc.
IT-Infrastructure	→ Network, periphery, connection and transmission installations

Source: Teubner (1999)

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 and Information

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

Item No ← → **Price**

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

Payment Method → BAR EUR

Kasse: 002/0018 Bon: 0639PE01Z
Datum 08.03.2006 Zeit 14:25:00

Cashier ID **Invoice No**
Time & Date **Time & Date**

1 Monat Rückgaberecht gegen
Vorlage des Kassenbons!
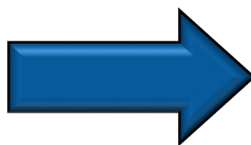
Information for "Distribution Controlling"

Distribution Section:
Frankfurt West

Market:
Supermarket –MINUS-

Item No.:
12223

Description: Pasta Squares

Sold Quantity: 7.156

Total Revenue:
€ 8515,64

- **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 comprehendible 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

Source: Laudon, Laudon, Schoder (2010), p. 20.
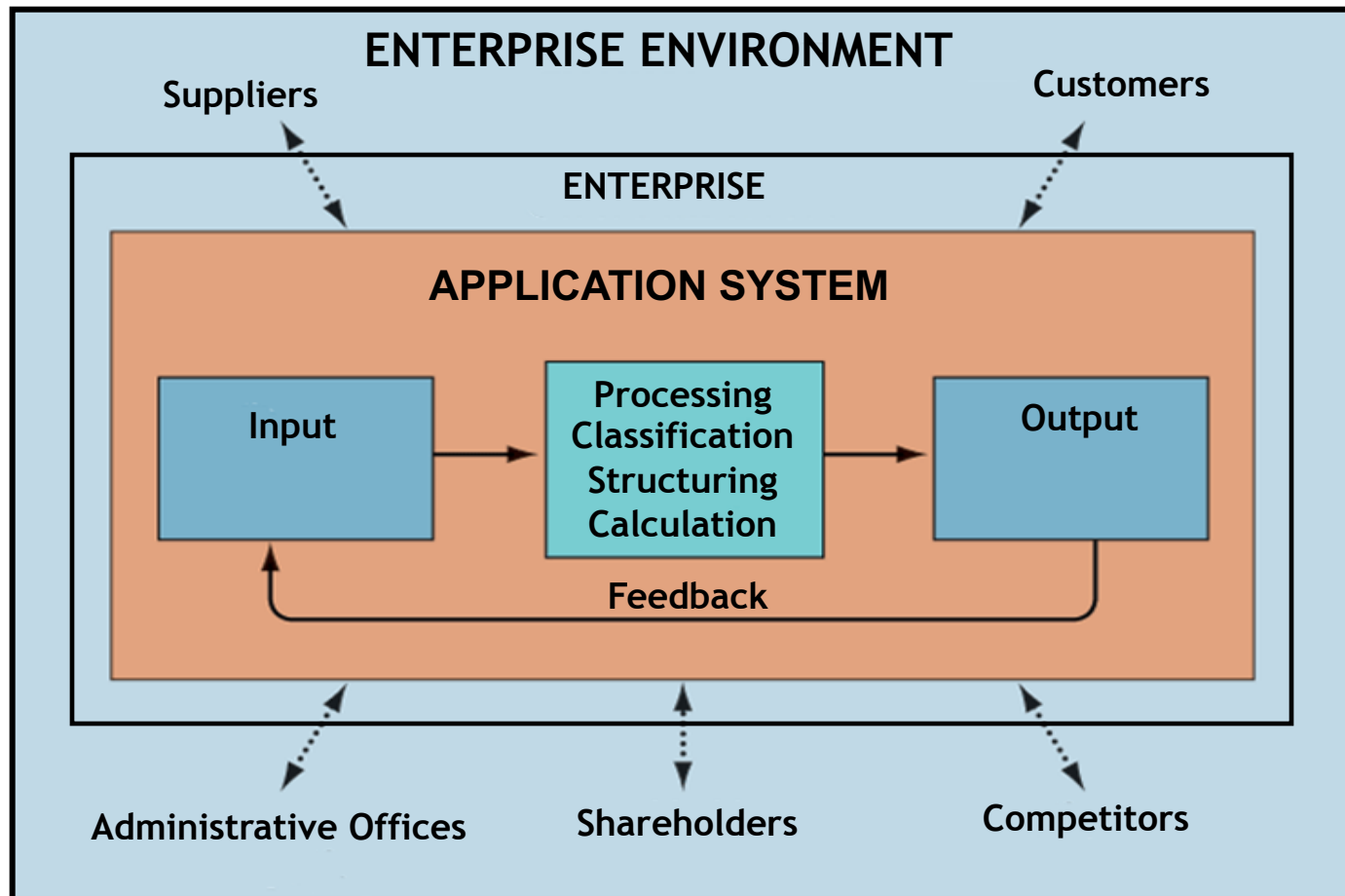
- **Formal System**: A system which is based on accepted and fixed definitions for data and processes and works based on predefined rules.

- **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**
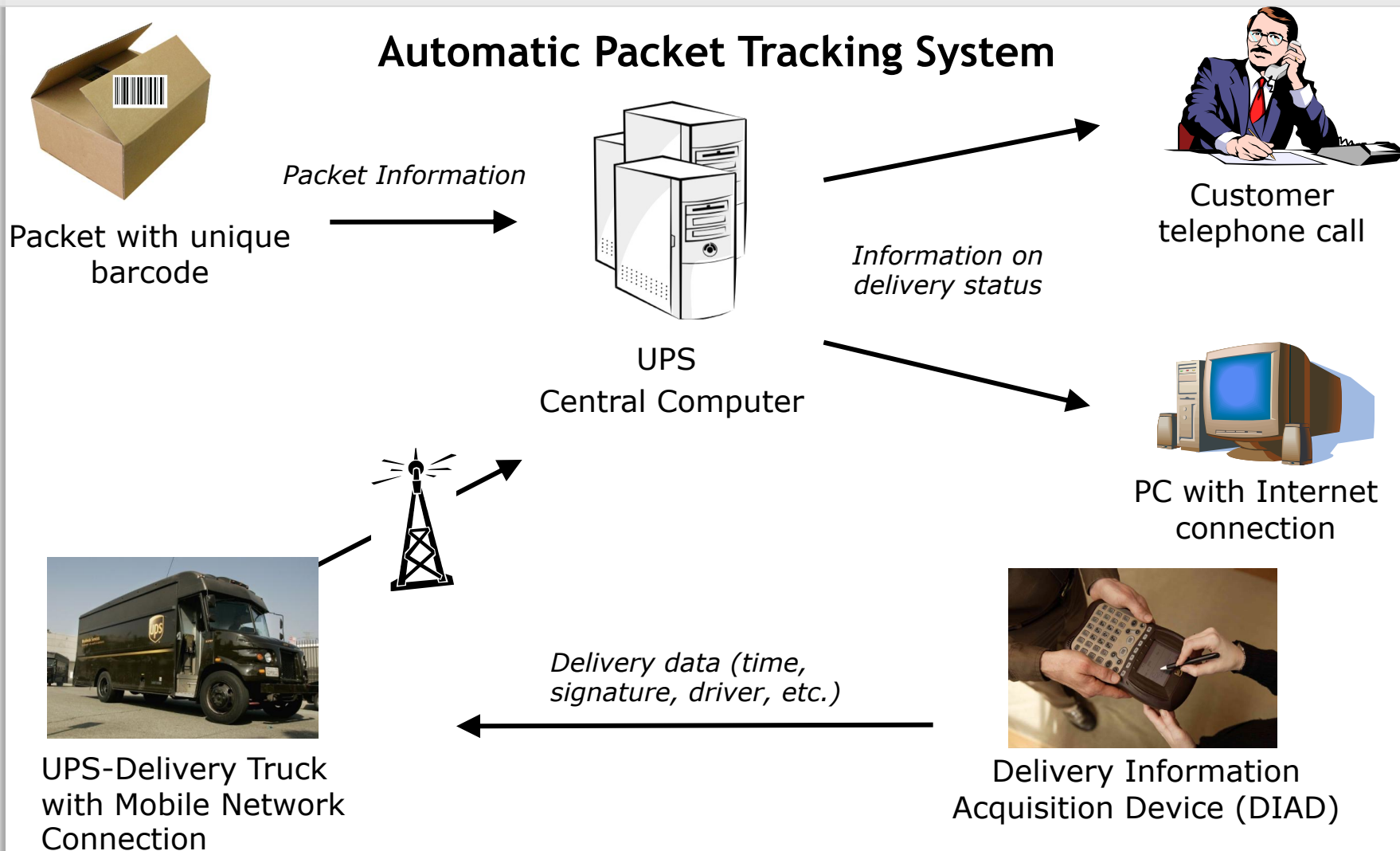
- **Excursus: Research on Information Systems**

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.

Automatic Packet Tracking System

Packet with unique barcode

Packet Information

UPS Central Computer

Information on delivery status

Customer telephone call

PC with Internet connection

UPS-Delivery Truck with Mobile Network Connection

Delivery data (time, signature, driver, etc.)
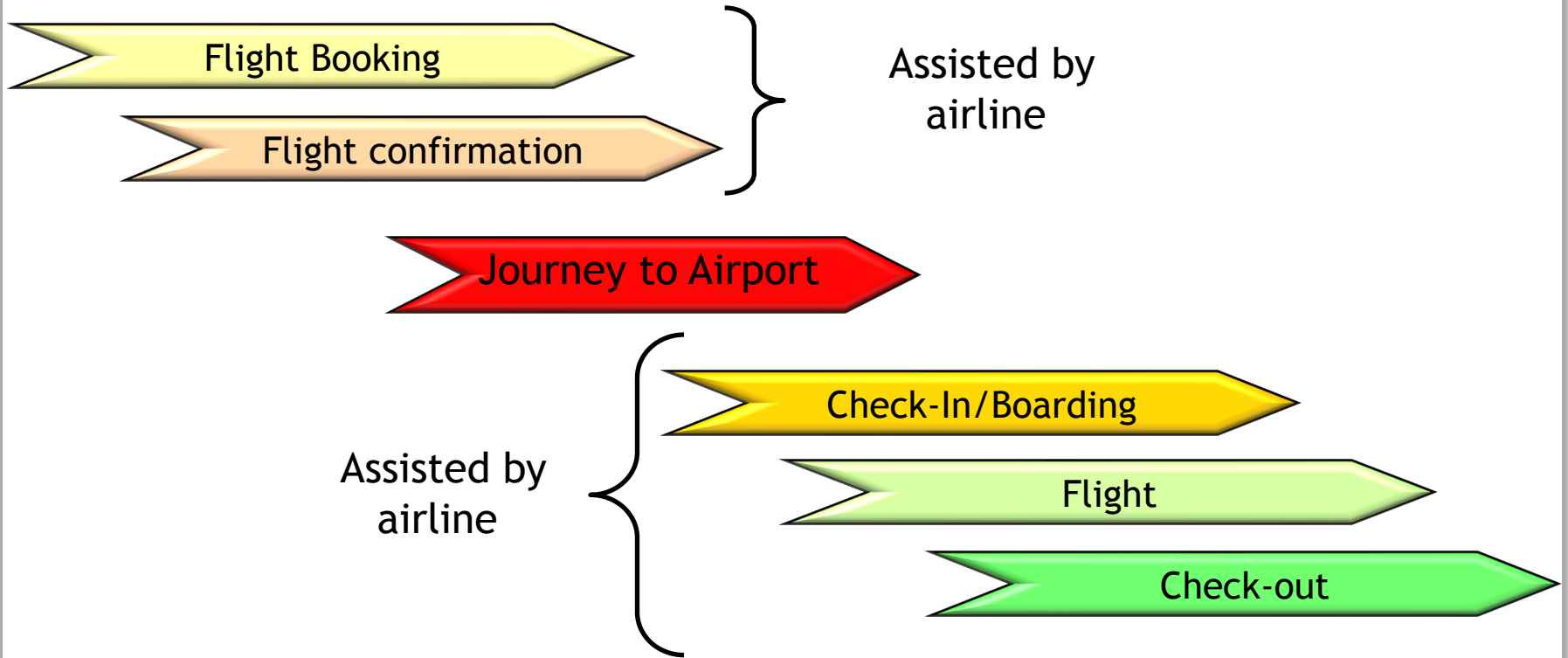
Delivery Information Acquisition Device (DIAD)

- # 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.

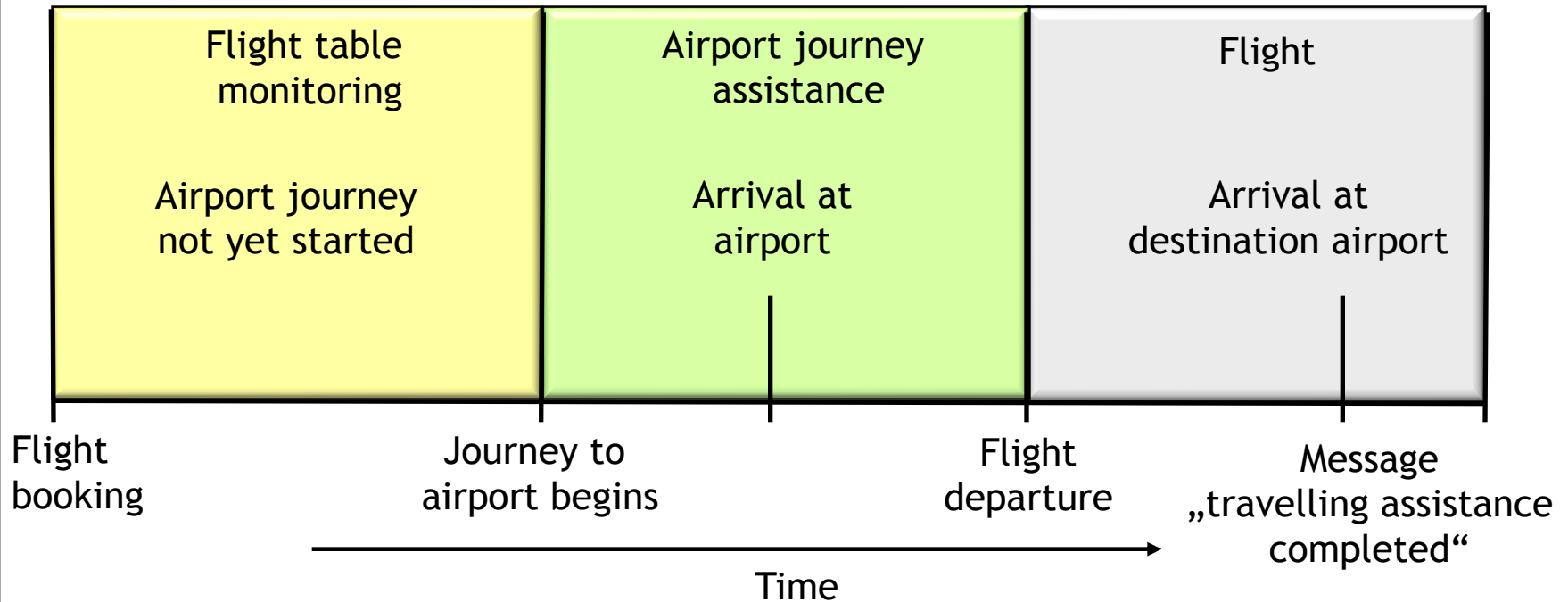# Motivation for Travelling Assistance for Frequent Flyers

Flight Booking

Flight confirmation

Assisted by airline

Journey to Airport

Assisted by airline

Check-In/Boarding

Flight

Check-out

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

Flight table monitoring Airport journey not yet started	Airport journey assistance Arrival at airport	Flight Arrival at destination airport

Flight booking | Journey to airport begins | Flight departure | Message „travelling assistance completed"
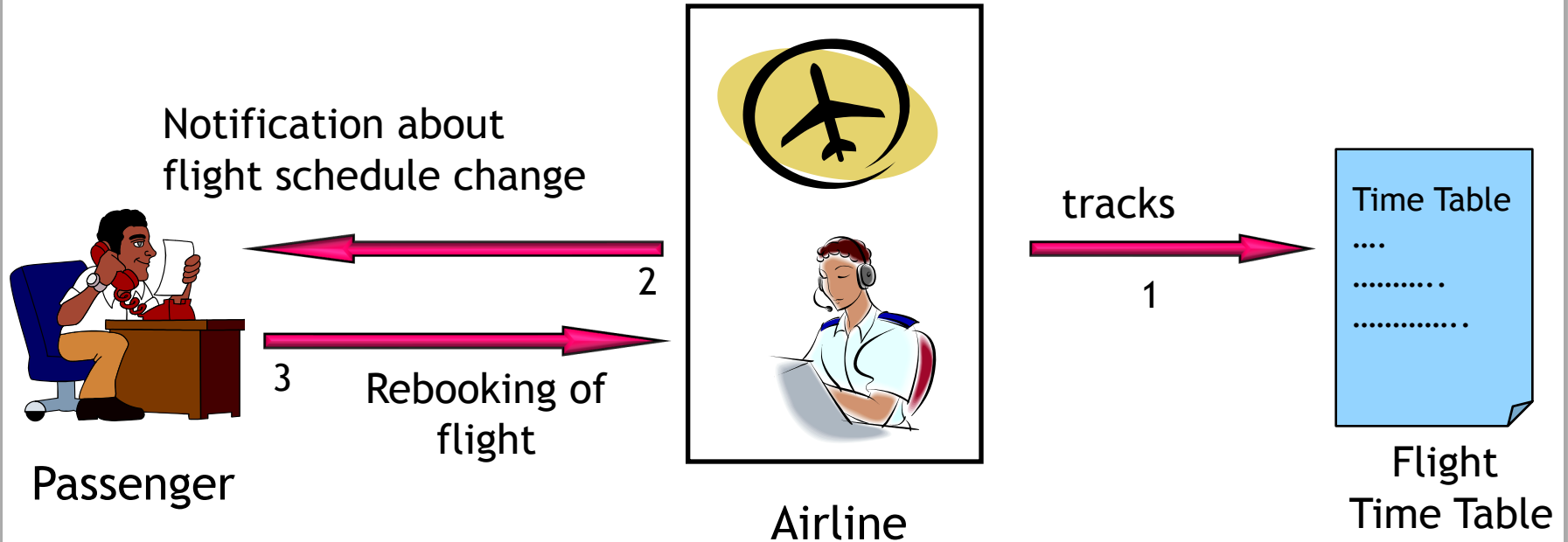
Time

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

Notification about flight schedule change

2

tracks

1

Time Table
....
....
....

3

Rebooking of flight

Passenger

Airline

Flight Time Table

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
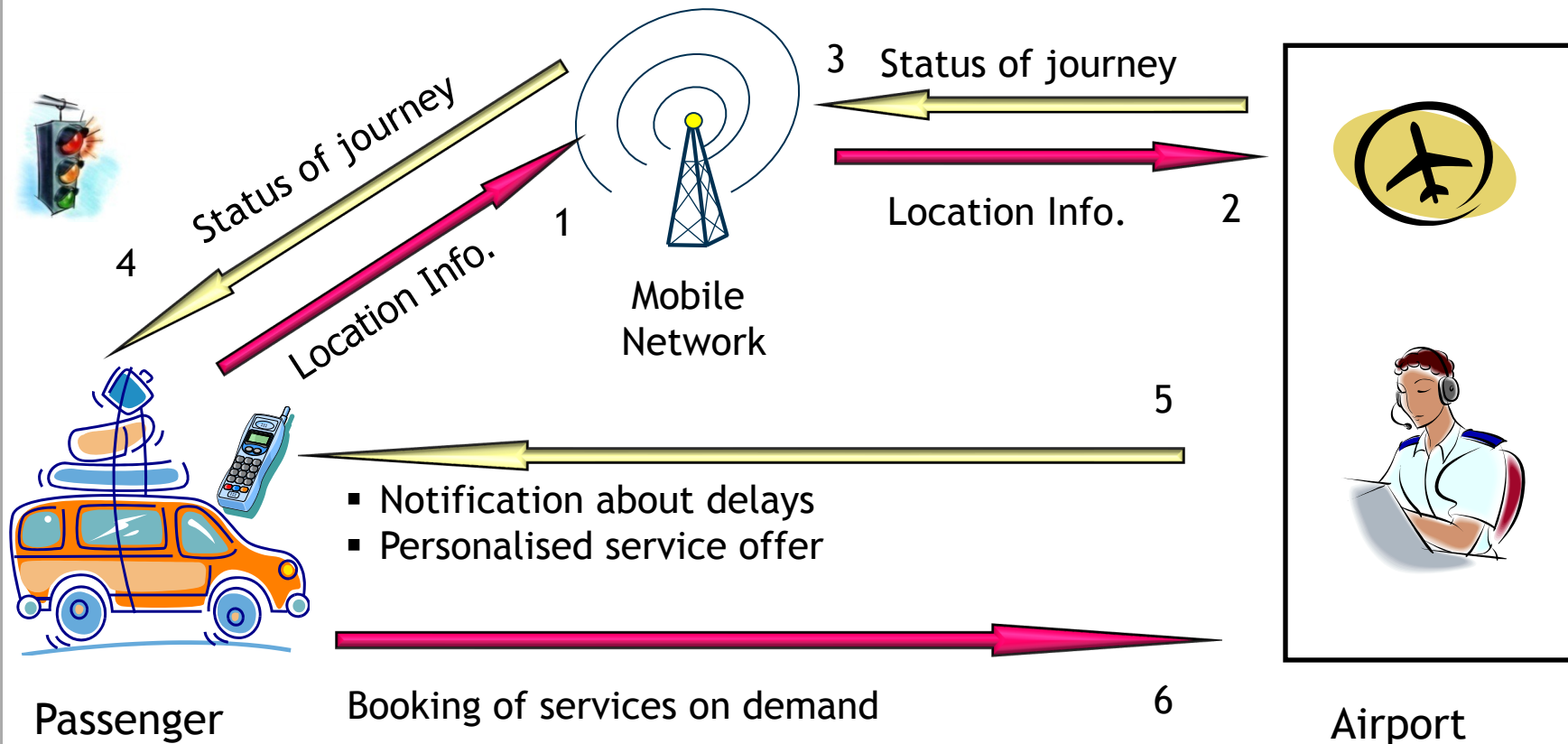- Check of status journey status (e.g. delayed, on time, etc.)

2

1

Explicit activation of assistance for the journey to the airport

Passenger
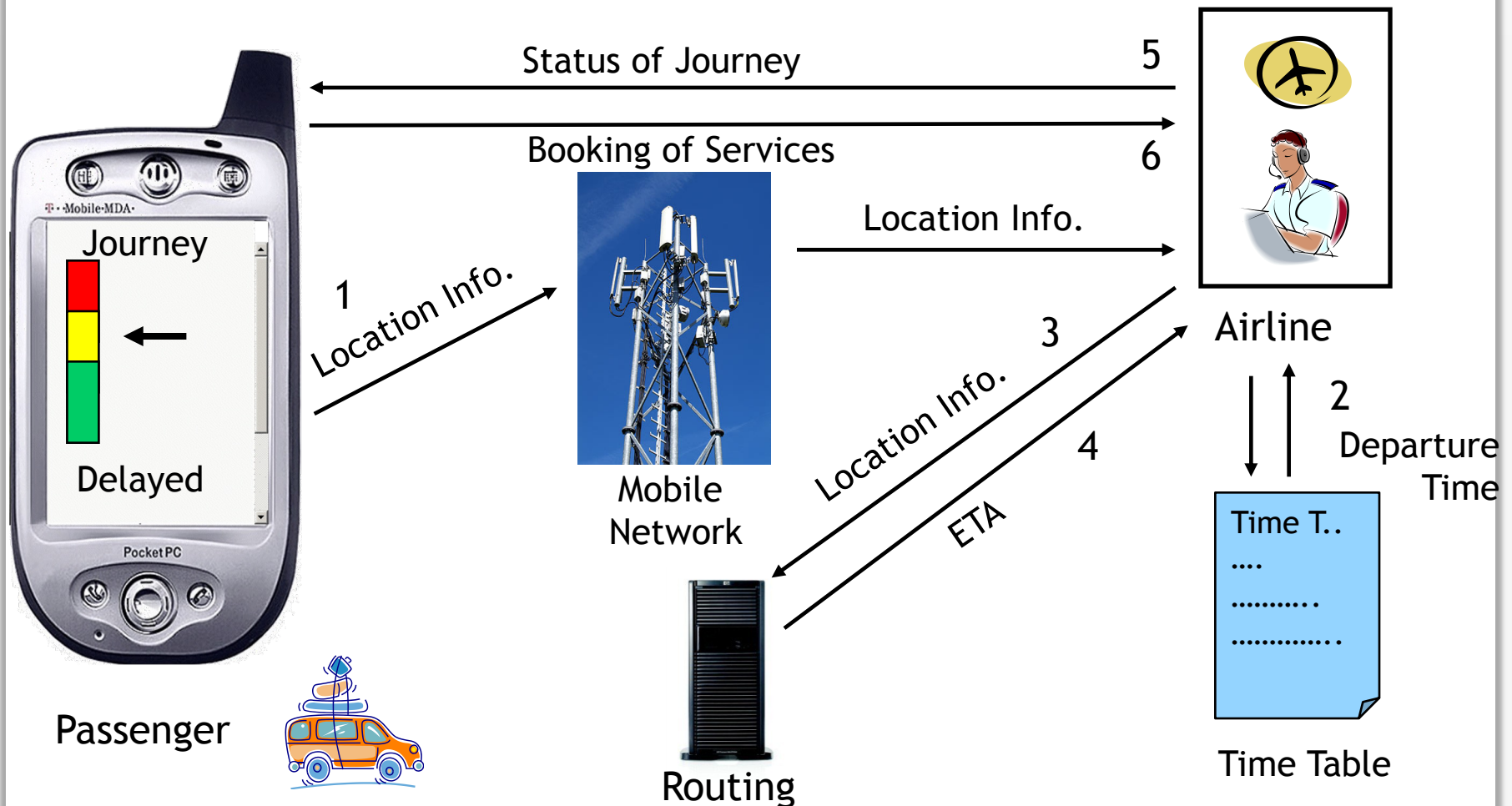
Airline

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

Status of journey

3 Status of journey

Location Info. 2

1 Mobile Network

4 Status of journey

Location Info.

5

- Notification about delays
- Personalised service offer

Passenger

Booking of services on demand 6

Airport

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

Arrival at the Airport
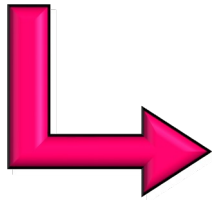
Execution of booked services by airline

- Parking service
- Transfer to gate
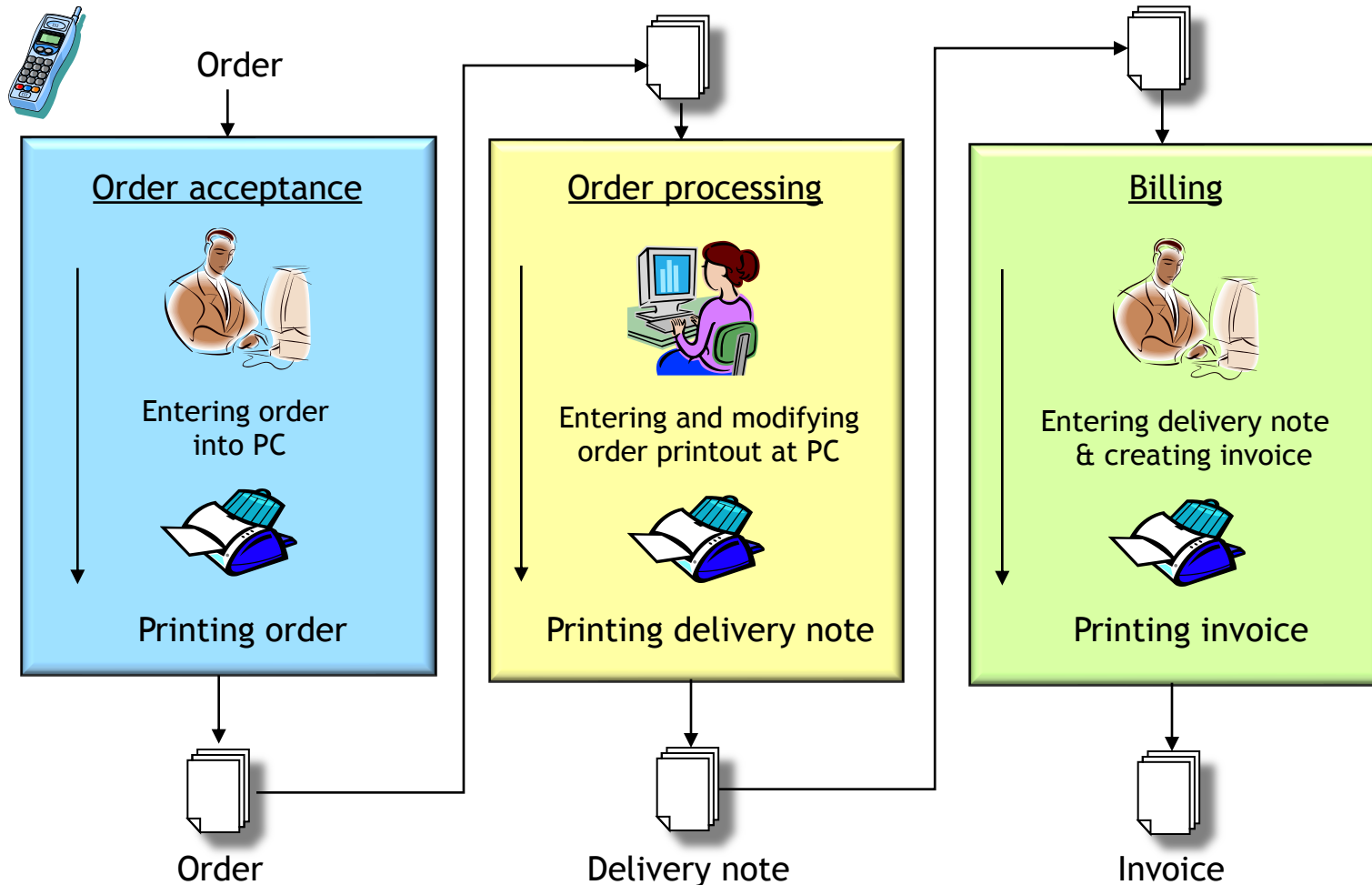- Priority Check-In
- Accelerated luggage transportation
- …

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**

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Business process in an enterprise (example)

Order

Order acceptance

Entering order into PC

Printing order

Order processing

Entering and modifying order printout at PC

Printing delivery note

Billing

Entering delivery note & creating invoice

Printing invoice

Order

Delivery note

Invoice

Source: Based on Schwickert, 2015

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Due to media disruptions between Information Systems, isolated Information Systems are
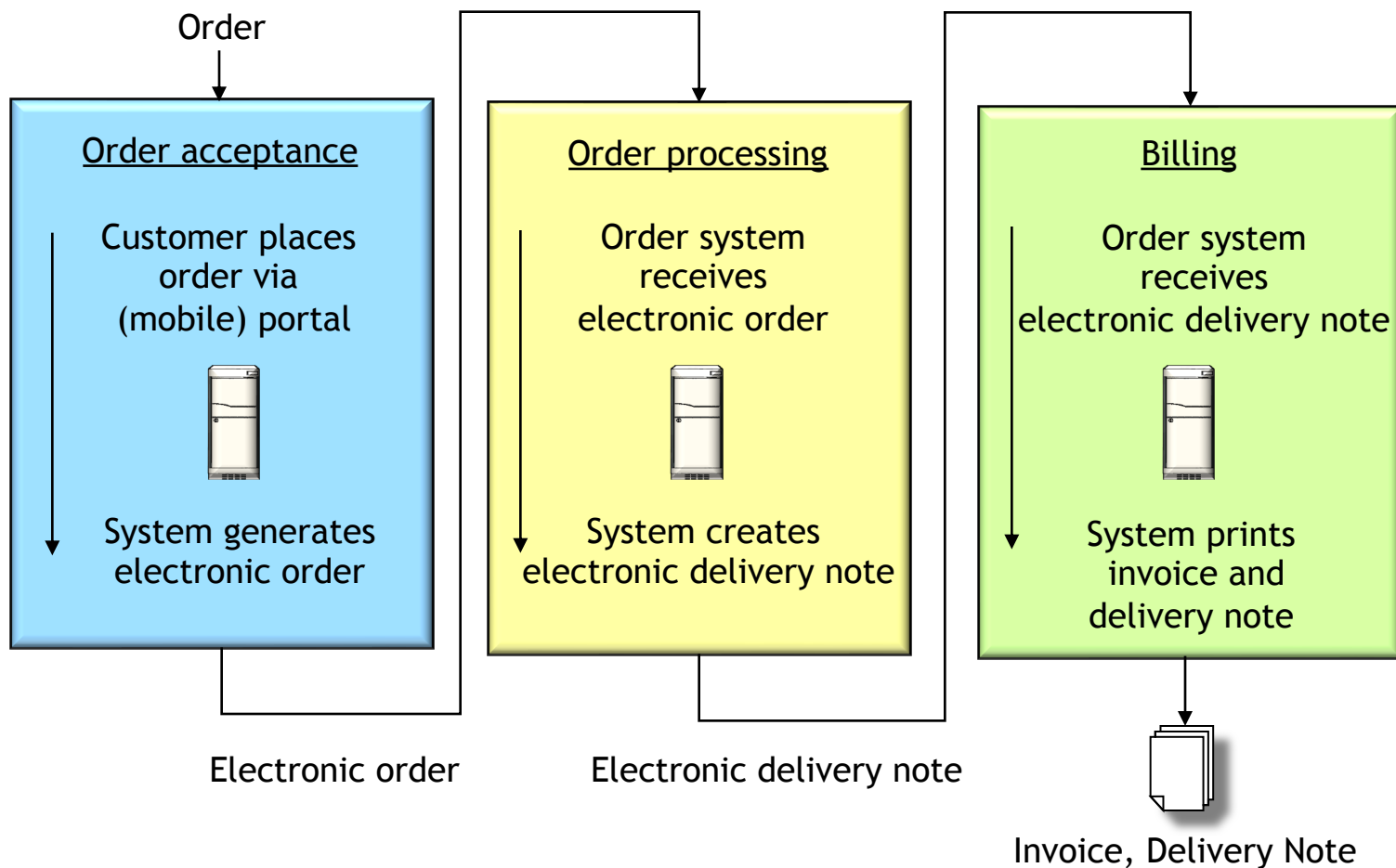
- prone to errors,

- 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.

Business process in an enterprise (example)

Order

Order acceptance	Order processing	Billing
Customer places order via (mobile) portal	Order system receives electronic order	Order system receives electronic delivery note
System generates electronic order	System creates electronic delivery note	System prints invoice and delivery note

Electronic order

Electronic delivery note

Invoice, Delivery Note

Source: Based on Schwickert, 2003

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 determined by the following questions: For whom? Why? For what?

- *Example:*

    - Building vs. Build Plan
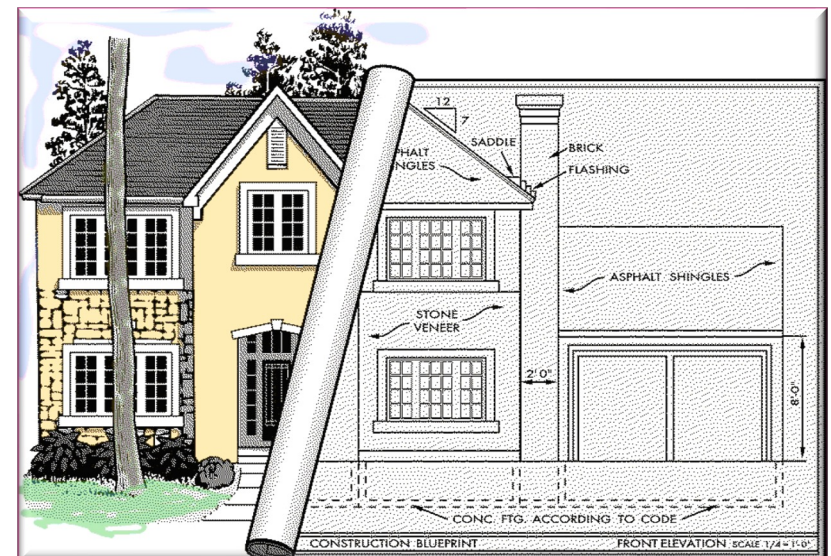
Modelling According to the „Rules"

- **Consistent correspondence of structure and behaviour** between model and original required

- Consequently, the modelling function is to be a **homomorphic** transformation.

- The "language" for the definition of a model system is provided by a meta-model.

| Object System | → | Model System | ← | Meta-Model |
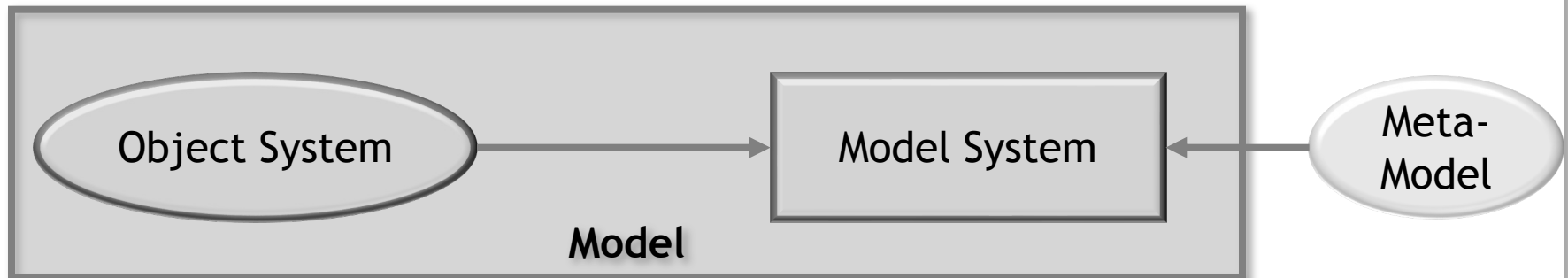
Model

- 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 Organisations (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
- …

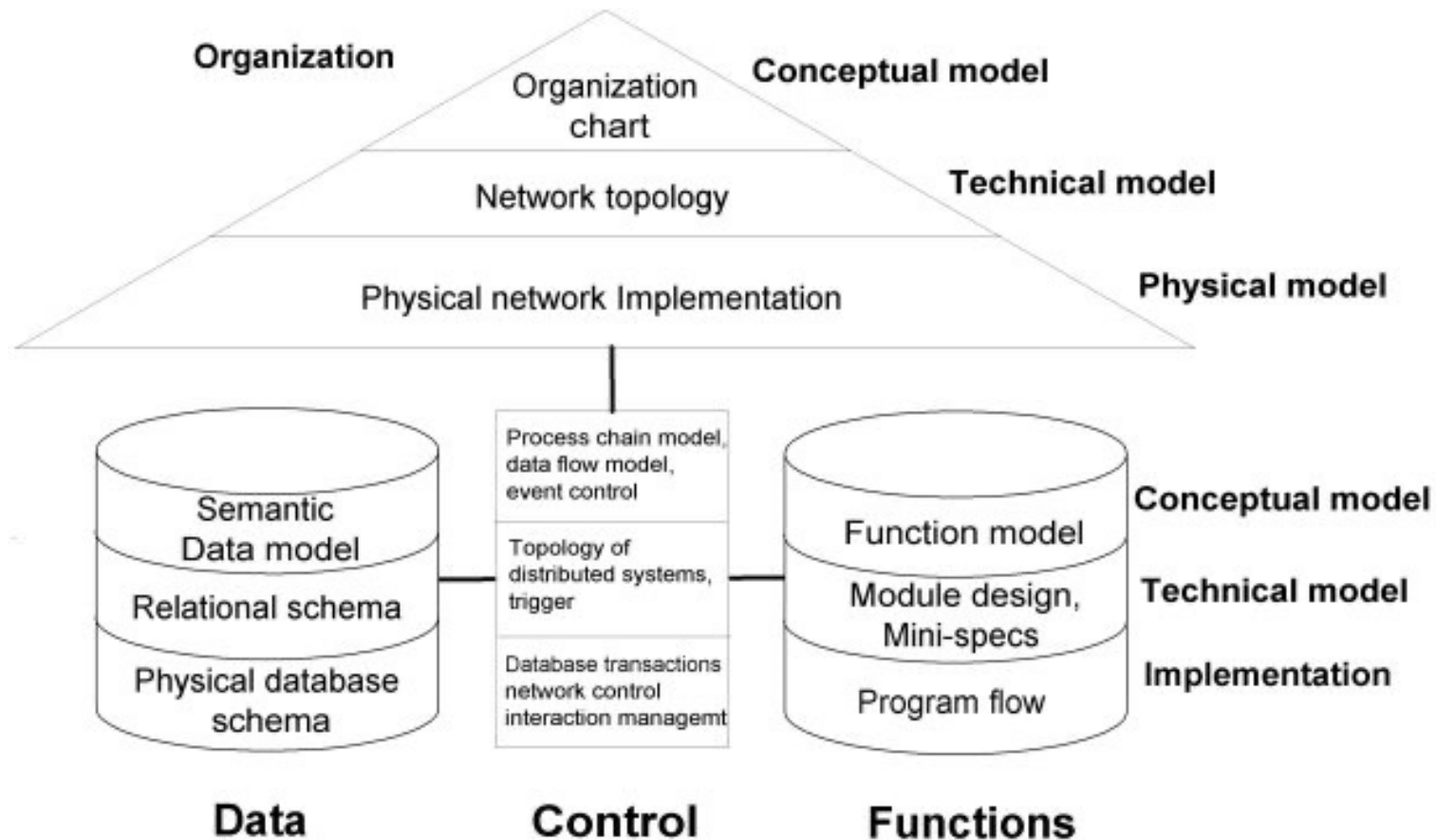# ARIS – Architecture of Integrated Information Systems

- 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 1990's

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**
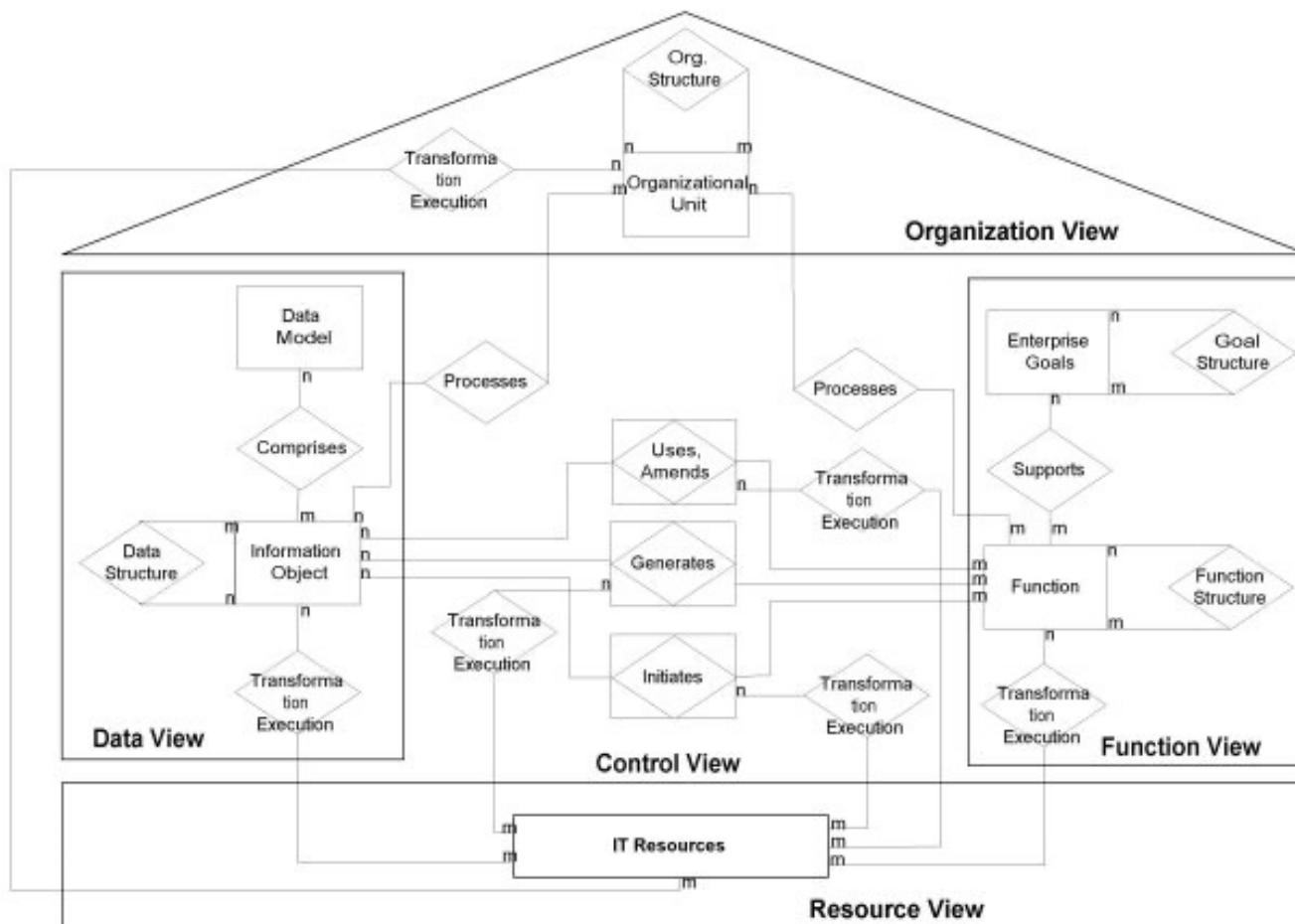 - Services, products and financial assets
  - Product tree

Organisational view

Data view

Control view

Functional view

Resource view

ARIS Architecture

Source: pera.net, 2011
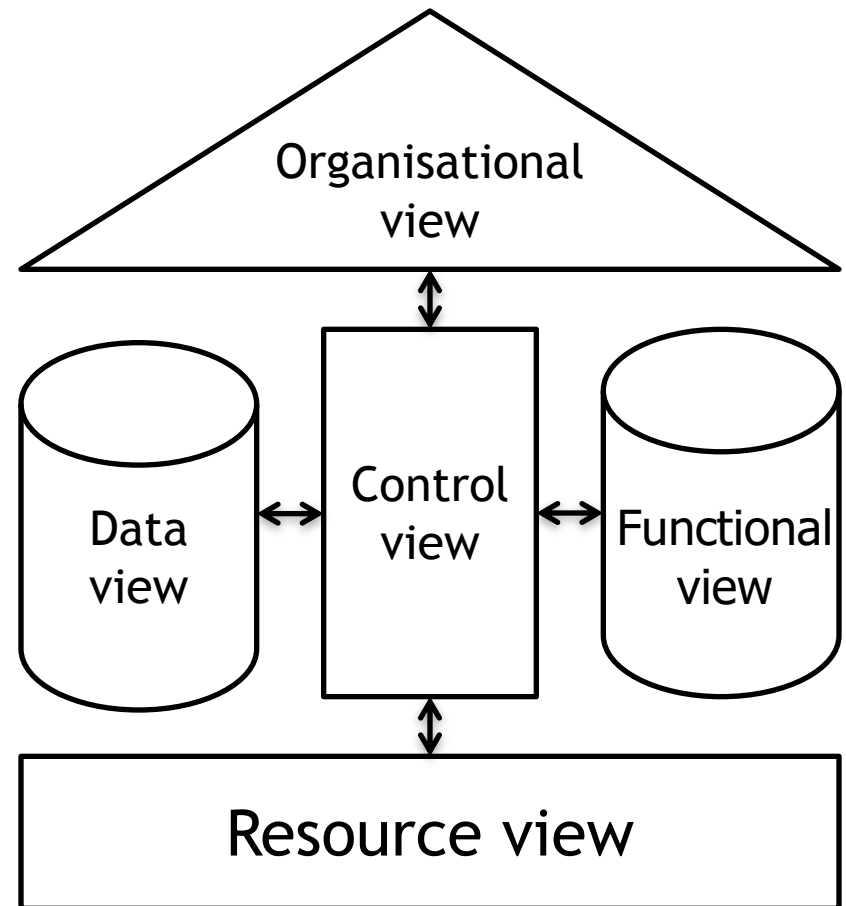
Information model of the ARIS architecture

Source: pera.net, 2011

ARIS Layer Example
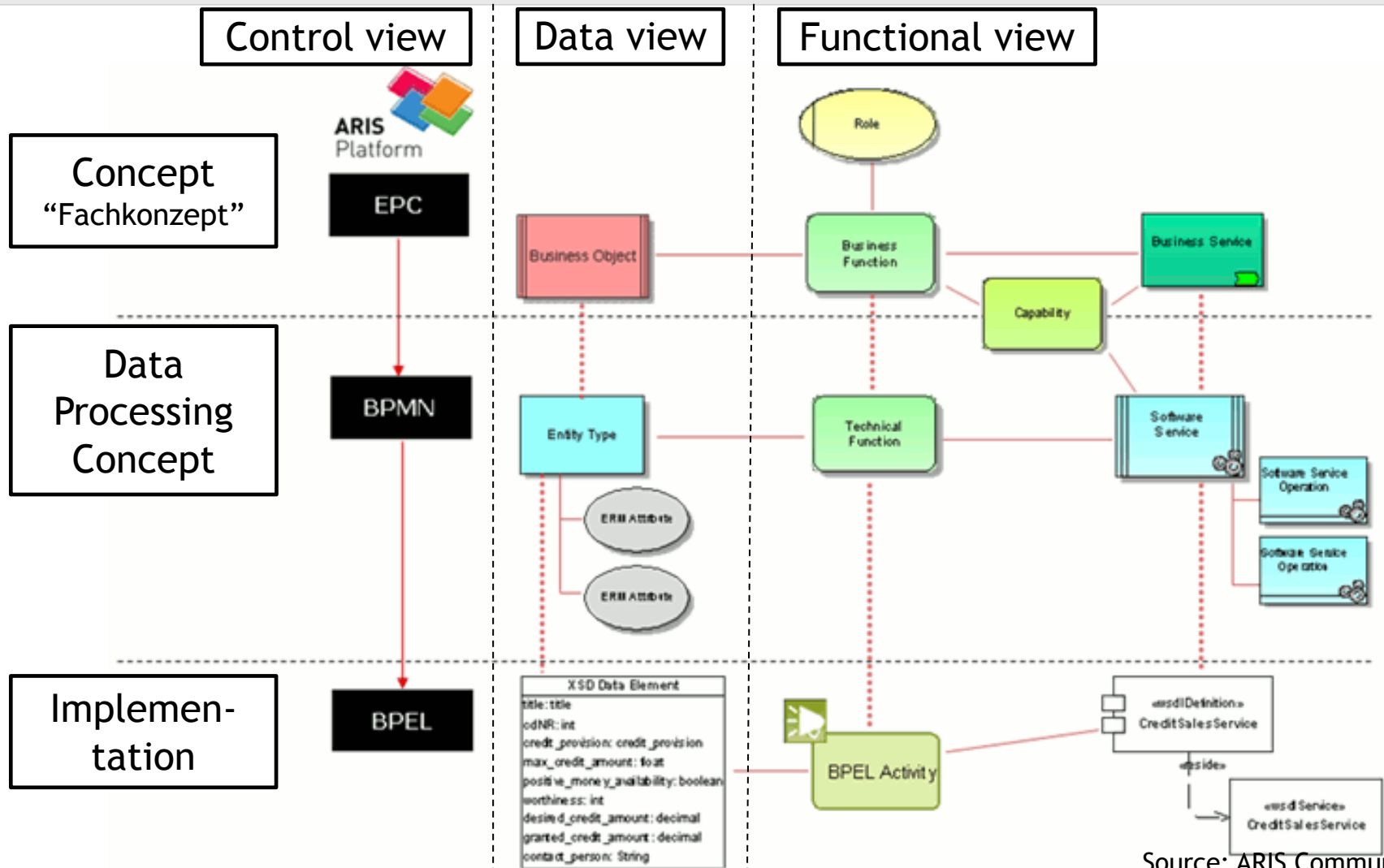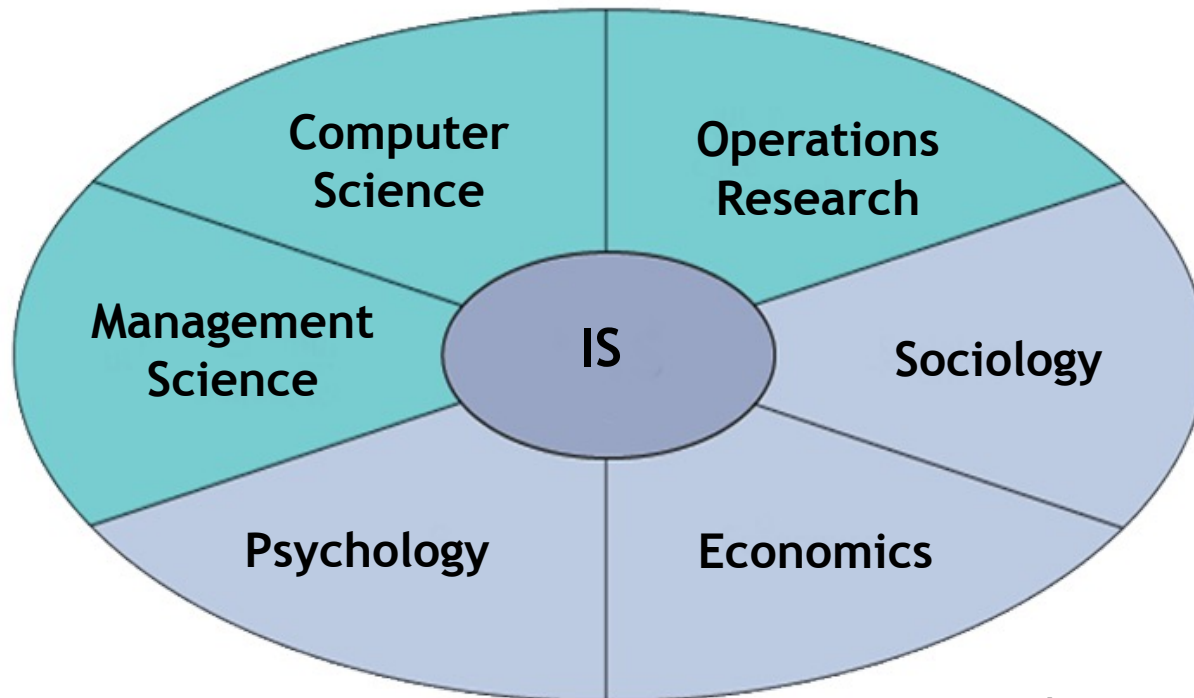
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IS Research

vs.

Business Informatics Research

Technical Approaches

Behavioural Approaches

Source: Based on Laudon, Laudon (2013), p. 37

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"Systems Thinking" in IS Research

Information System

The behavioural subsystem
- People
- Procedures
- Culture
- Business processes

The technological subsystem
- Hardware
- Software
- Networks
- Data
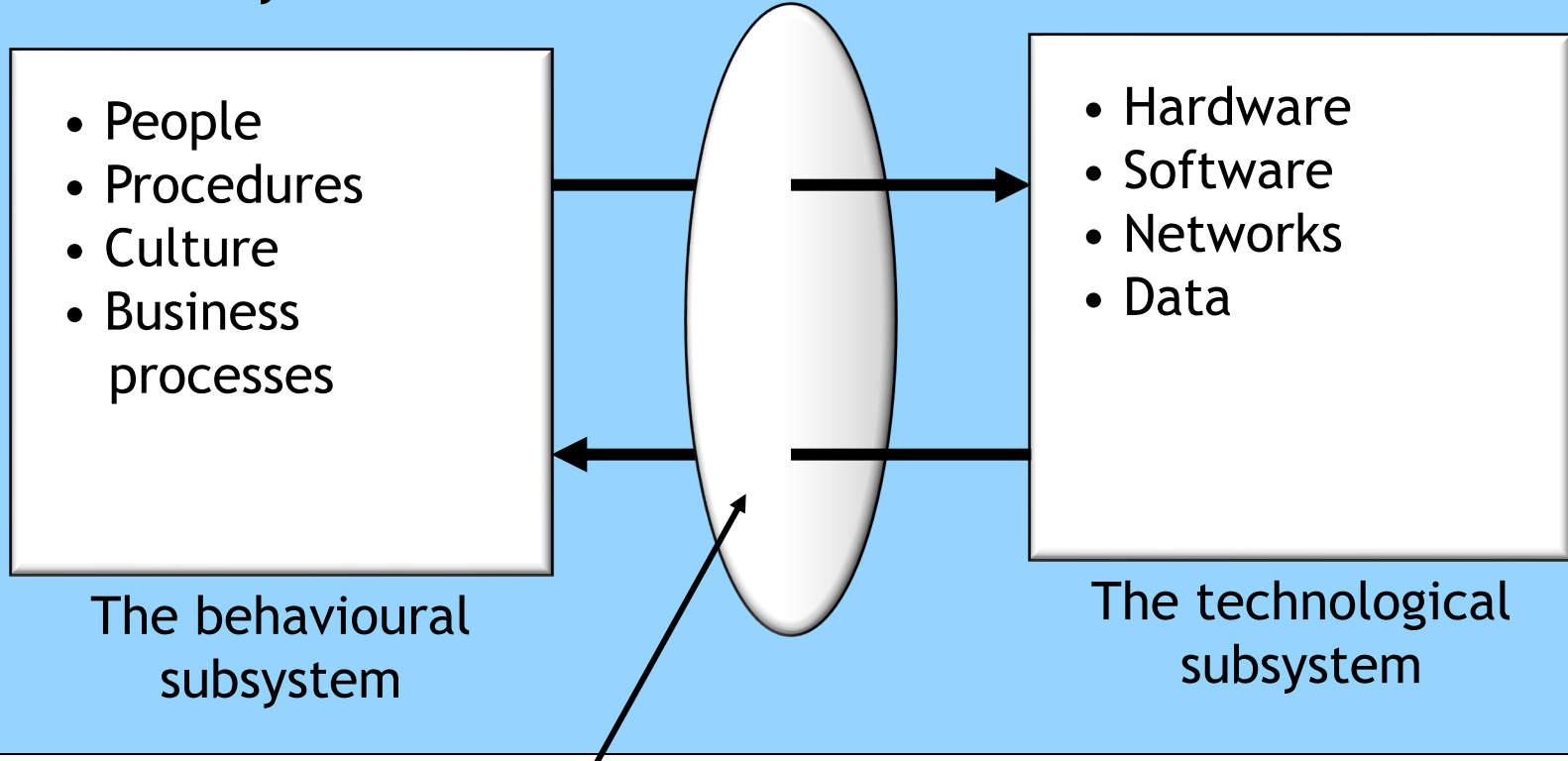
The emergent interactions between the behavioural subsystem and the technological subsystem

Source: Lee (2000), p. 12

Industrial sectors (trade, production)

Functions (production, decision support planning)

Process support

Applications

Business Informatics

Processes

Data

Modelling

Information Technology

Storage

Automation   Communications   Transformations

Source: Based on Hars (2002)
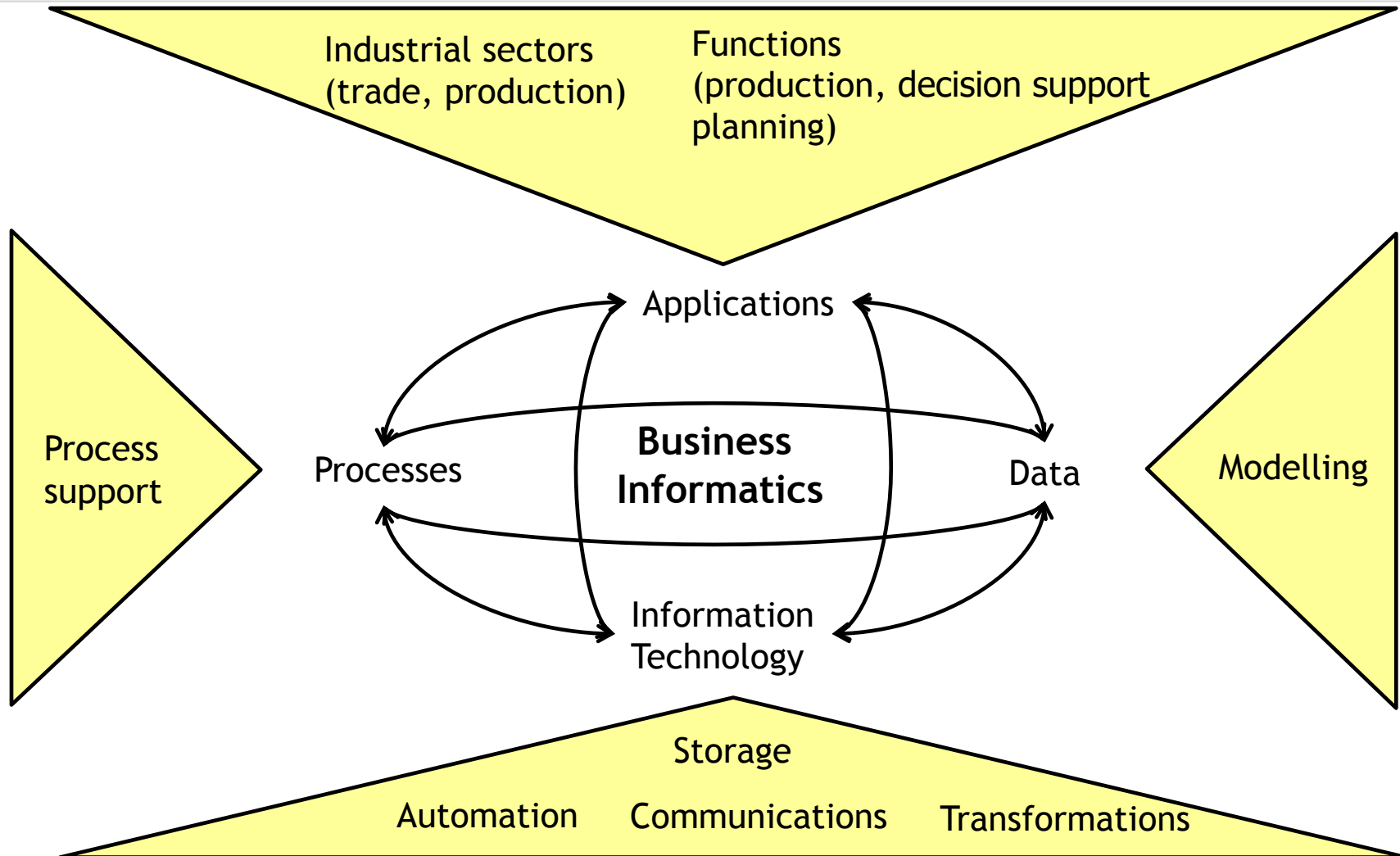
Business Informatics Research Objectives

	Knowledge Objective	Design Objective
Methodological Task	Comprehension of methods and techniques of information systems design	Development of methods and techniques of information systems design
Content & function-driven Task	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.

Literature

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