# *Business Intelligence: Making Informed Decision*
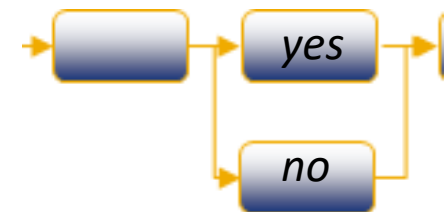
Knut Hinkelmann

Business Intelligence – Definition(s)

- *Hans-Peter Luhn(1958):* «the ability to apprehend the interrelationships of presented **facts**in such a way as to **guide action**towards a desired goal»

- *Sabherwal (2011):* «We define BI as providing decision makers with valuable information and knowledge by leveraging a variety of sources of data as well as structured and unstructured information. […] The key intellectual output of BI is **knowledge that enables decision making** with **information and data being the inputs**.»

- *Howson (2007):* Business Intelligence allows people at all levels of an organisation to **access, interact with and analyse data** to **manage the business, improve performance, discover opportunities, and operate efficiently.**
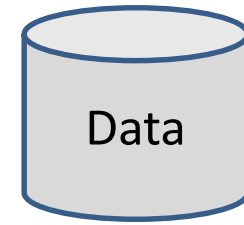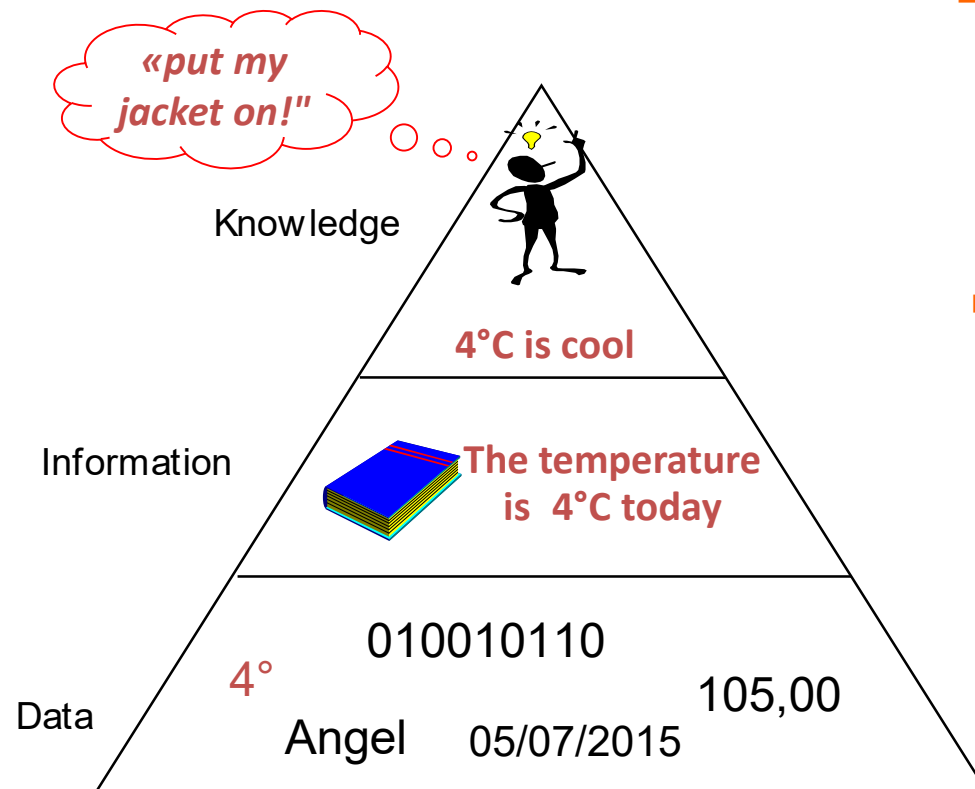
Data

Alpha Corporation
Sales in EUR

	'10	'11	ΔPY
Germany	84	87	+3
Austria	19	17	-2
France	28	27	-1
Rest	36	39	+3
Europe	167	170	+3

yes

no

Data, information and knowledge

«put my jacket on!"

Knowledge

4°C is cool

Information

The temperature is 4°C today

010010110

4°

105,00

Data

Angel   05/07/2015

- **Knowledge** enables decisions and actios
  - originates from messages (information), experience, insight
  - is embedded into the beliefs and opinions of its owner

- **Information** is an interpretation of data, often assembled in messages
  - influences the judgment and behaviour of the recipient and
  - that has a significance (relevance, purpose)

- **Data** is a set of facts and/or signals
  - Do not have meaning by itself
  - To understand data you need an interpretation

Decision making

- **Decision making =** *The action of selecting among alternatives to achieve a goal*
  - each alternative leads to a different future
  - what is needed is the ability to predict the futures

- **Options:**
  1. Decide/predict based on **intuition** (gut feeling)
     - cheap in the first place
     - risk of low-quality decisions
  2. Experiment with real system (try out)
     - risky
     - time-consuming
  3. Decide/predict based on the **facts** (past):
     - data collection is time-consuming
     - difficult to determine when to stop and make a decision

Business Intuition (1)

- *Intuition = human competence of deriving insight from implicit knowledge (experience), typically in situations where data is too complex to analyse*

  - ♦ **supporters:** «humans can process much more data subconsciously than consciously»

  - ♦ **Critics:** «intuition simply means that a person who uses it doesn't have an adequate explanation for how an insight was derived»

- Decision making based on intuition (experience) is subjective

  - ♦ Different people come to different conclusions

- **BI can be used to train the successful use of intuition by giving objective feedback on gut-based decisions!**

Business Intuition (3)

Fact-based Decision Making and BI

■ Fact-based decisions are based on information

■ **BI supports fact-based decision making** by providing access to data and data analysis

■ BI supports the (human) decsion maker, usually in the following way:

- ♦ the human decision maker (HDM) formulates the decision problem
- ♦ the HDM identifies which information is needed to make an informed decision
- ♦ the HDM consults a BI tool to get the answers, usually by querying or browsing (e.g. OLAP)
- ♦ the HDM uses the answers to take an informed decision

Perspectives on BI – pain points

MANAGEMENT

MARKETING

*For targeted campaigns, we would urgently need data about customers and their buying behavior […] ideally on an **integrated platform** where we can communicate with sales.*

*I wanted to retrieve some numbers myself from my laptop. I then got **access to various (!) systems** […] I finally gave up*

ADVISORY BOARD

SALES

*In most review meetings, we spend half the time discussing **which sales data are the right ones** because everyone brings their own reporting.*

*Why weren't you able to **preview that trend**? All our competitors seem to have reacted long before we did!*

Trend: Foresight and automated Decisions (1)

Did I reach my production goals? Did all my machines run smoothly?

Oops, two machines crashed? Were there any special incidents? If so, what can we learn from them?

For each machine, what is the likelihood that it will crash next month?

For each machine, should we leave the device in service (generating revenue) or repair it now (avoid cost of possible breakdown)? → optimization / OR

Main motivation: foresight and automation are cheaper than hindsight and manual intervention!

Trend: foresight and automated decisions (2)

■ Typical procedures:

    ♦ Hindsight («old school» business performance management):

        ● Prerequisite: we know that goals have not been reached (hindsight) and understand why (insight)

        ● Intervention: we remove general problems (e.g. change maintenance interval for a certain type of machine)

    ♦ Foresight:

        ● Prerequisite: we know the risks/opportunities and build predictive models + optimization strategies

        ● Intervention: completely automated decisions (e.g. on maintenance for individual machines)

An Enterprise and is Context

Market / Competitors

Technologies

Management

Desired Value

Actual Value

Supplier, Partner

Info

Enterprise

Info

Customer, Client
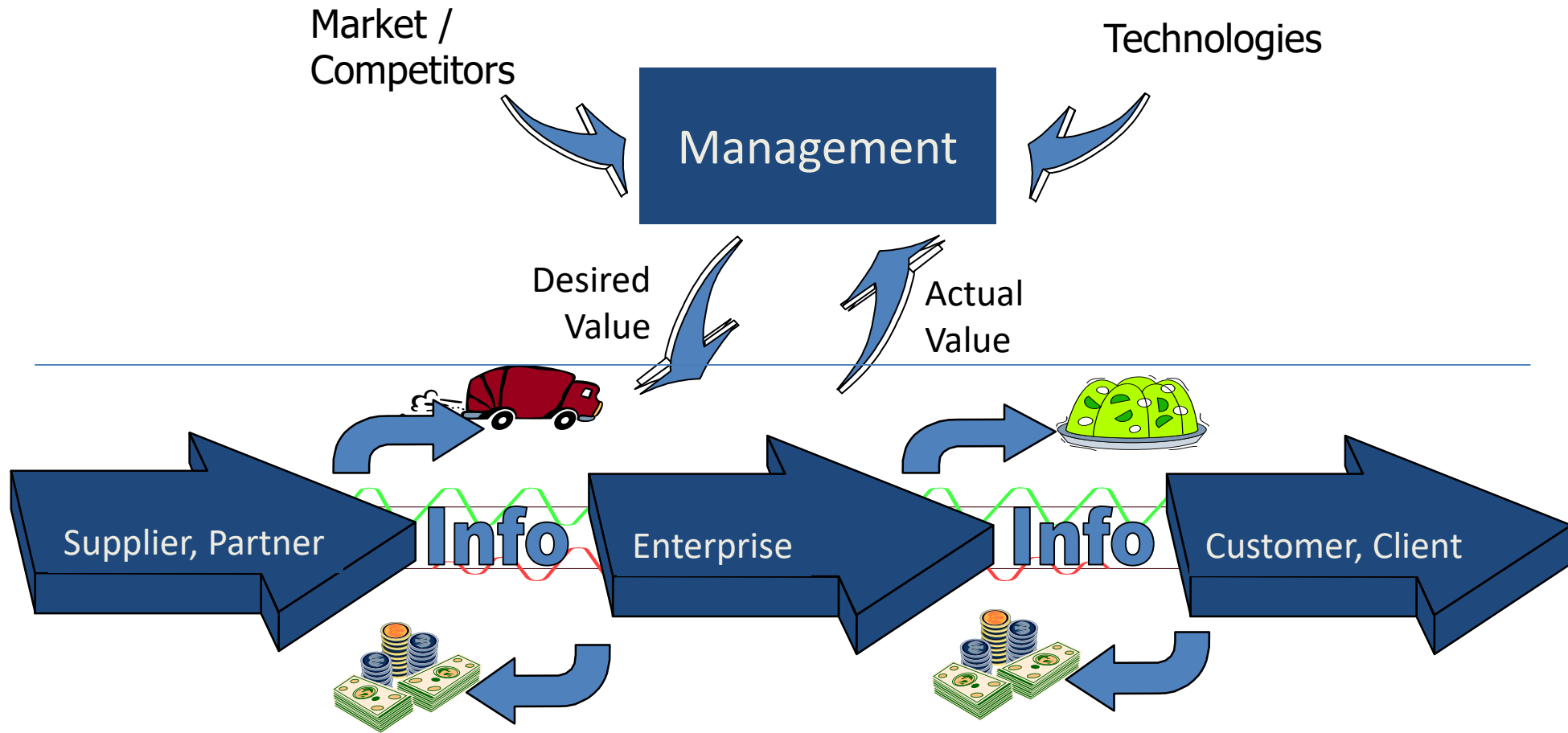
Management = Information Processing = Decision Making

Analytic vs. transaction processing

- ■ BI focuses on **analytic** processing instead of **transaction** processing

    - ♦ transaction processing supports *execution of core business processes*
    - ♦ analytic processing supports *insight and decision-making*
        - ● *Management*

BI and decision making: kinds of decisions

Strategic decisions

- Starting point: strategic goals of a company
  - ♦ goal achievement is measured via Key Performance Indicators

- Decisions…
  - … become necessary when goals are *not* achieved
  - … are based on awareness of the failure and an understanding of its causes

Operative decisions

- Starting point: execution of a business process
  - ♦ example: planning a marketing campaign

- Decisions…
  - … need to be taken during process execution
  - … are based on information of the outcomes of actions in the past (e.g. information about which customers reacted to previous campaign)

Strategic decisions…

■ **Business Performance Management:**

♦ "how to perform better as a company?"

♦ BI helps to achieve that by enabling measurement of achievement of strategic goals via Key Performance Indicatore (KPIs)

1. Define **strategy**

2. Define **goals**

   – e.g., identify key business processes to be improved, derive (concrete) strategic goals

   – for each goal, define KPIs and target values

3. **Measure**

   – current values of KPIs (dashboard/cockpit)

   – analyse / compare current to targeted values

4. **Decide**…

   – understand the (possible) deviation of KPI values from target!

Operative decisions: where BI creates value…
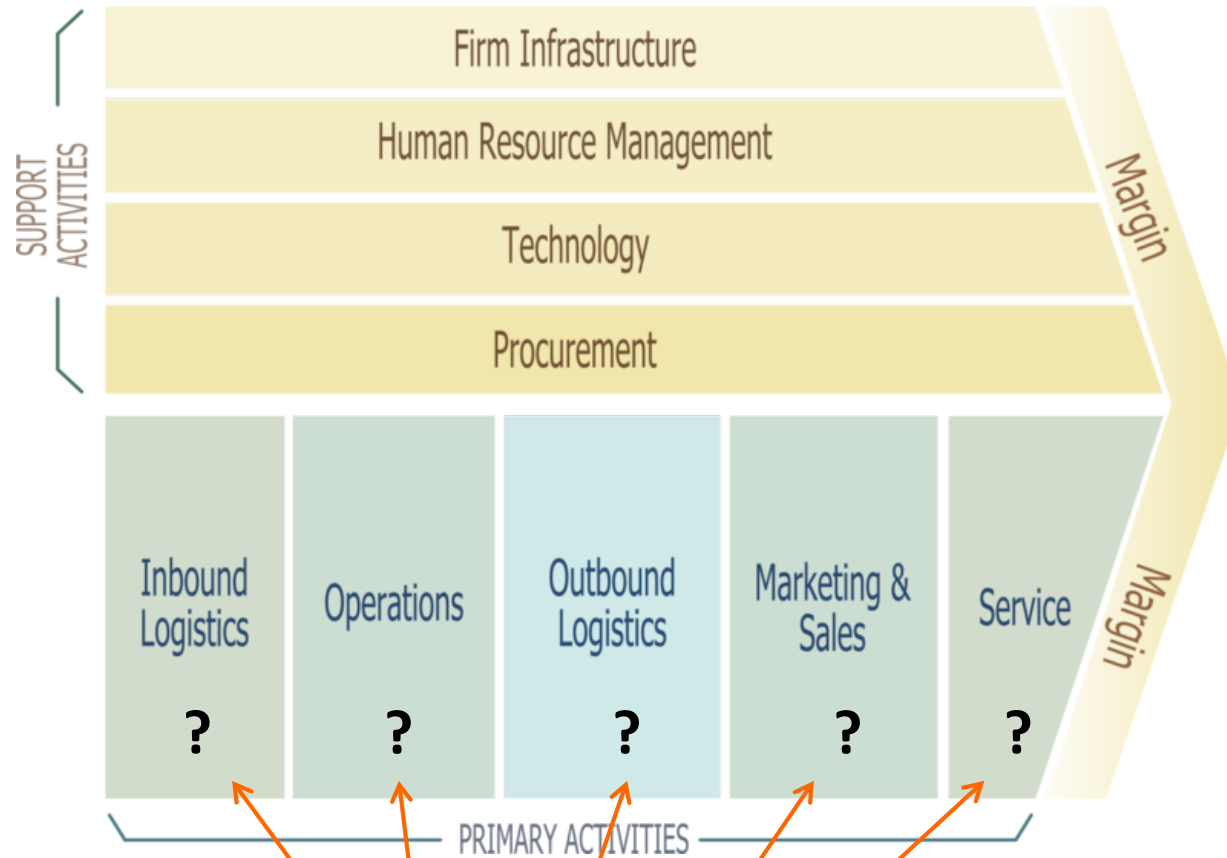
decisions to be taken in corresponding business processes?

Operative decisions: where BI creates value…

Procurement

Inbound Logistics

Operations

Outbound Logistics

Marketing & Sales

Service

Margin

PRIMARY ACTIVITIES

Logistics:
the process of planning, implementing and controlling the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements

- *how to best use resources (inbound)?*
  - which parts to order, in which quantity, at what time, from which supplier?
- *how to optimise processes (outbound)?*
  - which route/channel to use, how to schedule deliveries?

Operative decisions: where BI creates value…
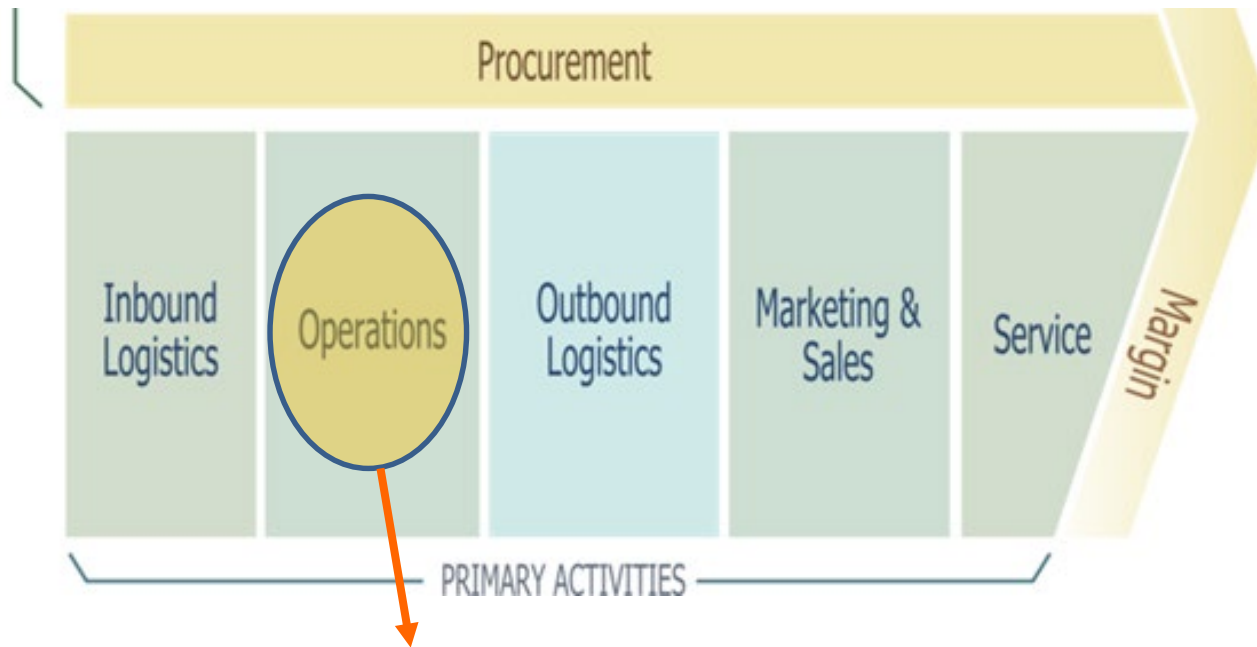
Operations:
activities associated with the functions of transforming inputs into the final product form, such as machining, packaging, assembly, equipment maintenance, testing, printing, and facility operations.

- ***how to improve efficiency and effectiveness of processes?***
  - which resources to allocate, in which quantity, …

Operative decisions: where BI creates value…
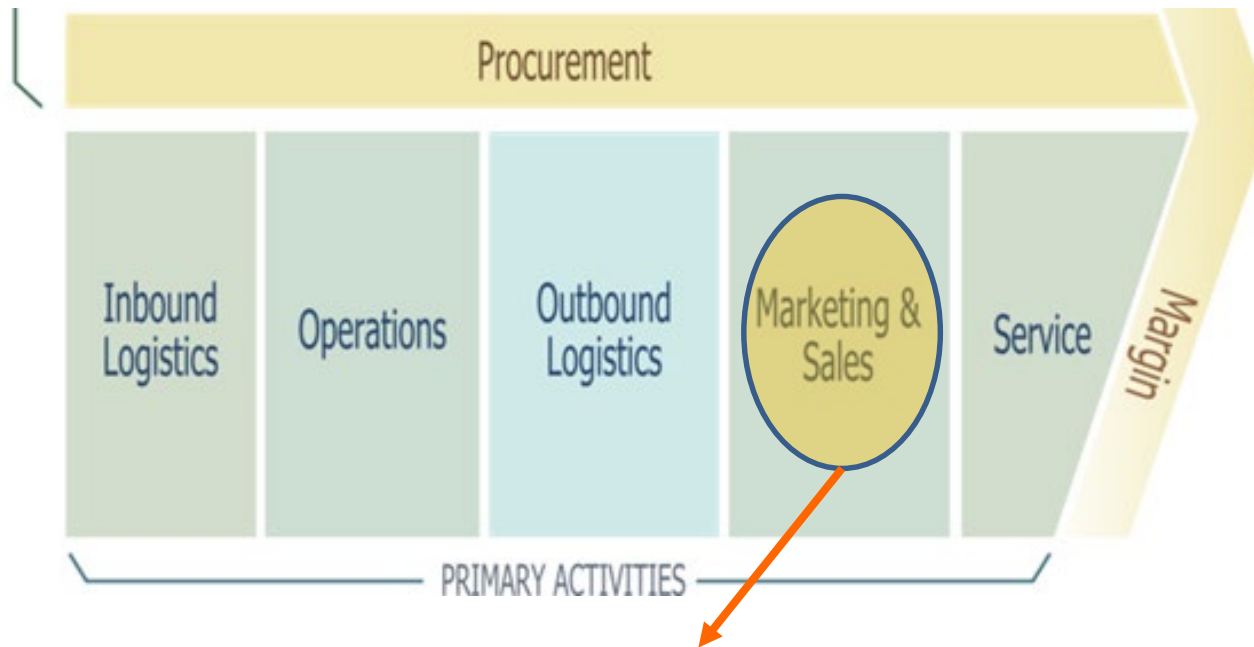
Marketing/Sales:
activities associated with the functions of providing the means by which buyers can purchase the product and inducing them to do so, such as advertising, promotion, quoting, pricing, channel and sales force management.

- *how to understand and best address the market?*
  - which customers to approach with a campaign?
  - cross-selling: which offers to make?
  - where to place products in stores?
  - client profitability: which customers to treat with special care?
  - pricing decisions

Operative decisions: where BI creates value…
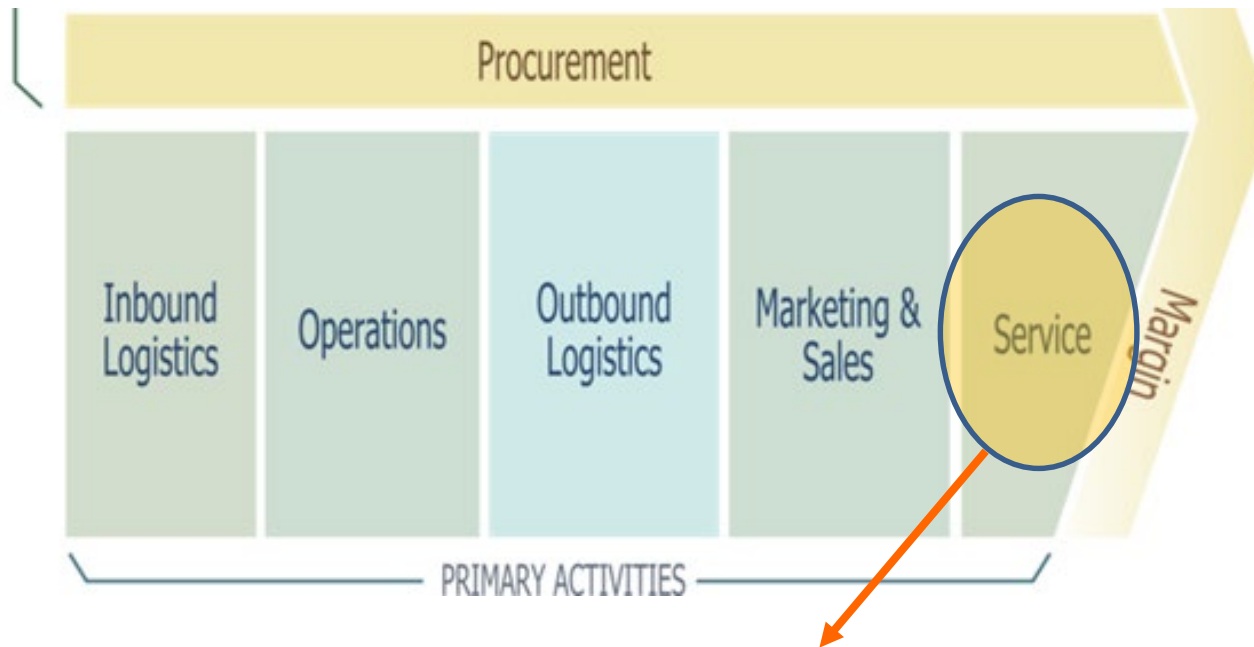
Service:
activities associated with the functions of providing service to enhance or maintain the value of the product, such as installation, repair, training, parts supply, and product adjustment.

- ***how to meet customer requirements and anticipate problems?***
  - which distribution channels to use for service delivery?
  - which quality problems to address first?
  - Attrition prediction: which customers to retain with special offers?

Where questions come from

- Generally speaking, companies need information to
  - ♦ monitor and improve **performance**
  - ♦ recognize and mitigate **risks**
  - ♦ recognize and seize **opportunities**

- All this can happen both on a strategic and an operative level

Monitor and improve performance

Strategic level:

be able to measure if strategic goals are achieved

- ♦ e.g. be able to measure the satisfaction of our customers over the last year
- ➢ so we can decide to change our customer service model

Operative level:

monitor performance within certain business processes, in small time intervals

- ♦ e.g. find out that/why (individual) customers are not satisfied today

- ➢ so we can decide to call them and find a solution

Recognise and mitigate risks

Strategic level:

be able to recognise general threats to our business

- ♦ e.g. become aware that sales in certain product category are dropping dramatically (which is threatening our whole business)

- ➢ so we can revise our product portfolio

Operative level:

be able to recognise risks related to individual processes, customers, suppliers, employees, …

- ♦ e.g. be able to predict if a customer is going to not renew (or cancel) her contract

- ➢ so we can decide to make a special offer to that customer

Recognise and seize opportunities

Strategic level:

be able to recognise general opportunities for our business

- ♦ e.g. become aware that (potential) customers are asking for a certain kind of product or product feature in social media

- ➢ so that we can decide to develop such a product

Operative level:

be able to recognise opportunities related to individual process instances, customers, suppliers, employees…

- ♦ e.g. recognise that we can cross-sell a certain product to an existing customer

- ➢ so that we can decide to make the customer aware of that product

Data-driven vs. Business-driven BI
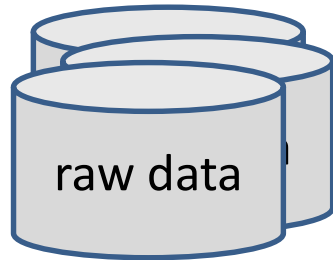
We have data. What can we do with it?
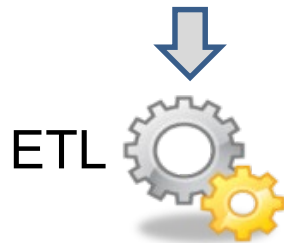
ETL — Consolidate and integrate data

DWH
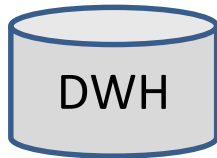
Analyze data

We have questions. How do we get answers?

?

What data do we need to answer the questions?

DWH

ETL
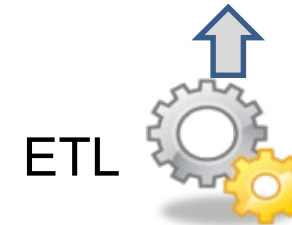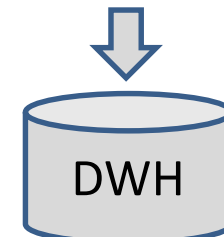
Collect and consolidate data

raw data
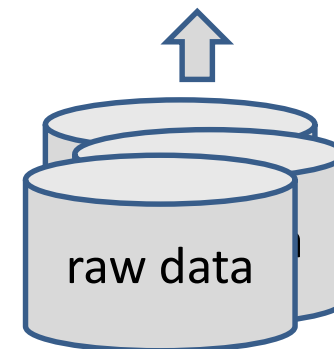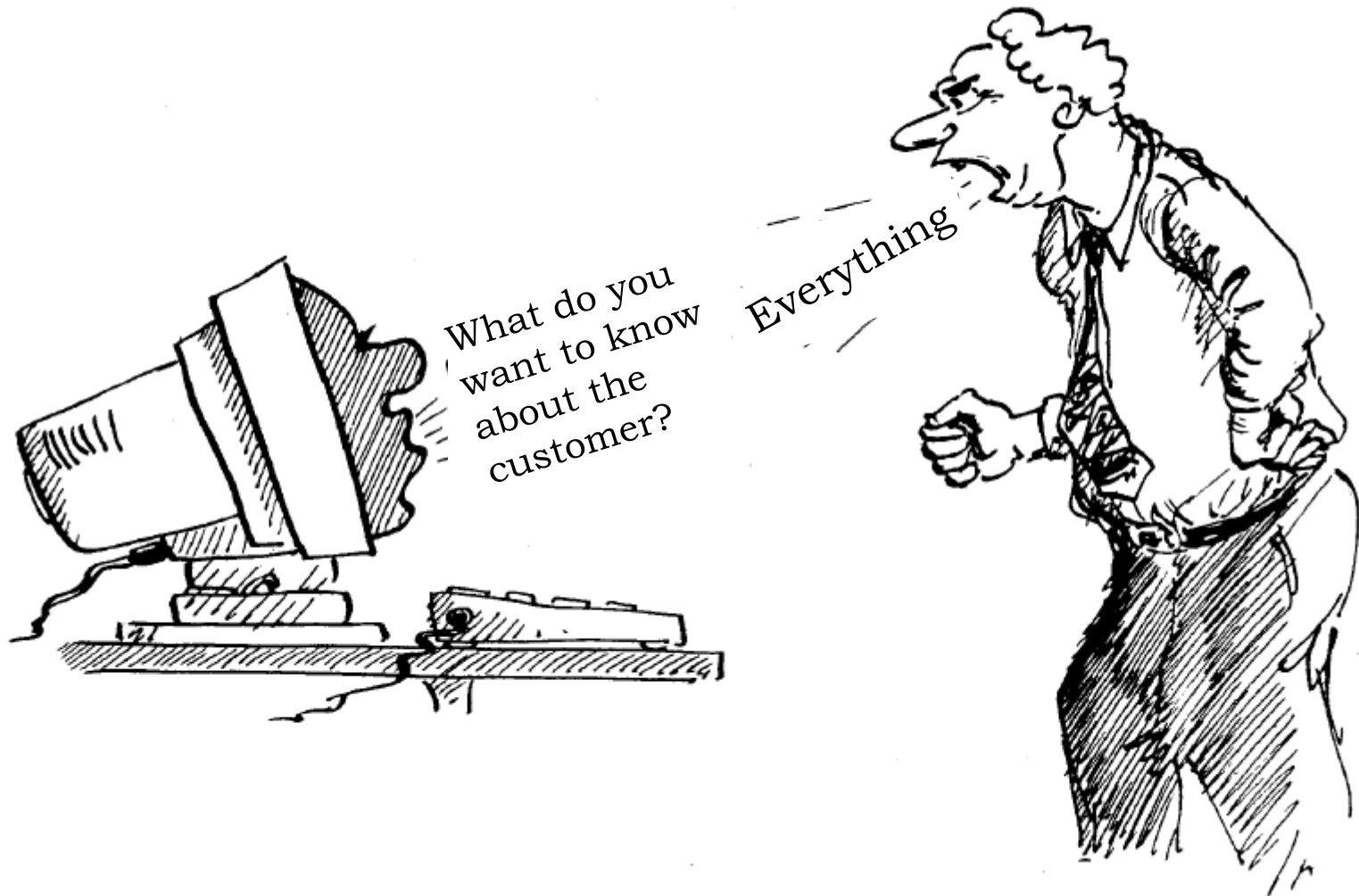
adapted from slides by Dani Schnider

Why introduce BI? – primary motivations

- **Drive company strategy**
    - ♦ being able to connect planning to measuring of impact (do not manage «blindly»)

- **Growth and competitiveness:**
    - ♦ anticipate market trends and adapt R&D accordingly
    - ♦ better customer relationships through better-targeted offers
    - ♦ better leverage of customer potential (cross-/up-selling)

Increase effectiveness

- **Single point of truth**
    - ♦ no by-pass reporting, consistent data

- **Cost reduction**
    - ♦ faster access to information
    - ♦ automation of reports, self-service BI

Increase efficiency

Question types – summary

■ Types of questions identified:

♦ **compute a measure or KPI by aggregating numbers**

- *e.g. cost, margin, turnover, profitability*

♦ **analyse KPIs / facts in different ways**

- *e.g. sales/bookings/profit by product/customer/date/store/*
- *e.g. receipts/failures/stock by part/supplier*

strategic

♦ **query** for particular numbers or facts

- *e.g. retrieve all (complicated) complaints, retrieve all sales of a specific product, retrieve all high-value customers*

♦ **predict**

- *e.g. predict fraudulent transactions/claims*
- *e.g. predict if a customer will buy a product*
- *e.g. detect types of customers or types of complaints*

operative

Question types – summary

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complexity
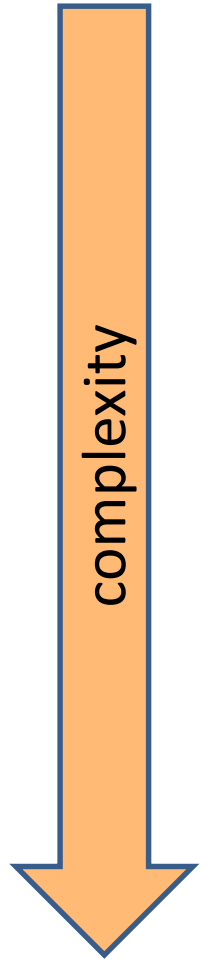
Business Intelligence

Data Sources **Data Management** **Analysis and Use**

Operational data

ETL
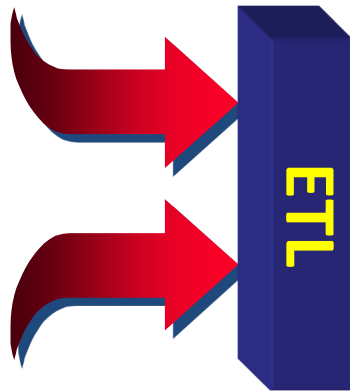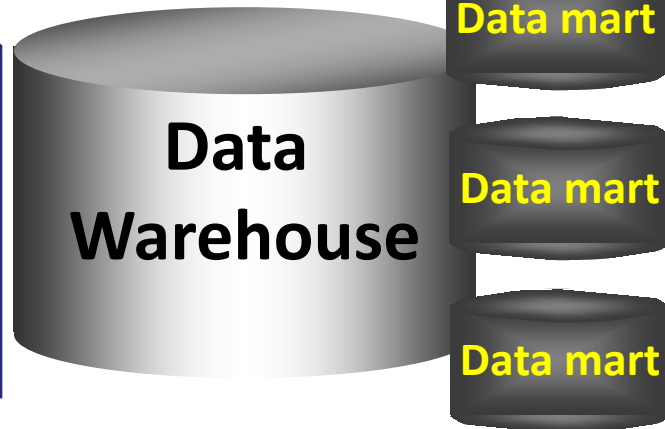
Data Warehouse

Data mart

Data mart

Data mart

External Data
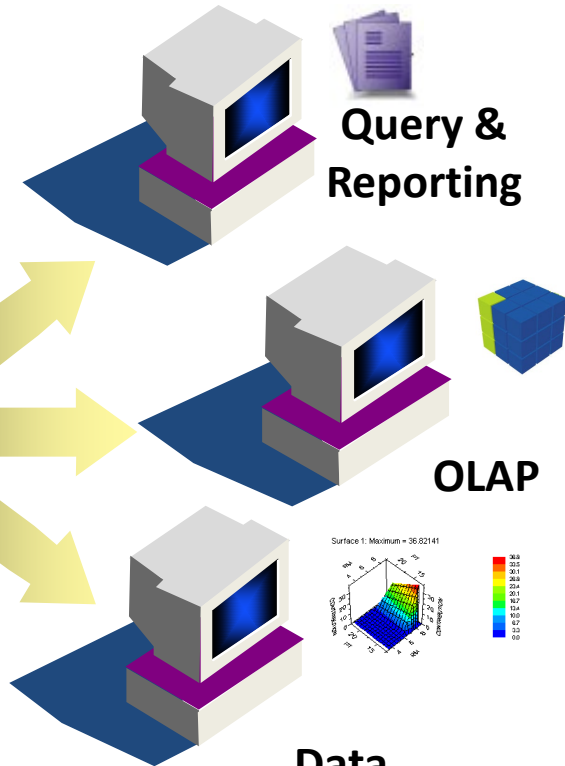
Query & Reporting

OLAP

Data Mining