Welcome to the Bielefeld International Conference on Applied Business (BiCAB)

Business Faculty

BiCAB
Bielefeld International Conference on Applied Business

FH Bielefeld
University of Applied Sciences

Keynote speech –

Dr. Stefan Breit, Executive Director Miele & Cie. KG, Germany

9.40-10.00

Data Driven Business at Miele – An implementation case in the manufacturing industry

Dr. Stefan Breit | May 6th, 2022

Conference on Applied Business 2022

Tradition & Innovation – for 120 years

- Company founded in 1899 by Carl Miele
  and Reinhard Zinkann
- Family-owned company with more than 80 family shareholders
- Focus on only one domestic appliance brand
- Five Executive Directors, including two founding great-grandsons
- Holding a consistent position in the premium segment
- Miele is considered the quality and innovation leader in its branch of industry

Eight Business Units drive growth and success at Miele – all of them with their own P&L[1)] responsibility

Overview of our Business Units

Cooking	Dishwashing	Laundry	Refrigeration	Small Domestic Appliances	Service	Professional	New Growth Factory
							

Fiscal year 2021:

- **€ 4.84 bn in revenue**
- **21,900 employees (of which 11,400 in Germany)**

1) Profit and Loss

Digitalization is everywhere – 1,000 People (!) are engaged in business development, architecture, engineering and coding.

Role of the Digital Governance Board

DIGITAL GOVERNANCE BOARD

Digital consumer relations

Digital product ecosystems

Digital operations

PRODUCT as a CHANNEL

PROCESS as part of PRODUCT

Executive Board + Corporate Strategy Department

COMOPS –Strategy[1)]

BU-Strategies[2)]

Functional Strategies

Digitalization with appr. **1,000 employees** working at:

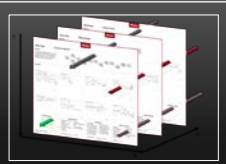
Miele X | **SH&E[3)]** | **Global IT**

Digitalization of:

Miele markets

Miele products

Organization and people



Processes, roles, data, systems

1) Commercial Operations Strategy; 2) Business Unit; 3) Smart Home and Electronics

Miele X Amsterdam is our global digitalization hub and community – Customer Centric, Performance & Data Driven, Strategic

Introduction “Miele X”

“We are **Miele’s digital upgrade** to hit revenue goals, create **delightful E2E[2)] customer experiences** and to be a **talent and expert capacity** through development, culture and guidance in tech, marketing, data and community solutions.”

- **118** experts, nerds, digital natives
- from **37** nations, speak **92** languages
- **57%** female member
- Full **agile**, **transparent** work culture
- Based in **Amsterdam** South
- **We are hiring, too ;-)**

Miele Global (VGs[1)])

Customer Engagement – CRM, Consent, Automation

eCommerce and PurePlay – Build and Run

Data – Analytics, Governance, Visualization, Optimization and Integration

Miele Business Units

1) Regional sales organizations (German Vertriebsgesellschaften); 2) End to End

Miele Smart Home: Our products are increasingly integrated into digital ecosystems – The Miele App as entry gate to additional lifetime value

Miele digital ecosystems – Example “Miele App”

78%

of consumers state that smart funtions play an important role when buying a new appliance.

The Miele App already provides desired functionalities with remote control, monitoring & smart assistance.

Customer feedback has a positive trend currently!

Miele Network

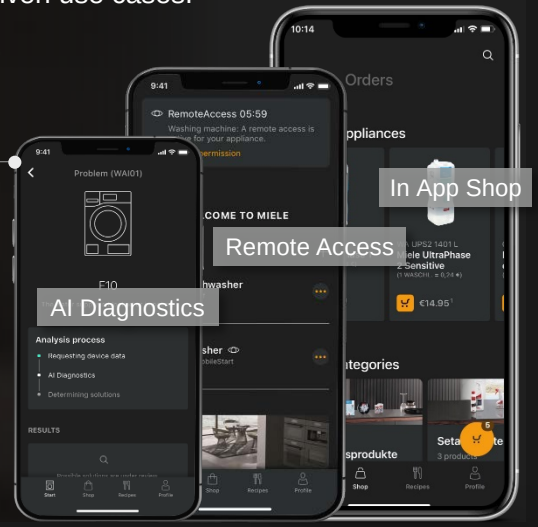
App as an entry gate

Lifetime value

~600.000
CONNECTED DEVICES

13%
CONNECTION RATE

An increased connection rate automatically unlocks additional lifetime value through monetization, cost savings and other data driven use cases.



Source: Skopos Report 2022 (based on a quantitative survery conducted in 5 countries, N=1,513 people participated)

Artificial Intelligence as “new MechEng”[1)] – Organization of AI & Data Science in hybrid “hub & spokes” model to balance synergy and decentralized application

AI & Data Science Hub at Miele “Smart Home”

To effectively scale AI & Data Science we balance centralized responsibility & governance and decentralized activities

“We enable and guide Miele to sustainably develop and operate data-driven products and services.”

…

COORDINATION OF AI & DATA STRATEGY

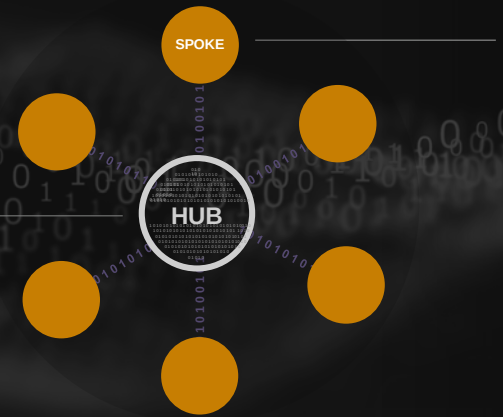
CENTRAL DATA & USE CASE CATALOG

AI & DATA TECH STACK

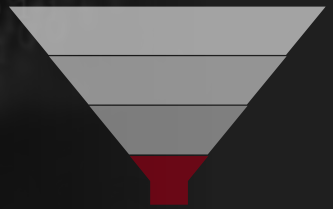
DEVELOPMENT SUPPORT

DATA LITERACY & AI CULTURE

GUIDELINES AND BEST PRACTICES



The spokes are supported with a systematic approach to use case collection, description and prioritization.

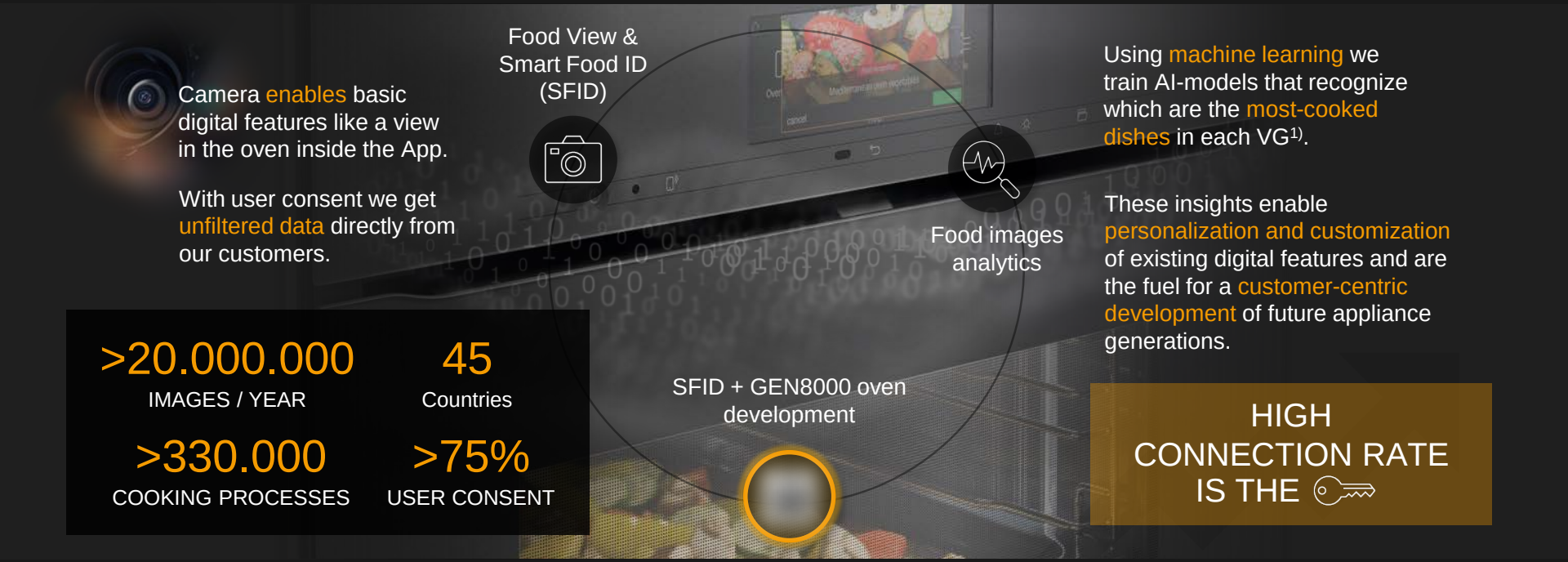


And get development support with exploration sprints, proof-of-concepts to cooperative AI solution development.

1) MechEng = Mechanical Engineering

Real Life AI use case: The Miele GEN 7000 oven with camera and SmartFood ID creates consumer benefit and at the same time fuels data-driven R&D

GEN 7000 oven with Smart Food ID



Camera enables basic digital features like a view in the oven inside the App.

With user consent we get unfiltered data directly from our customers.

Food View & Smart Food ID (SFID)

Food images analytics

Using machine learning we train AI-models that recognize which are the most-cooked dishes in each VG[1)].

These insights enable personalization and customization of existing digital features and are the fuel for a customer-centric development of future appliance generations.

SFID + GEN8000 oven development

>20.000.000 IMAGES / YEAR	45 Countries
>330.000 COOKING PROCESSES	>75% USER CONSENT

HIGH CONNECTION RATE IS THE

Outlook: “Every croissant is perfect” – Use of camera data streams for further product development

Further product development – Data driven cooking

Also in operations, AI opens a wide variety of possibilities to increase quality and process efficiency

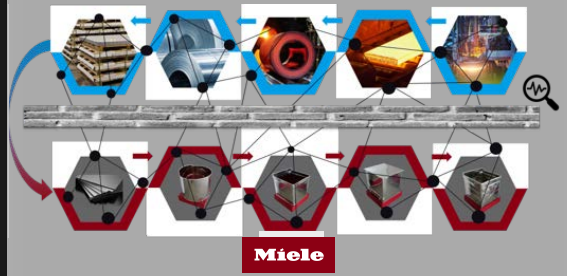
Examples of AI in operations at Miele

Predictive Maintenance

Prediction of pollution level of soldering ovens in the electronic production

Smart Home

Predictive Quality



Understanding raw material effects on the quality of washing chambers

BU Dishwashing

Optimization of production parameters

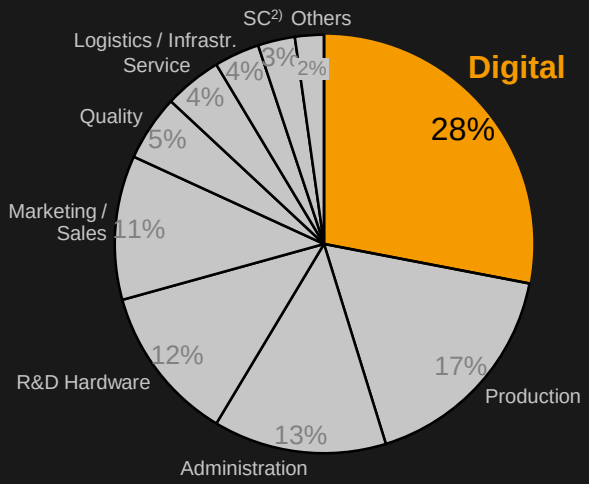
Determining the optimal Bituming melting time

BU Professional

Availability of digital talent will determine growth and prosperity – For companies but also for economies

Role of digitalization for Miele's recruiting activities

Open job positions at Miele by categories (total >300)[1)]



Examples:

- Product Owner App/Web
- System Engineer/ Architect IoT
- Creative Technologist Digital Innovation
- ...

Who companies are looking for (m/f/d)

Agile mindset with interest in:

- ✓ Digitization
- ✓ Technology
- ✓ Innovation

Education in:

- Business Information Systems
- International Studies in Management
- Electrical Engineering
- Computer Sciences
- Engineering Computer Sciences
- Digital Technologies
- ...

Modern academic curriculum as foundation for future talents is appreciated!

1) Germany only, as of January 11th, 2022; 2) Supply Chain

Summary

- Miele's digitalization is an integral part of the overall strategy **"Pioneering 4 / 8"**.
- Digitalization is everywhere – From consumer relations to product digital ecosystem and operations.
  1,000 People (!) are engaged in business development, architecture, engineering and coding.
- Our products are increasingly integrated into **digital ecosystems** –
  The **Miele App** serves as an entry gate to additional lifetime value.
- We have real life AI use cases in place – For example "**Smart Food ID**" technology in the current GEN 7000 ovens in order to improve the user's **baking experience** and **result**.
- Besides products, the use of AI in **operations** bears huge potentials to increase process **quality** and **efficiency**.
- Digitalization is our **fastest growing** area for new talents.
  Industrial companies rely on **modern academic curriculum** as source for future talents.


Miele

Miele & Cie. KG

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+49 5241 892090

Keynote speech –

Prof. Dr. Haldun Akpinar, Marmara University Istanbul, Former Director of Business Informatics Department

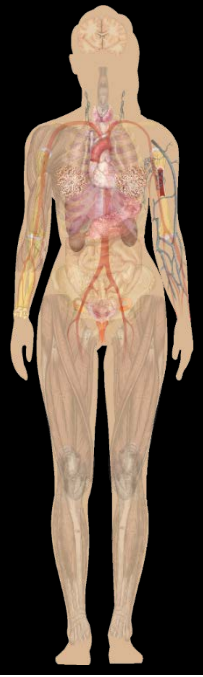
10.00-10.20

ALEA IACTA EST

Prof. Dr. Haldun AKPINAR

1st Bielefeld International Conference on Applied Business on

„Data driven decisions in enterprises – implications for business education and cases“



Human	Robot	Animal	Plant	Alien

A system is a group of interacting, interrelated, or interdependent elements forming a complex whole that work toward a common goal.

Macro System

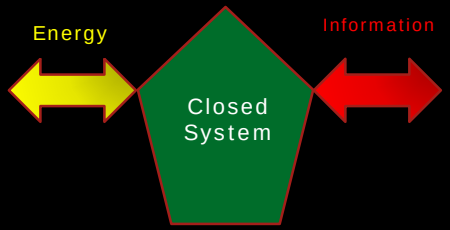
Mezo System

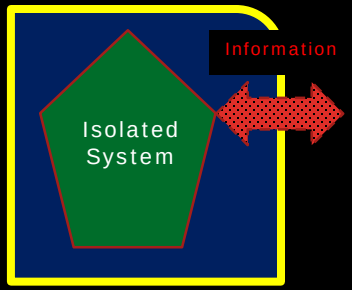
Micro System

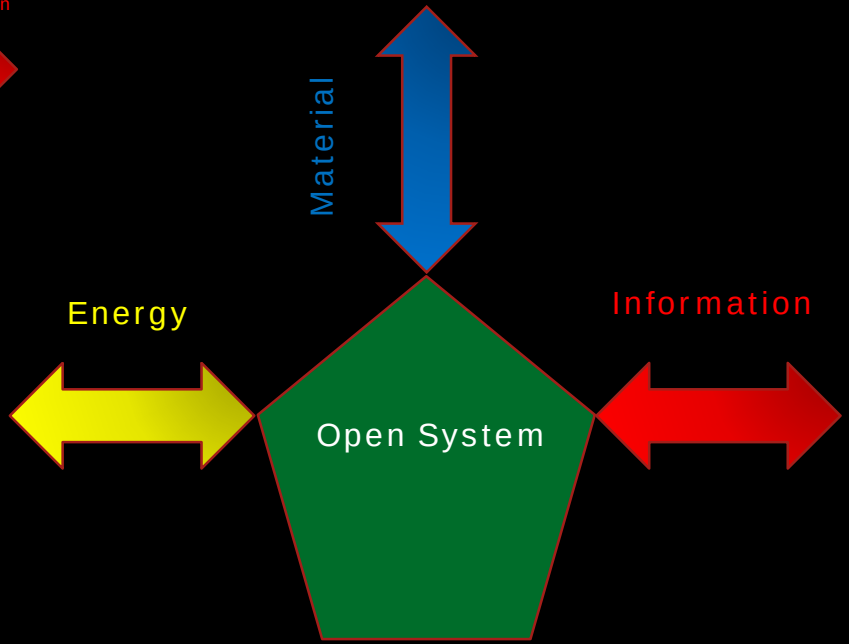
Super System

Supra System

System







EXTERNAL ENVIRONMENT

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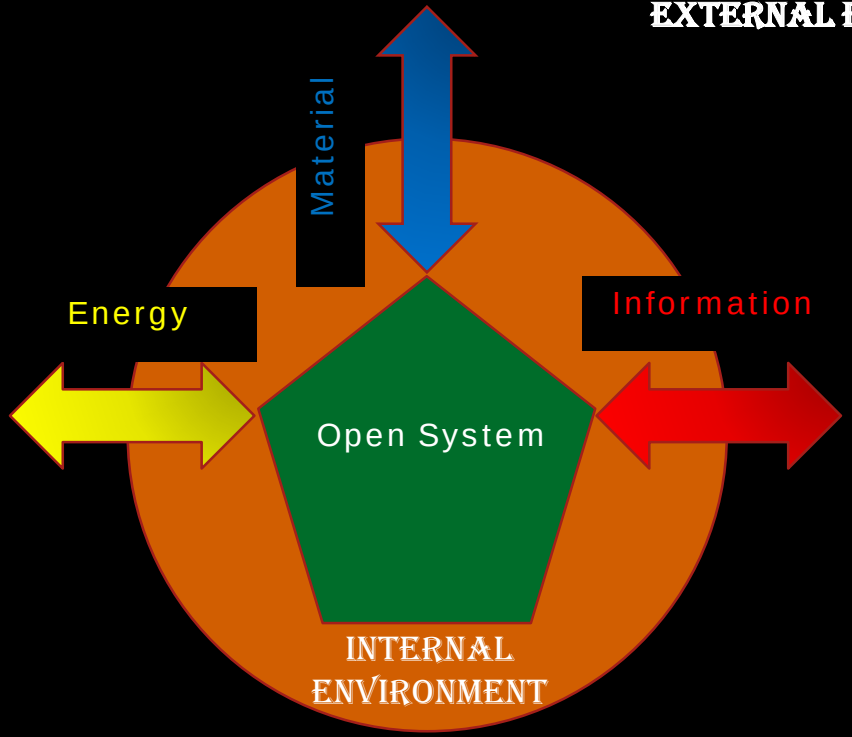

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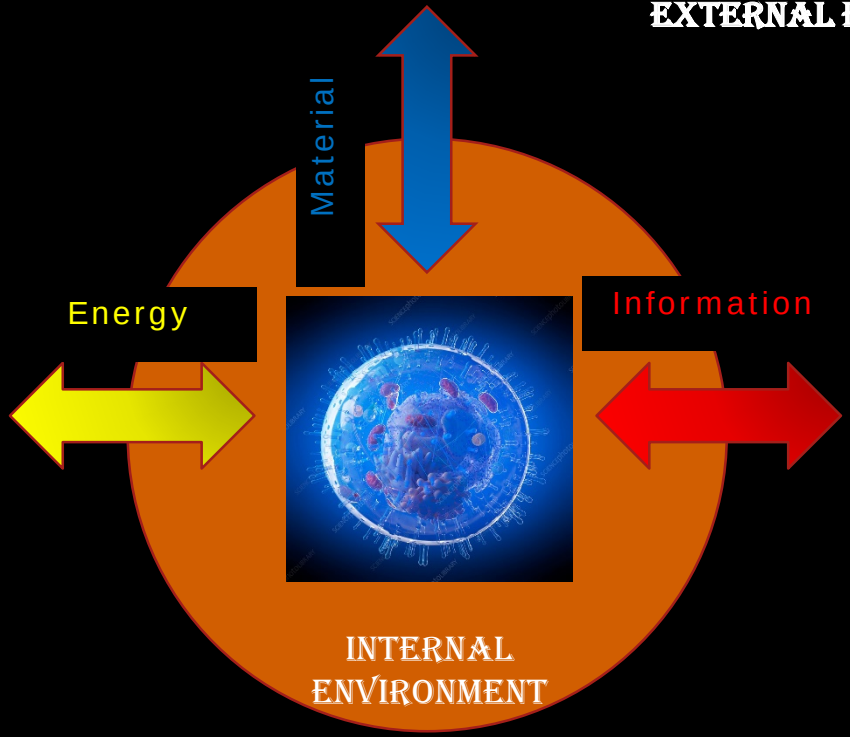

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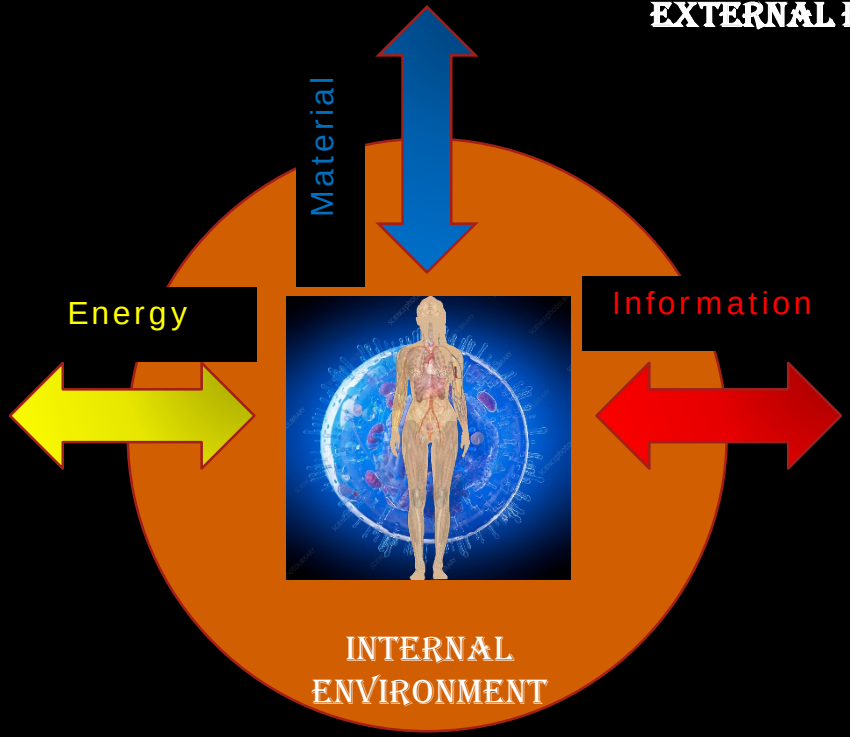

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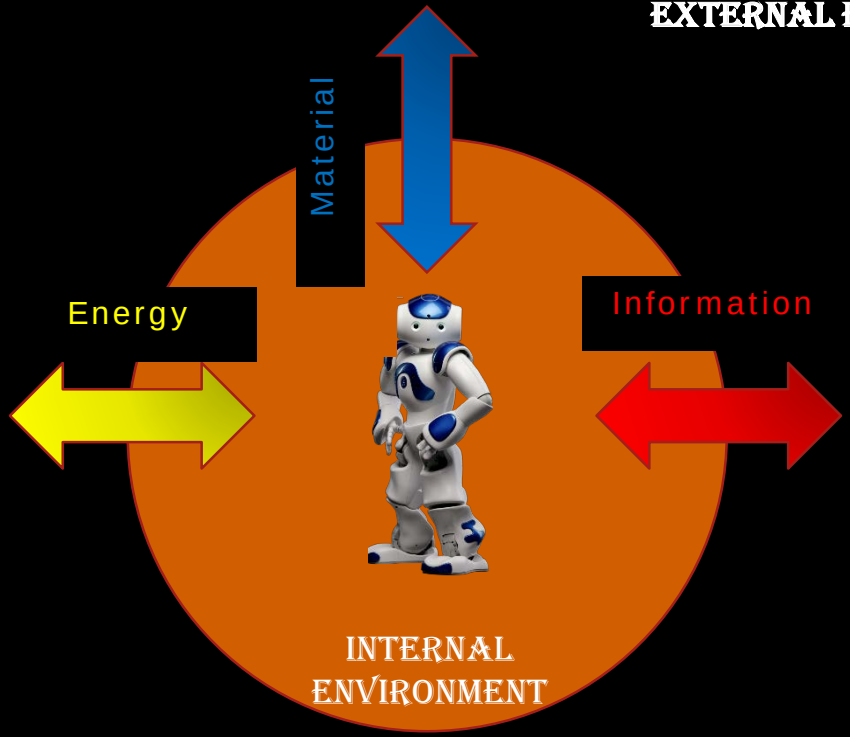
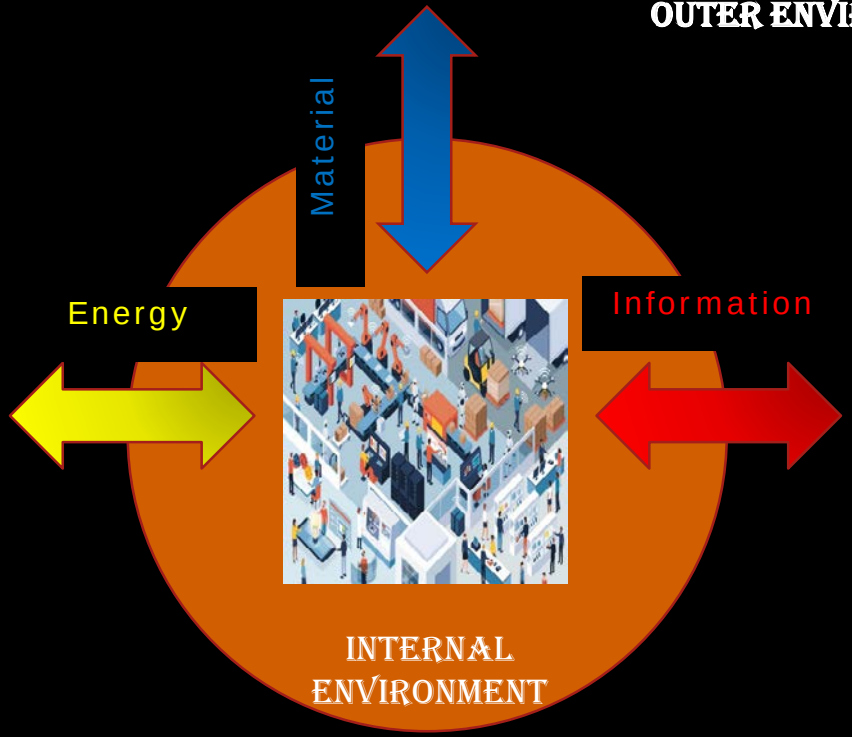


OUTER ENVIRONMENT



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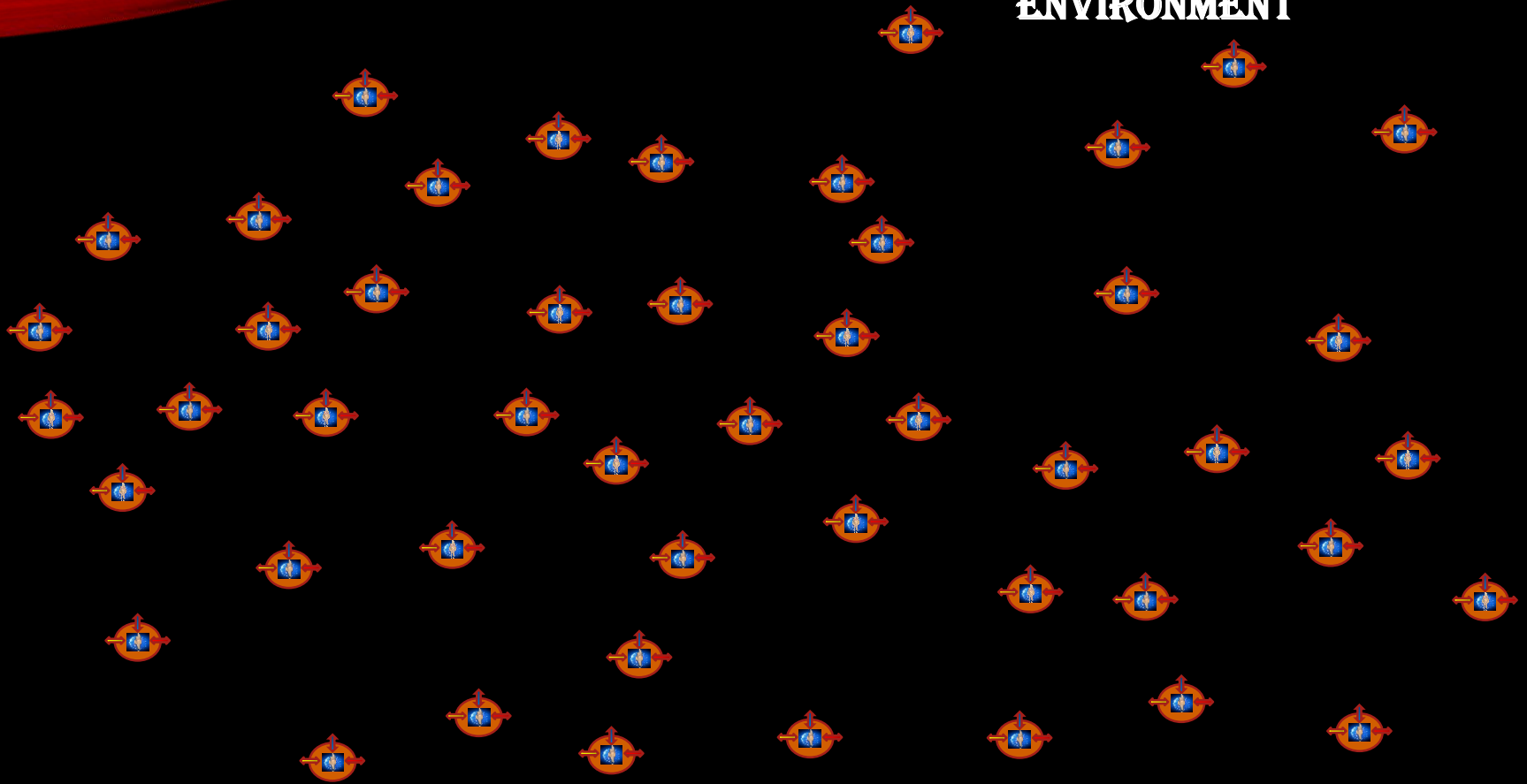

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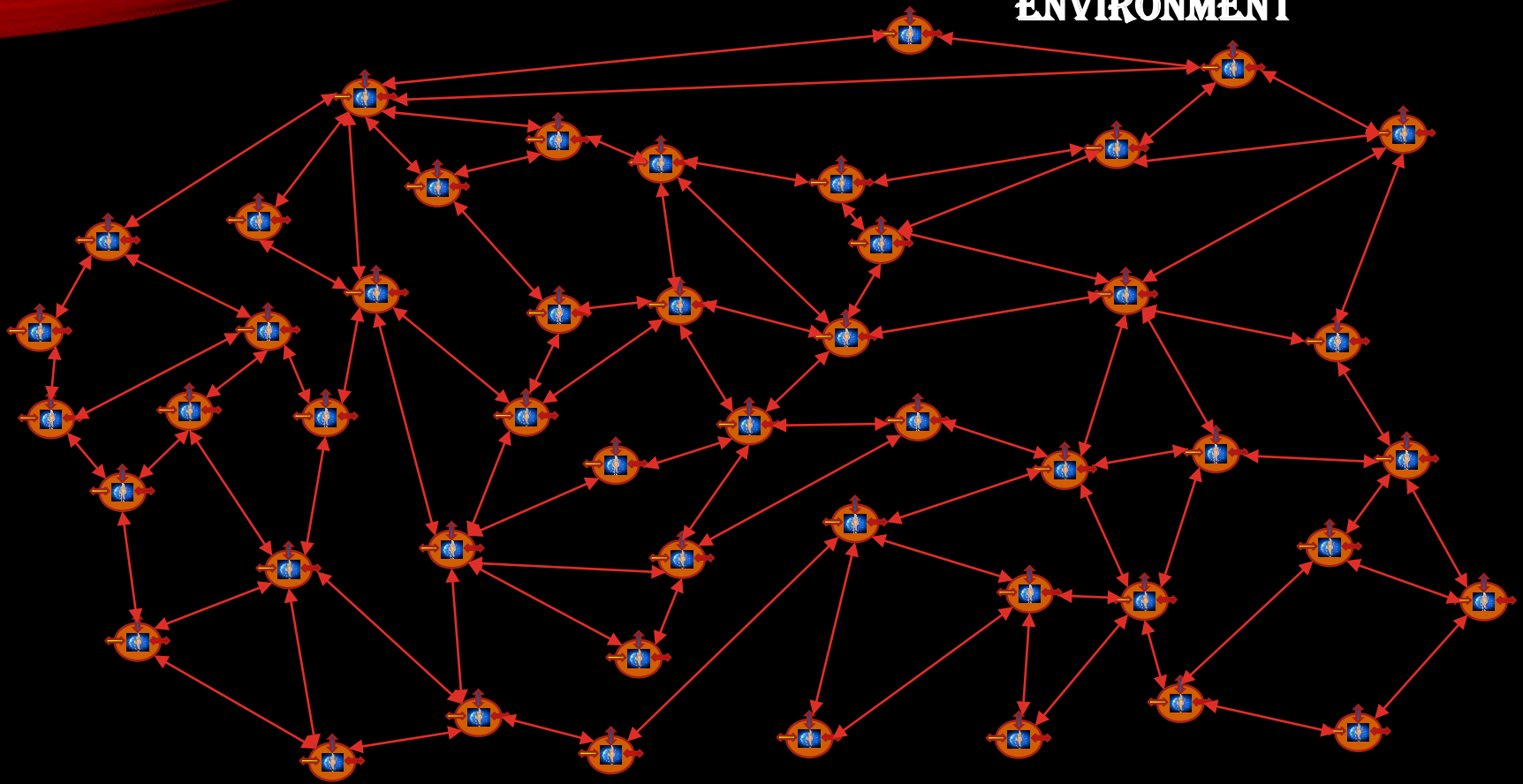
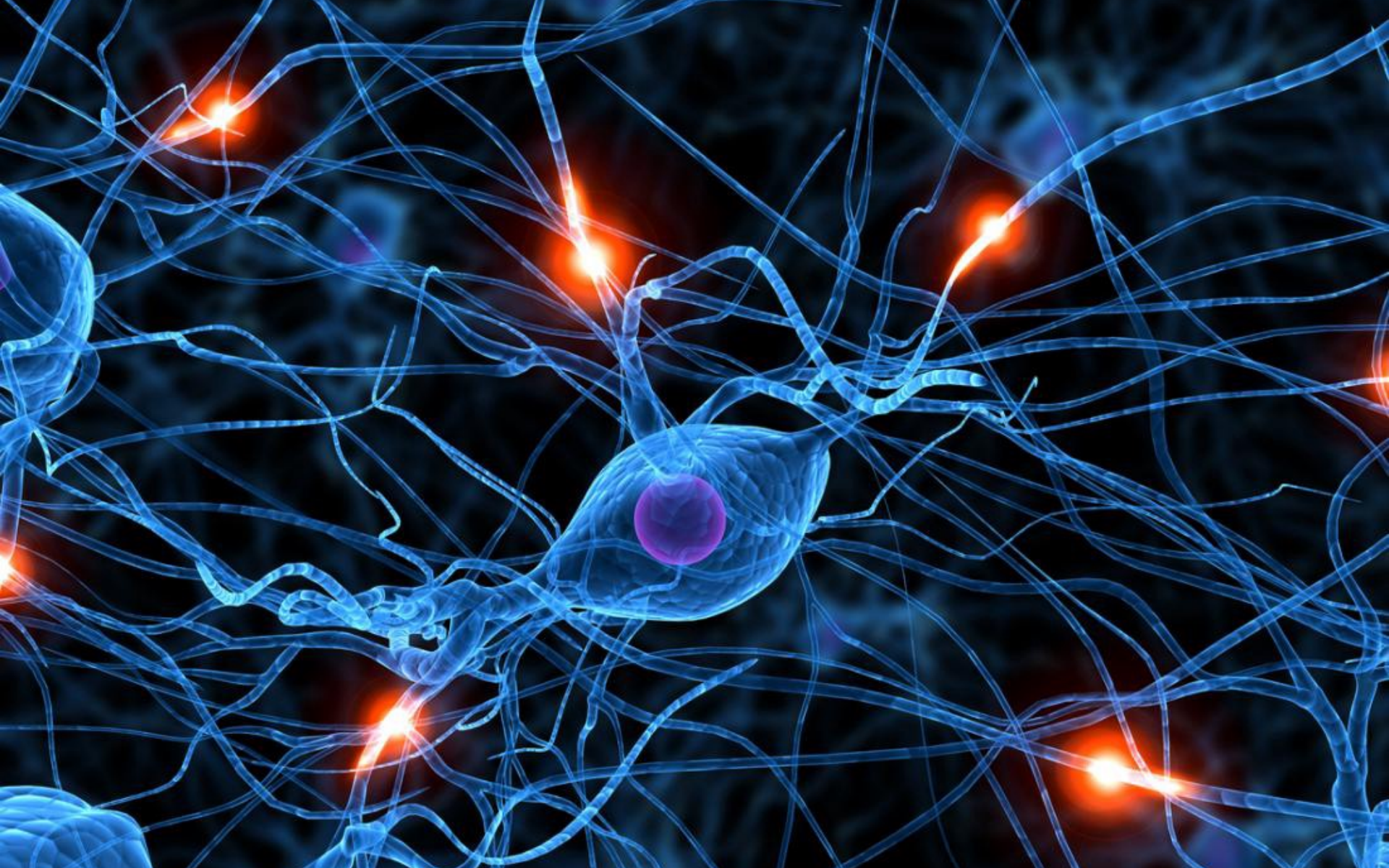
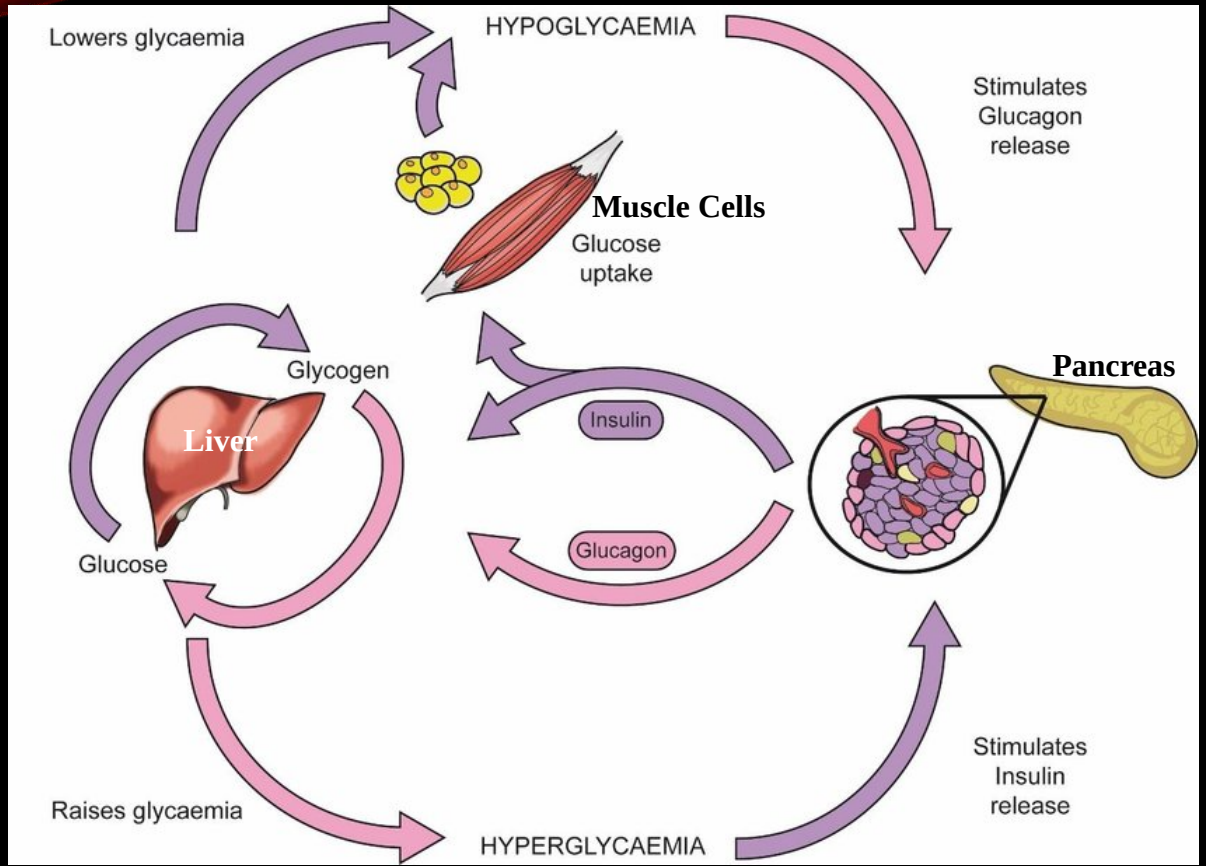





Lowers glycaemia
HYPOGLYCAEMIA
Stimulates Glucagon release
Muscle Cells
Glucose uptake
Glycogen
Liver
Pancreas
Insulin
Glucagon
Glucose
Raises glycaemia
HYPERGLYCAEMIA
Stimulates Insulin release

Data driven decision making

is the process of using data to make informed and verified decisions.

FORTUNE TELLER

DECISION

DECISION MAKER

DECISION

DATA

DECISION

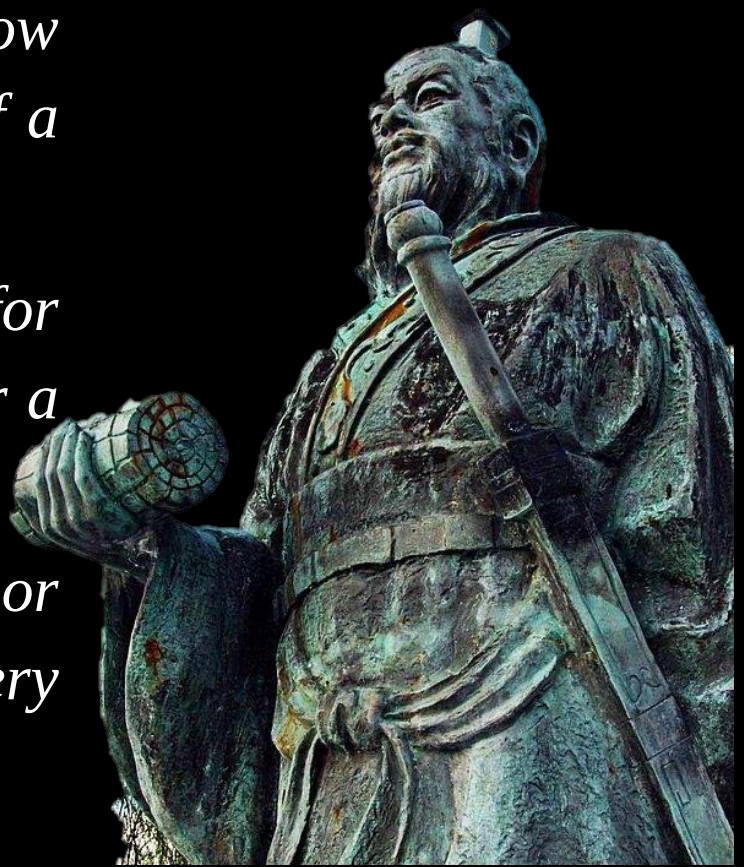
To make effective and efficient decisions, the aim is to remove randomness, albeit partially, to try to see the future in the twilight instead of trying to see in the dark.

“If you know the enemy and know yourself, you need not fear the result of a hundred battles.

If you know yourself but not the enemy, for every victory gained you will also suffer a defeat.

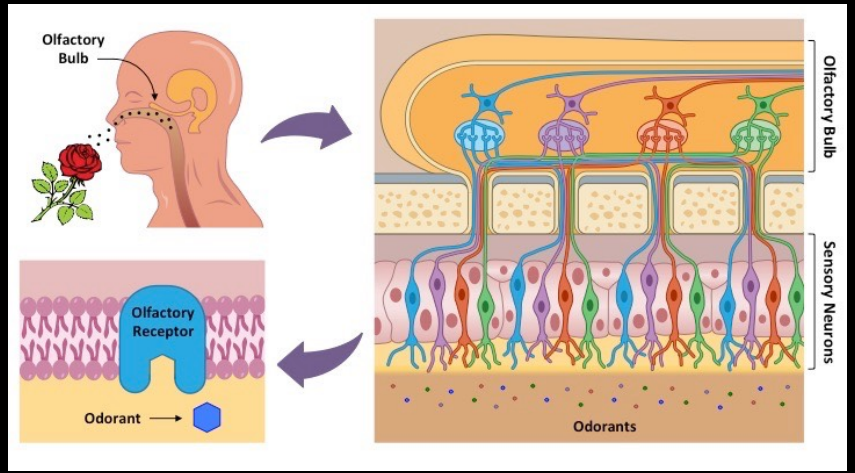
If you know neither the enemy nor yourself, you will succumb in every battle.”

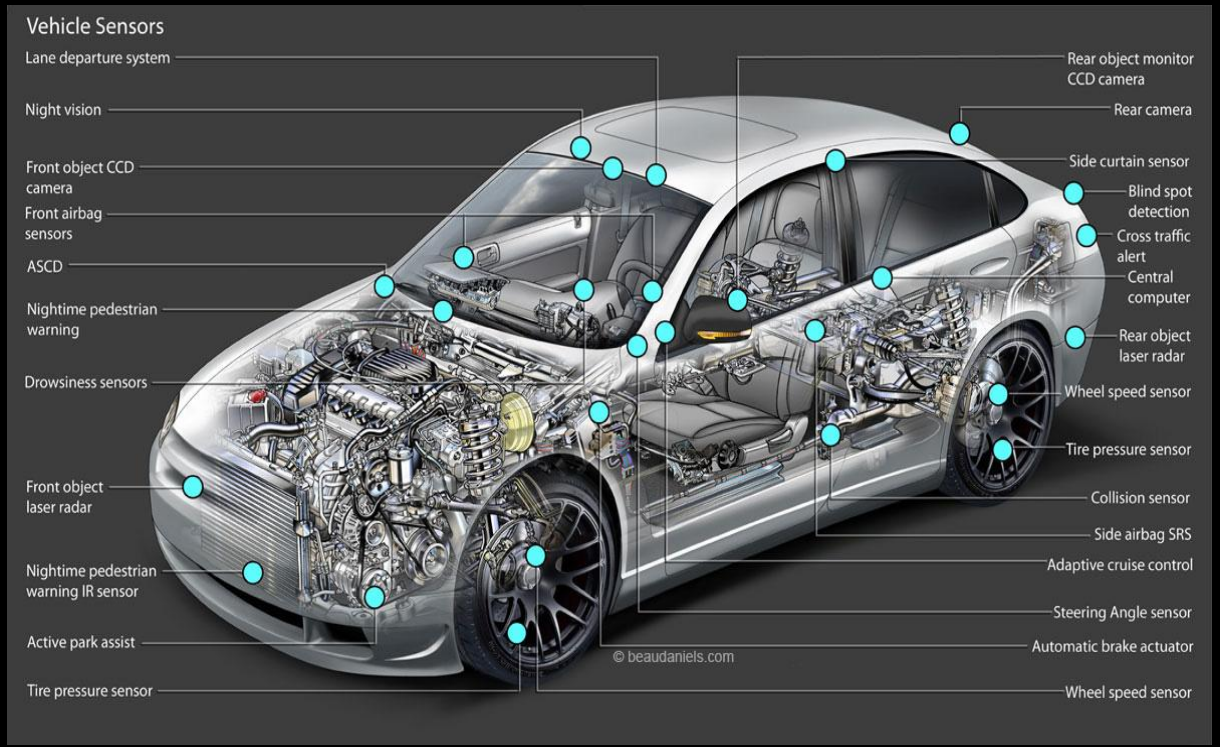
Sun Tzu – The Art of War




Venedig
Ofen
Craca
Insprucк
Nurmberg
Uncorff
Lisbona

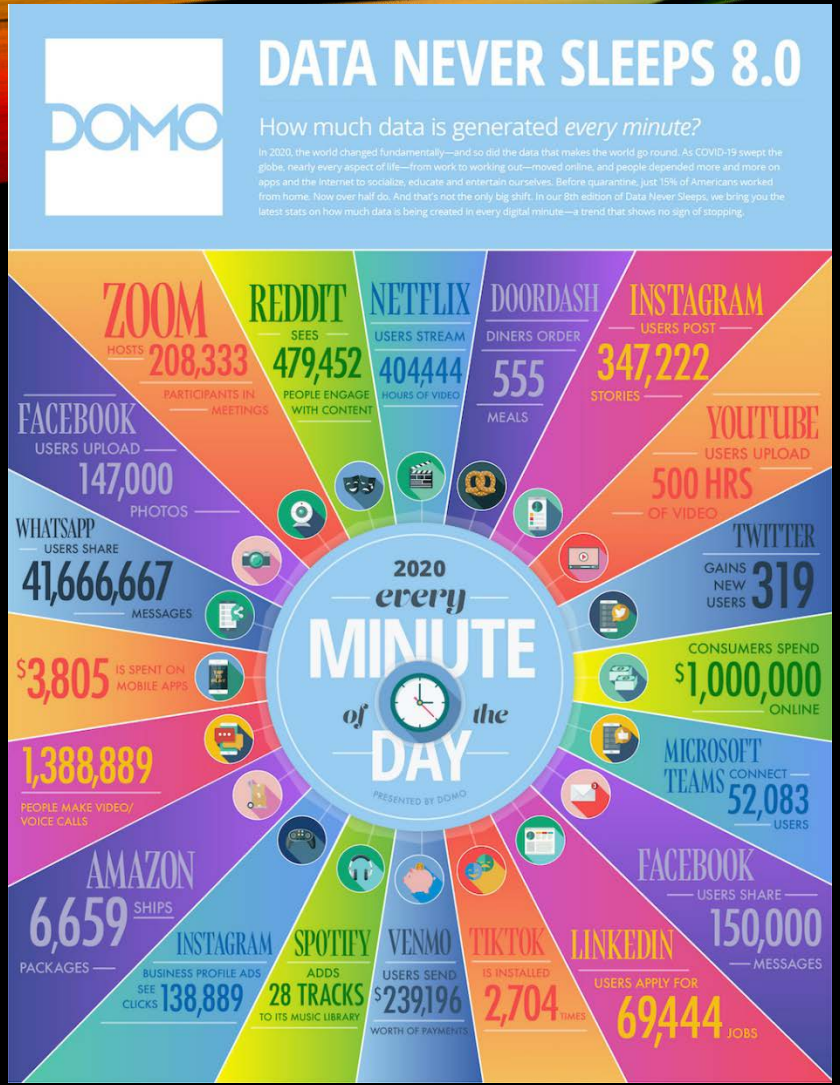
Nature has equipped living things with hundreds of millions of receptors to collect data. For example the olfactory area in humans is about 2.5 cm2 wide and contains a number of about 50 million receptor cells. This figure is 100 million in rabbits and 220 million in dogs.





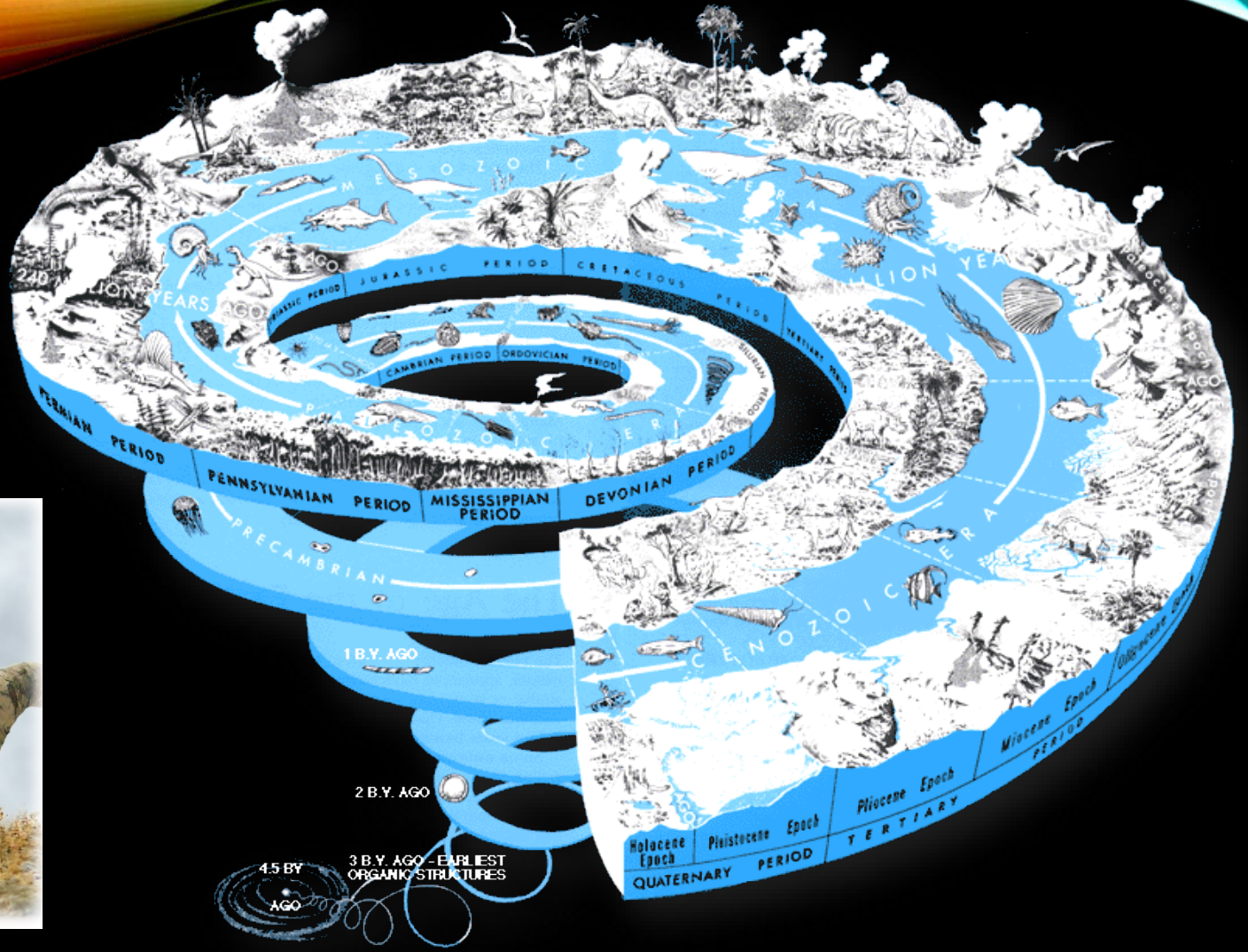
In contrast, how many sensors do we have to collect data in man-made vehicles?

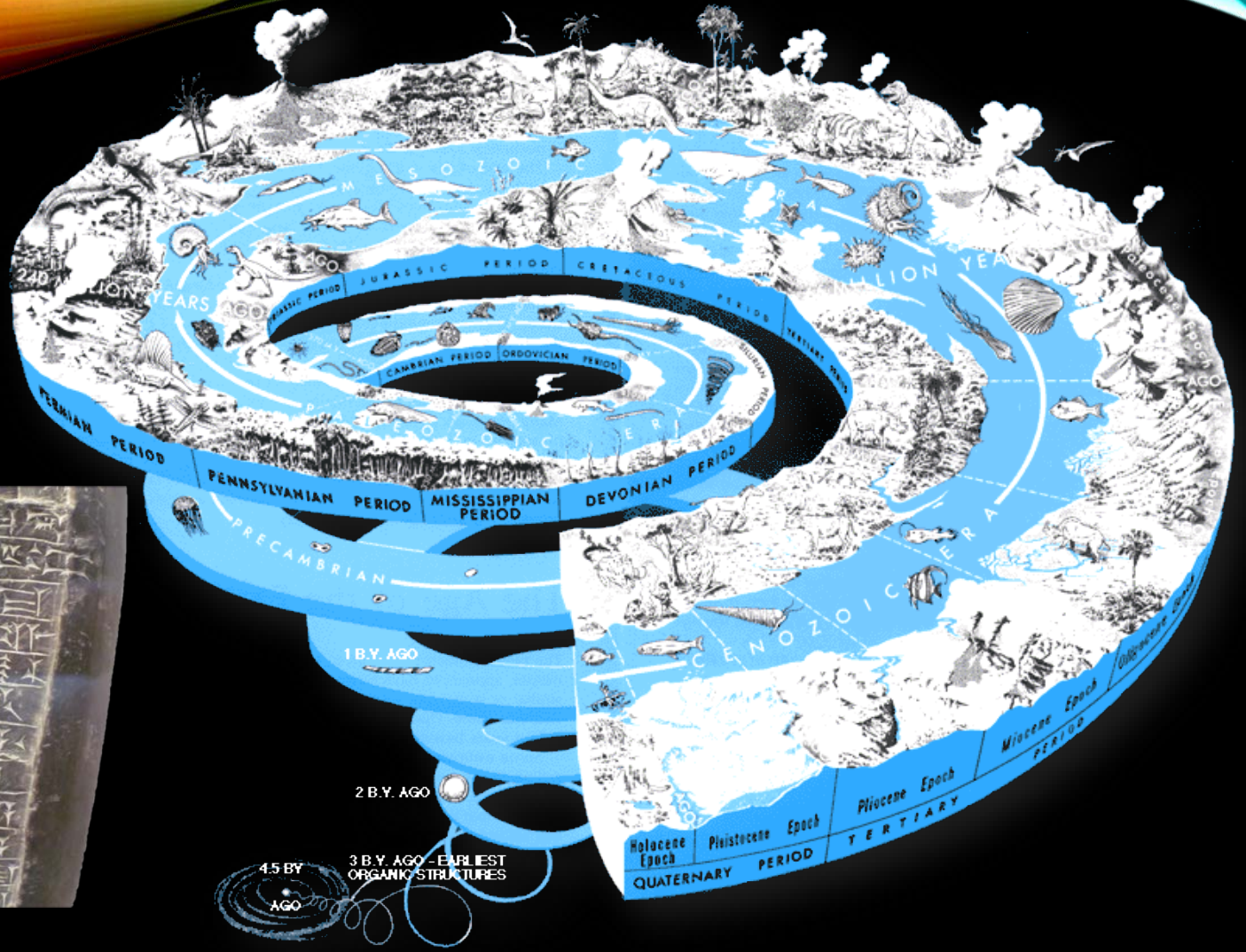
However, we are incapable of processing even this little data, which we call big data, with our tools.



But that's it for today. We are able to collect and process more and more data every day.

- omniscient
- omnipotent
- omnipresent


MESOZOIC ERA
PALEOZOIC ERA
CENOZOIC ERA
240 MILLION YEARS AGO
JURASSIC PERIOD
CRETACEOUS PERIOD
TERTIARY PERIOD
CAMBRIAN PERIOD
ORDOVICIAN PERIOD
SILURIAN PERIOD
DEVONIAN PERIOD
MISSISSIPPIAN PERIOD
PENNSYLVANIAN PERIOD
PERMIAN PERIOD
PRECAMBRIAN
1 B.Y. AGO
2 B.Y. AGO
3 B.Y. AGO - EARLIEST ORGANIC STRUCTURES
4.5 BY AGO
Holocene Epoch
Pleistocene Epoch
QUATERNARY PERIOD
Pliocene Epoch
Miocene Epoch
TERTIARY PERIOD
Oligocene Epoch
Eocene Epoch
Paleocene Epoch
65 MILLION YEARS AGO


MESOZOIC ERA
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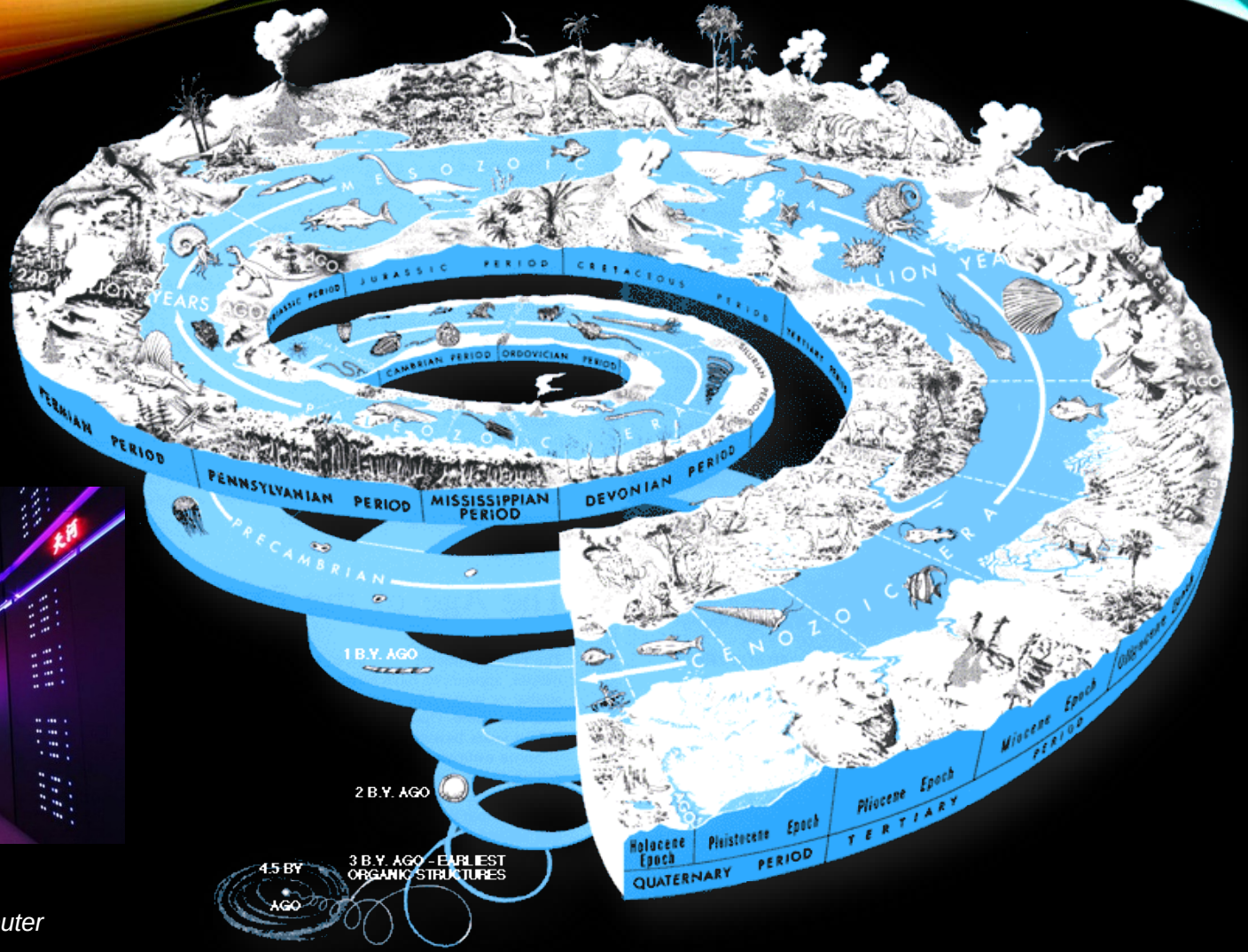
PERMIAN PERIOD
1 B.Y. AGO
2 B.Y. AGO
3 B.Y. AGO - EARLIEST ORGANIC STRUCTURES
4.5 BY AGO
Holocene Epoch
Pleistocene Epoch
QUATERNARY PERIOD
Pliocene Epoch
Miocene Epoch
TERTIARY PERIOD
Oligocene Epoch
AGO

Tianhe-2

The world's most powerful computer



Limited Memory

Misjudgment

Changes in Mood

Prejudices

Near-Sightedness

Physical Inability

Fatigue

Fears

Resistance to Change

Limited Memory

Misjudgment

Changes in Mood

Fatigue

Prejudices

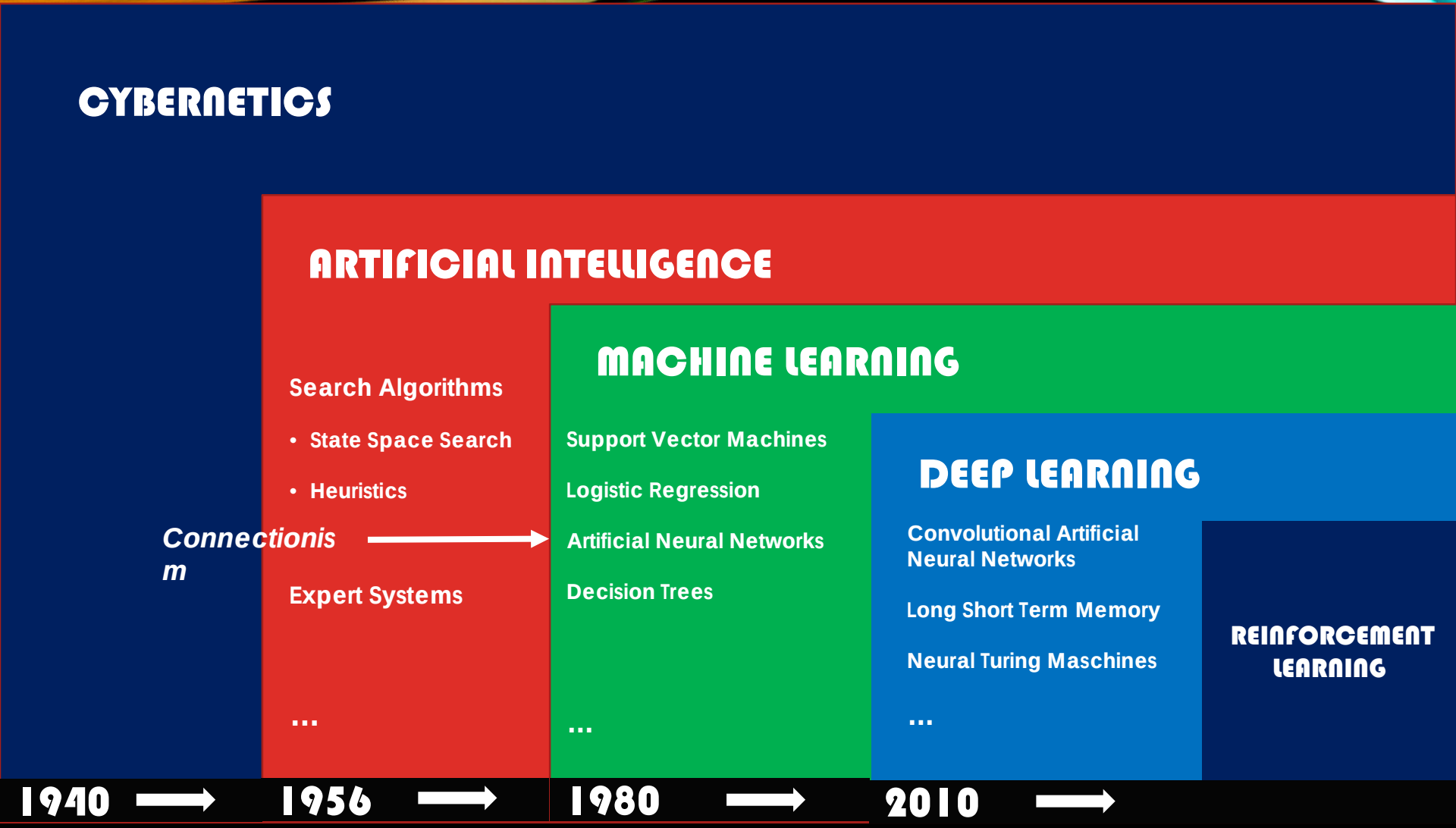
Near-Sightedness

Physical Inability

IN THIS CASE WE NEED ANOTHER ENTITY

Fears

Resistance to Change


CYBERNETICS
ARTIFICIAL INTELLIGENCE
Search Algorithms
• State Space Search
• Heuristics
Connectionism
Expert Systems
...
MACHINE LEARNING
Support Vector Machines
Logistic Regression
Artificial Neural Networks
Decision Trees
...
DEEP LEARNING
Convolutional Artificial Neural Networks
Long Short Term Memory
Neural Turing Maschines
...
REINFORCEMENT LEARNING
1940
1956
1980
2010

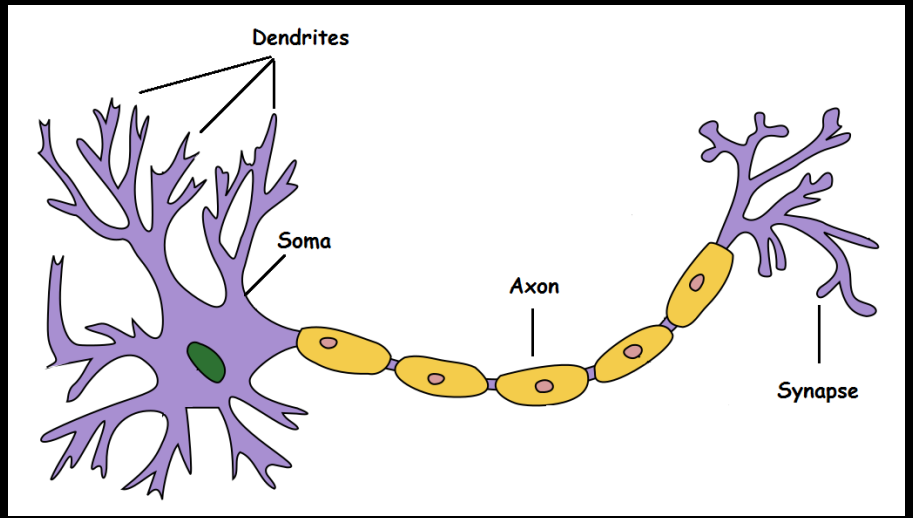
CyberSyn Project

1971-1973

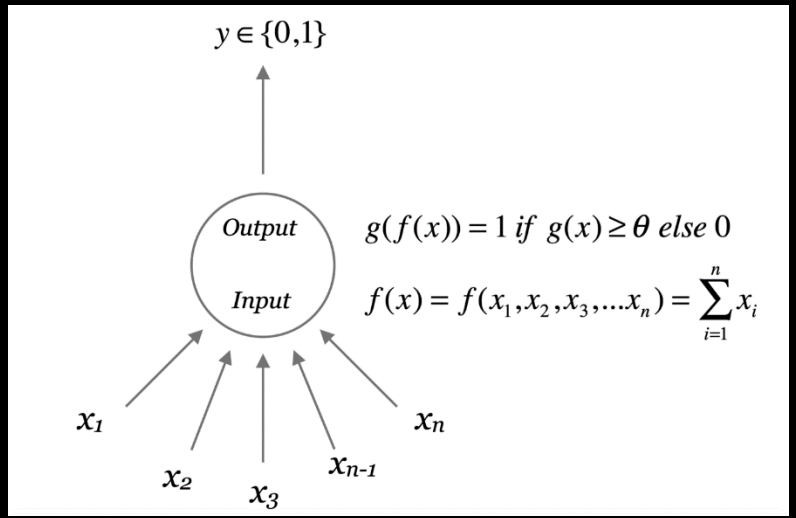
Medium

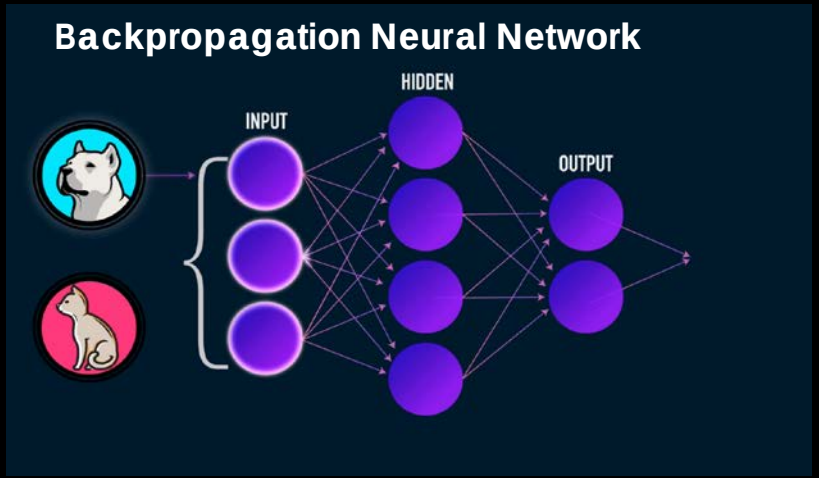
McCulloch Pitts (MP) Neuron

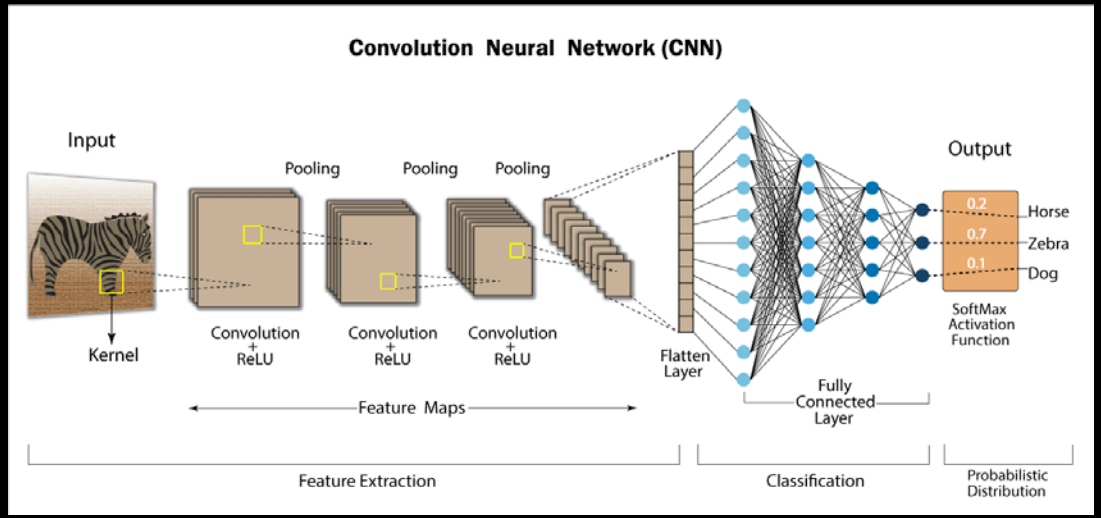
A Biological Neuron

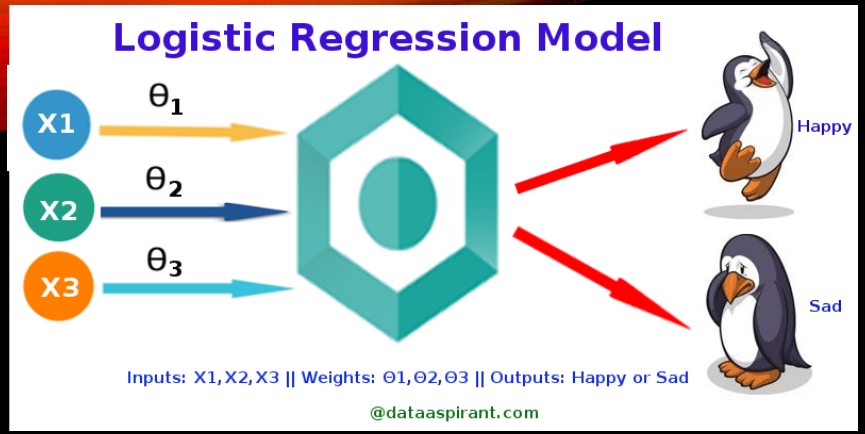


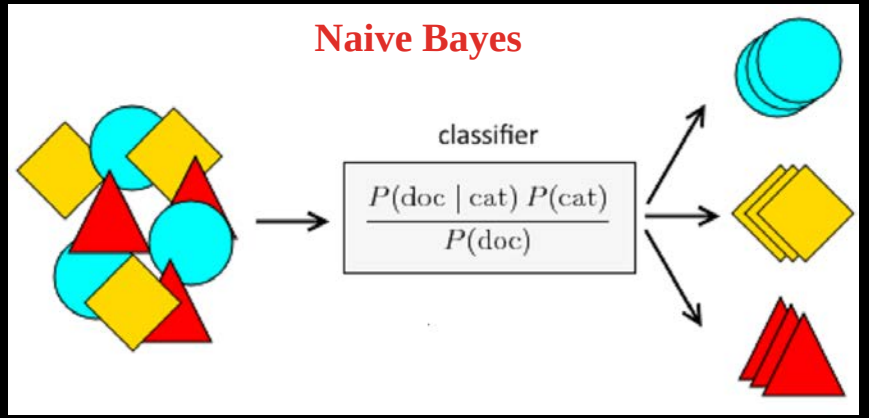
McCulloch Pitts Neuron

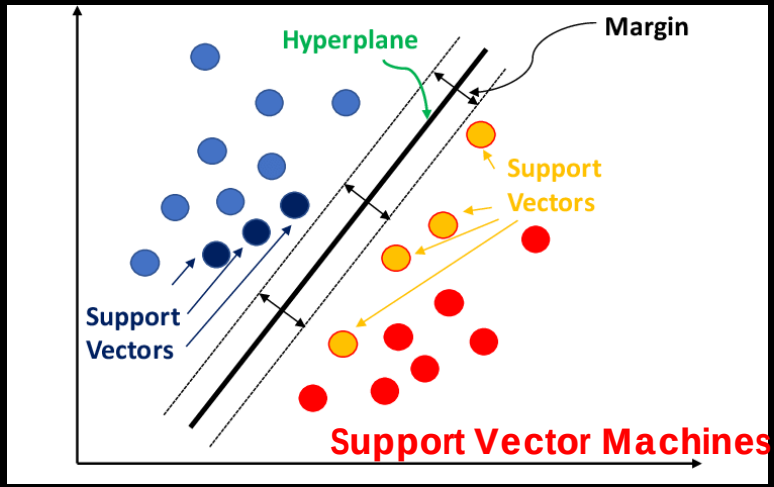


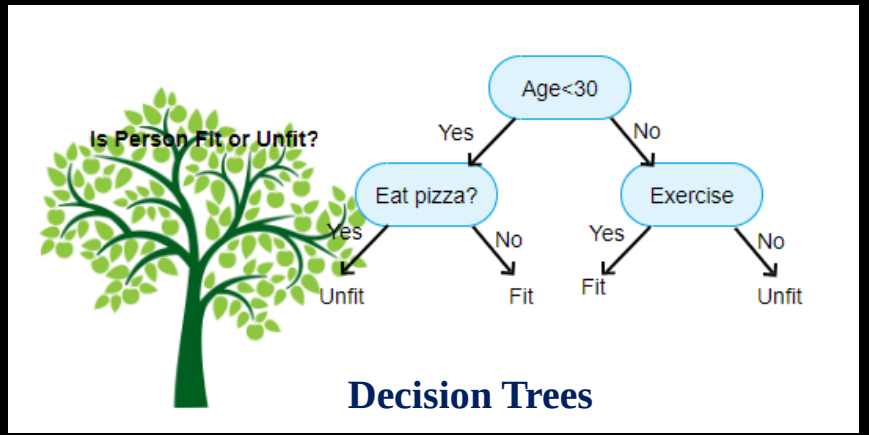

Backpropagation Neural Network
INPUT
HIDDEN
OUTPUT


Convolution Neural Network (CNN)
Input
Pooling
Pooling
Pooling
Output
0.2
0.7
0.1
Horse
Zebra
Dog
SoftMax Activation Function
Kernel
Convolution + ReLU
Convolution + ReLU
Convolution + ReLU
Flatten Layer
Fully Connected Layer
Feature Maps
Feature Extraction
Classification
Probabilistic Distribution


Logistic Regression Model
X1
X2
X3
θ1
θ2
θ3
Happy
Sad
Inputs: X1,X2,X3 || Weights: Θ1,Θ2,Θ3 || Outputs: Happy or Sad
@dataaspirant.com


Naive Bayes
classifier
$\frac{P(\text{doc} \mid \text{cat})\, P(\text{cat})}{P(\text{doc})}$


Hyperplane
Margin
Support Vectors
Support Vectors
Support Vector Machines


Is Person Fit or Unfit?
Age<30
Yes
No
Eat pizza?
Exercise
Yes
No
Yes
No
Unfit
Fit
Fit
Unfit
Decision Trees

Sensors

Stimulus

Collected Data

Process

Knowledge

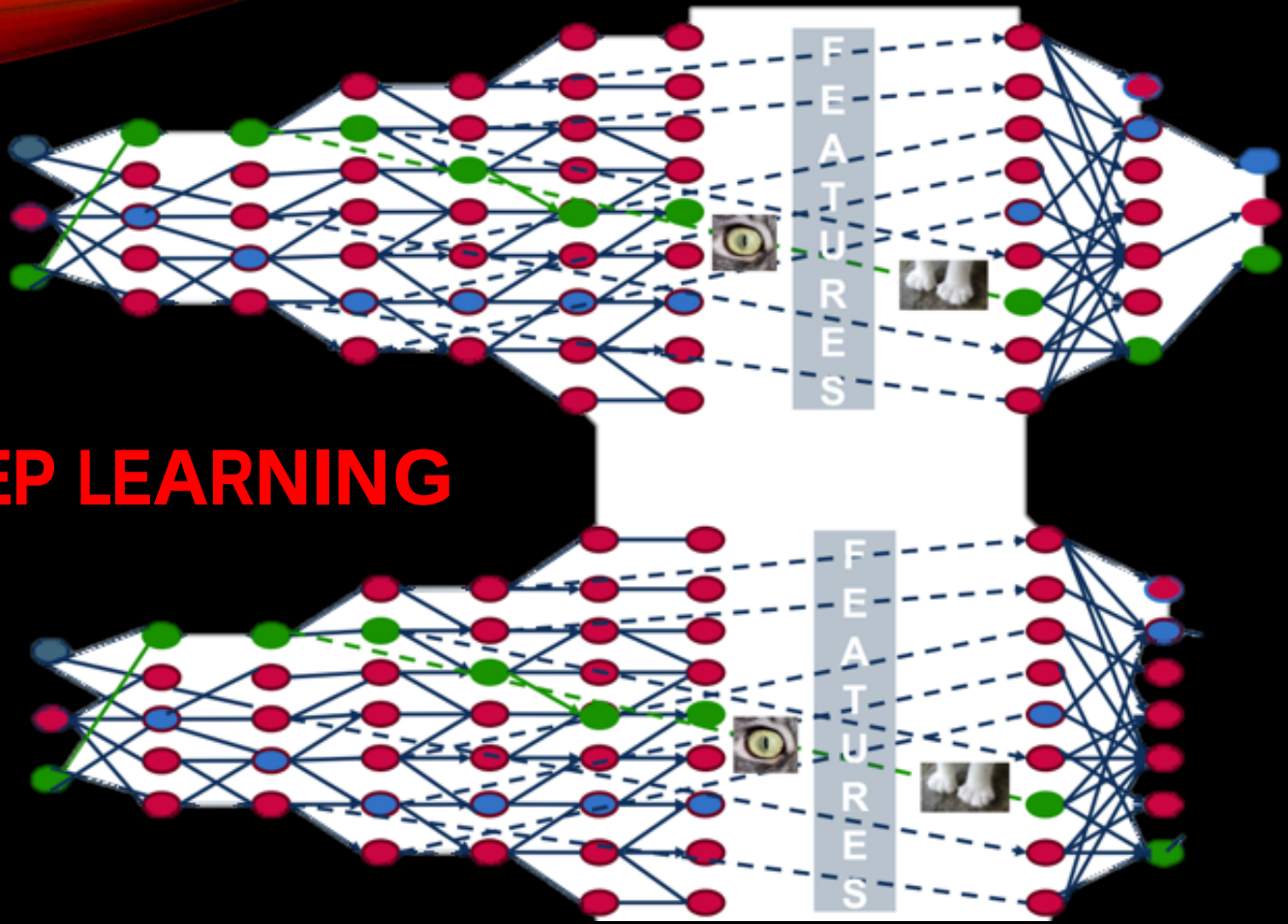
Decisio
n

Adaptation

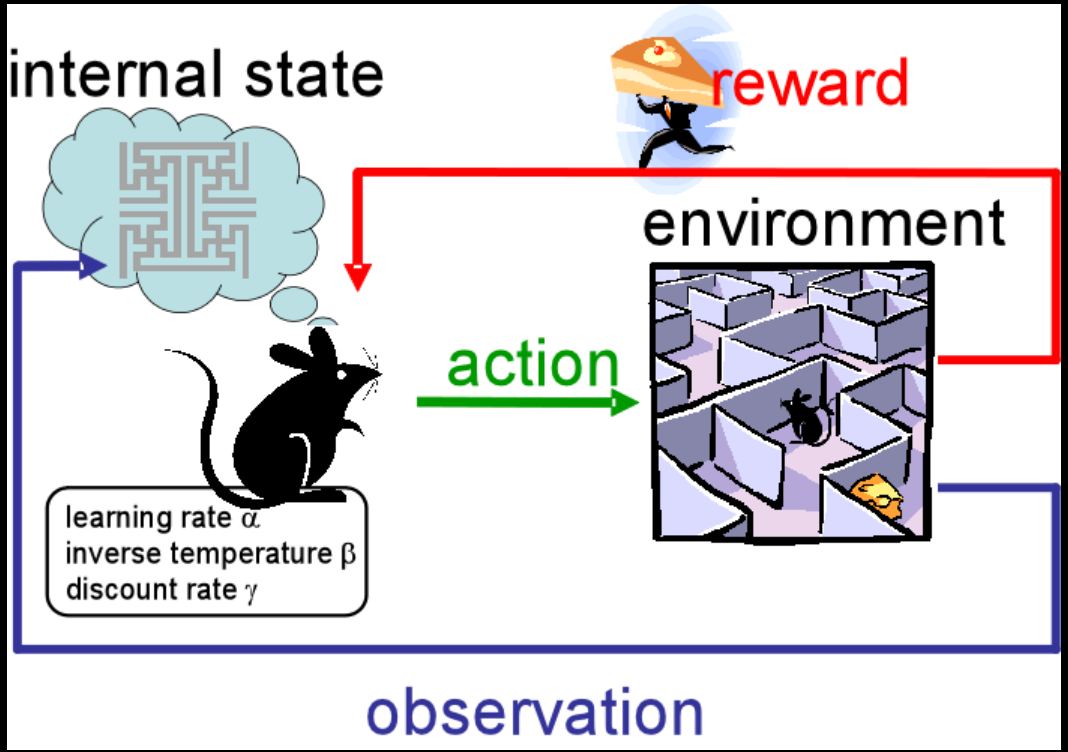
BUSINESS INTELLIGENCE

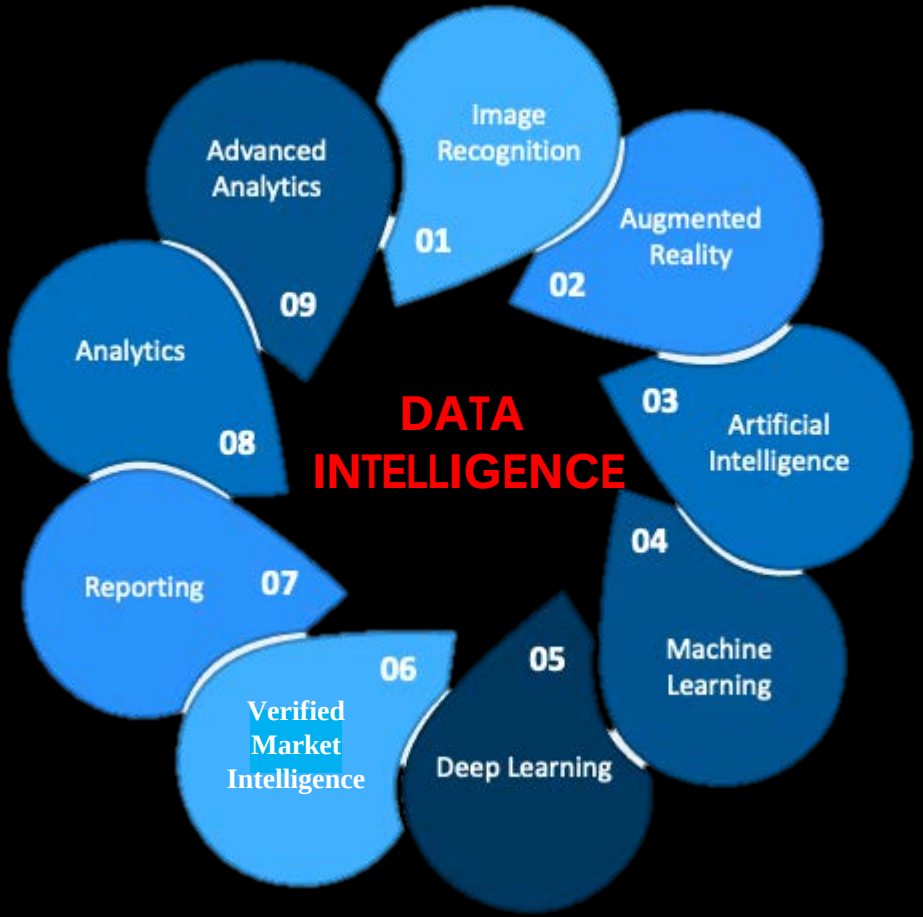

BIG
DATA
INFORMATION
STORAGE
LARGE
SETS
SOFTWARE
SAN
NAS
VOLUME
PROCESS
MANAGEMENT
TECHNOLOG
DATABASES
PROCESSING
SIZE
ANALYTICS
SIMULATIONS
EXABYTES
PETABYTES
RESEARCH
LEARNING
EVERY
WORLD
BASED
SEARCH
INTERNET
DEVELOPMENT
TECHNOLOGY
BILLION
NEW
SCIENCE
UTURE
PARALLEL
APPROACH
PRIVACY
INTERNATIONAL
IMPLEMENTATION
BECOMES
APPROACHES
PROCESSES
PARADIGM
RECORDS
FUNDING
INSIGHT
VARIOUS
TIMES
LESS
HUGE
PRIVATE
HIGHER
ALGORITHMS
COMPANIES
DEPARTMENT
VISUALIZATION
EFFECTIV
ONLINE
DAY
WORLDWID
SYSTEMS
GOVERNI
MAKING
INTEGRATION
HAND
CAPACITY
ONE
OUT
SECOND
NATIONAL
INTELLIGENCE
MANY
CRITIQUES
ISE

DEEP LEARNING



REINFORCEMENT LEARNING




DATA
INTELLIGENCE
01
Image Recognition
02
Augmented Reality
03
Artificial Intelligence
04
Machine Learning
05
Deep Learning
06
Verified Market Intelligence
07
Reporting
08
Analytics
09
Advanced Analytics

March 2016

PAST

Almost all of what we know in the last years of the 20th century, there were remnants of an ancient civilization, in the first 10 years of the 21st century.

FUTURE

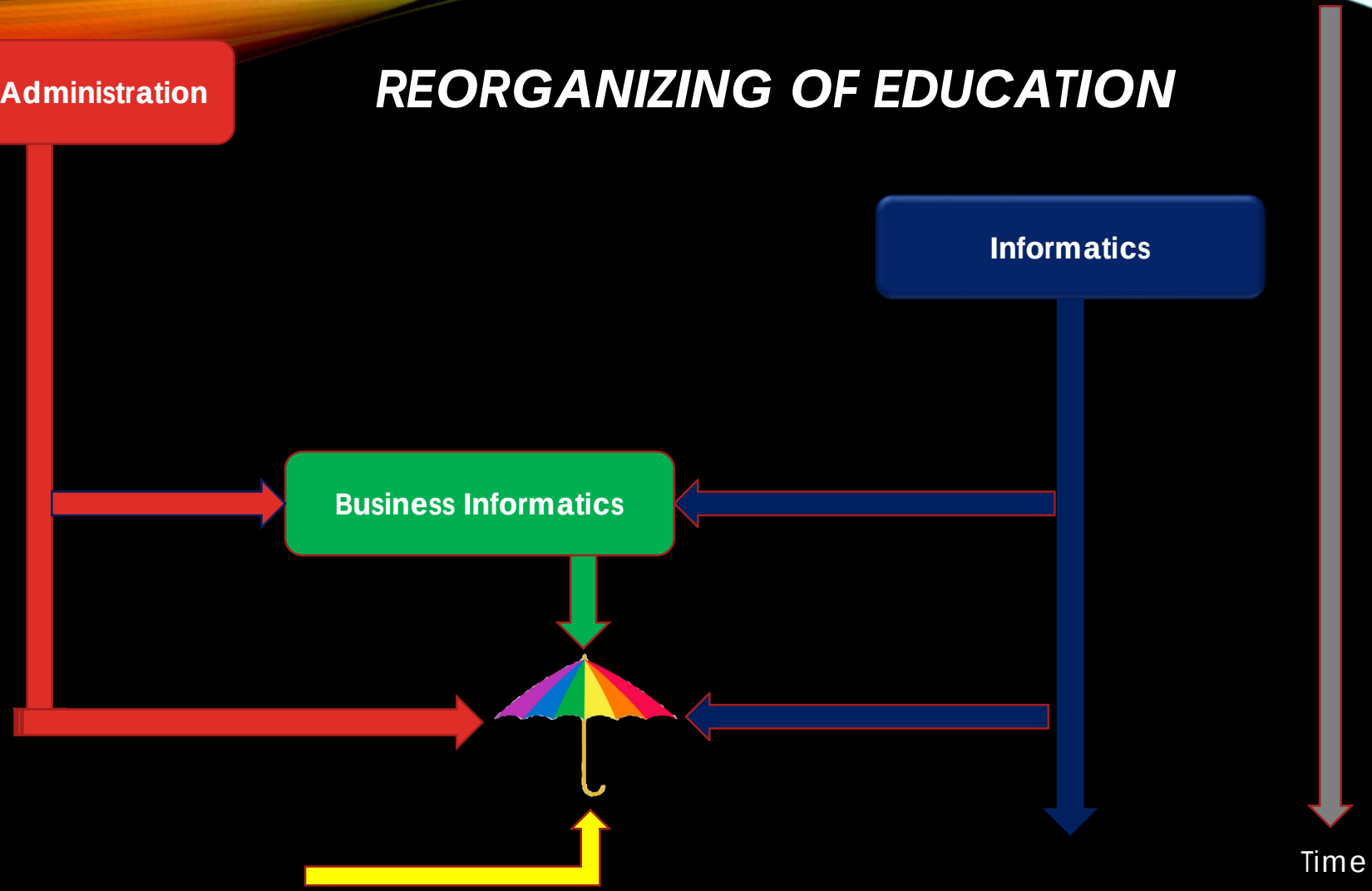
The developments since 2010 will probably cause us to look at 2010 in this way in the next decades.

AUTOMATED DECISION MAKING SYSTEMS

HUMAN BRAIN PROJECT

The Human Brain Project aims to put in place a cutting-edge research infrastructure that will allow scientific and industrial researchers to advance our knowledge in the fields of neuroscience, computing, and brain-related medicine

REORGANIZING OF EDUCATION



Digital Transformation in Education

It is a fact that it has been a long time since information and communication technologies crossed the Rubicon River.

Nataraja, before he finishes his cosmic dance «Tandava»,

On this road of no return, both human capabilities and businesses have to change every day.

Do not forget! Alea Iacta Est!

Session 1 chair: Prof. Dr. Schmidtmann

10.30-11.30

„Resource Based Theory: A managerial Profile“ –

Prof. Dr. Mario Gjoni,
Prof. Dr. Olta Nexhipi,
Prof. Dr. Erisa Musabelliu, University Aleksander Moisiu Durres, Albania

10.30-10.50

RBT
(Resourse Based Theory)

A managerial View

Introduction

- Changing Market Trends
- Competitive Advantage
- RBT as a hack to Competitive Advantage

Keywords: RBT, Heuristic Approach, Situational Approach, SCA

Entrepreneurship

- Systemic Way, aka Holistic, large organizations, vast info, well-structured structures, procedures, people, systems

- Vs. Heuristic, very fast decision making process, varying info scale from none to some, small scales, direct info contacts etc, little to no structure, applicable to SME's mostly rather than Large Organizational Managerial Structures.

Enterperneurship 2.

- Essentially, this closer look at the potential advantages and disadvantages of a heuristic-based logic sheds significant light on how entrepreneurial decision-making and cognitive ability can be a source of **competitive advantage.**
- In summary, it seems that those who use a heuristic-based logic can not only make faster decisions, but also learn faster. Here we can argue that those with such an entrepreneurial approach can **facilitate** a potential competitive advantage in at **least two important ways**. 1. **The first area is about discovering new opportunities**. An entrepreneurial cognition perspective provides us with a way to better understand why some individuals are able to see new opportunities where most others see threats or obstacles.

2. **The second area** involves the development of a firm in the initial stages of organizational development. A heuristic-based decision style can allow them to navigate easily through a range of problems and irregularities inherent in the development of new firms.

Situational Approach and Controlled Heterenogenity

- Schumpeter 1934, 'New Combinations' of resources, where and how to obtain resources, undervalued, visible or not, how to distribute and utilize those resources.
- The problem of entrepreneurship is how to ensure the best use of resources to get a profit. But the market itself is not able to organize the information disseminated, the entrepreneur understands this and takes advantage of the opportunity. Therefore, it is not the market that organizes situationally variable knowledge, in fact it often happens that markets are inefficient in transferring and integrating knowledge, it is the firm that organizes knowledge efficiently. The primary role of the firm is the integration of specialized knowledge (Conner & Prahalad, 1996).

SCA

Once knowledge is made known, it is easily imitated and becomes incapable of generating revenue for the original producer of that knowledge. Tacit knowledge by definition cannot be articulated and therefore cannot be transferred. Regardless of the nature of the firm heterogeneity, consistent competitive advantage requires that heterogeneity be maintained. If heterogeneity is not stable, it will not add stable value.

Some of the **limits** placed on competition can be successfully used by the company which has already achieved a competitive advantage such as: differences, complementary strategy, causal uncertainty, uncertainty, information asymmetry, and others like these which are particularly important in entrepreneurial environments.

SCA 2

- Complex knowledge and firm's resources tend to be more difficult to imitate
- Complex resources in social context are even more difficult to imitate because they become complex phenomena that are difficult to manage and influence in a systemic way.
- Many sources that lead to heterogeneity are **socially complex**, such as firm culture (Barney, 1986), firm reputation (Hill, 1990), and human capital (Carpenter, Sanders & Gregersen, 2001).

RBT

- Resources and Skills are central to the RBT
- Resource: "has a reference to something an organization can attract or own to accomplish its goals"

1. Physical
2. Financial
3. Human
4. Organizational

Capabilities on the other hand are firm resource subgroups, which represent a non-transferable way or process specifically rooted in the organization, the purpose of which is to improve the productivity of other resources owned by the firm

RBT 2

- Capabilities are specific types of resources, the purpose of which is to improve the productivity of other resources owned by the firm.
- A relatively modern concept related to skills is introduced by Teece et al. (1997) who called it dynamic capabilities, which can create, expand, improve, protect and maintain the unique enterprise asset base continuously in an ever-changing environment.

RBT 3

- In particular, two main characteristics influence the creation of a competitive advantage in the market through market-based resources;

1. **Inviolability** of resources and **complementarity**. Inviolability of resources, an ever-increasing number of resources studied in organizations are inviolable such as, for example, relational brands and assets, knowledge generation capabilities, etc.
2. **Complementarity**, Research suggests that market-based resources exhibit stronger performance effects than many non-market-based resources. Complementarity means that benefits from one source are exploited in the presence of another

Critical Approach

- RBT is a static theory, some argue it fails to address the impact of organizational actions on resource effectiveness over time.
- Resources should be used effectively rather than be owned by the firm.
- It's tautological and self-verifiying therefore not empirically testable.
- A more conceptual critique of these is what researchers have called KBV Knowledge-Based Theory. This approach considers firms as bodies that generate, integrate and disseminate knowledge (Miller 2002). According to KBV sustainable SCA competitive advantage is managed by the ability of organizations to develop new knowledge-based assets that form the basis for competencies

Thank you for your time!

- Questions?

Using Researched-Based Learning on Barriers to Digital Transformation to Impact Student Engagement during a Pandemic“ –

Prof. Dr. Sven Packmohr, Malmö University, Sweden
M. Sc. Henning Brink, Osnabrück University, Germany

10.50-11.10

UNIVERSITÄT OSNABRÜCK

MALMÖ UNIVERSITY

USING RESEARCHED-BASED LEARNING ON BARRIERS TO DIGITAL TRANSFORMATION TO IMPACT STUDENT ENGAGEMENT DURING A PANDEMIC

BICAB 2022, Bielefeld

Motivation

Companies

- Digital structures change access, communication, cooperation, and value creation.
- Digital transformation (DT) is "*a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies*" (Vial, 2019).
- DT needs attention, but problems in adoption (Carver, 2016).
- Barriers occur from interweaving physical and digital layers into business models (Hanelt et al., 2015).

Motivation

Higher Education

- Complex structure (stakeholder groups, different demands and obstacles) affect DT process (Reid, 2014)
- Students (critical) stakeholders (users).
  - Grew up as digital natives (Crittenden, Biel, & Lovely, 2019)
  - Digitalization will affect professional lives (Friga, Bettis, & Sullivan, 2003).
- Technologies motivate, enrich resources, and enhance evaluations (Vogelsang, Droit, & Liere-Netheler, 2019)
- Digital availability fosters issues for faculty and admin (Proserpio & Gioia, 2007)
- Use of digital assets is heterogeneous -> Enforcement due to Covid-19

Research Questions

- How to deal with enforcement in teaching? Research-based learning
- RBL is an instructional approach to actively involve students in the process of inquiry (Healy, 2005)

RQs

- What is the difference in organizational barriers between two differently digitalized subsets of the data collected by the students?
- How did students perceive research-based learning in the digitally instructed course?

- Applied in BM106 (Business Informatics), TAÜ, Master in Business Management

Research Method

- Industry: Questionnaire with five dimensions and 14 items
- Items based on pre-study in industry setting and HE setting
- data collection: April-May 2021 (Company questionnaire distributed by students and analyzed for in-class discussion after)
- Sample Industry: 279 participants (finance industry, more than 100 employees, age 20-30)
- Students: Course evaluation with open-ended questions
- Sample Students: 12 participants (male, age 24-47).
- Plus: in-depth interview with student 2 students of the above sample

Results - Industry sample (1/3)

Dimension	Mann-Whitney U test		Non-digitalized companies					Digitalized companies				
	Effect size	Sig.	Minimum	Maximum	Mean	Deviation	Variance	Minimum	Maximum	Mean	Deviation	Variance
Leadership	.39	.00	1.33	5.00	3.11	.73	.53	1.00	4.33	2.57	.61	.37
Culture	.36	.00	1.00	5.00	2.50	.84	.71	1.00	4.33	1.95	.58	.33
Employee	.37	.00	1.00	5.00	3.01	.96	.92	1.00	5.00	2.31	.83	.69
Skills	.31	.00	1.50	5.00	3.52	.66	.43	1.25	4.50	3.10	.63	.39

Results - Industry sample (2/3)

Dimension	Item in keywords	Mean non-digitalized enterprises	Mean digitalized enterprises	Delta
DT	Portfolio of smart products or services for customers	2.93	4.29	1.36
	Digital support for business processes	2.87	4.24	1.37
Leadership	Senior management is not supportive & not visibly engaged	2.51	1.89	-0.62
	Clear DT strategy not communicated	3.00	2.06	-0.94
	Employees not involved in decisions on technology implementation	3.90	3.98	0.08

Results - Industry sample (3/3)

Dimension	Item in keywords	Mean non-digitalized enterprises	Mean digitalized enterprises	Delta
Culture	Errors not used to improve work processes	2.54	2.15	-0.39
	No constant learning and improvement	2.48	1.88	-0.6
	No openness to new ideas about DT in processes, methods, techniques, etc.	2.48	1.81	-0.67
Employee	No new roles to manage DT projects.	2.88	2.16	-0,72
	Not enough resources and staff to manage DT	3.13	2.44	-0.69
Skills	IT knowledge is not adequate to keep up with DT	2.93	2.28	-0.65
	Lack of knowledge about the potential of DT	3.34	2.54	-0.80
	Lack of knowledge to use digital tech effectively	3.76	3.57	-0.19
	Lack of digital tech training for the employees	4.04	4.01	-0.03

Results – Course evaluation

Question	Mean	Std.Dev.
The technology used due to Covid-19 (Google Classroom) supported my understanding of the content in the same way as it had been in the classroom.	3.80	1.03
Students were encouraged to participate in class discussions.	4.80	0.42
Overall, I made progress in understanding the content.	4.60	0.70
Overall, I developed a more critical approach to thinking on the topic of the course.	4.60	0.70

- Open feedback:
  - Good / liked
  - Analyzing
  - Understanding research flow / preparation for thesis

Results – In-depth interview

Cognitive

- first, students perceived the RBL project as hard.
- Some results were insignificant
- After, further apply the generated knowledge in other courses and at work

Emotional

- Well-established peer groups important
- “It was not like doing homework or studying. I was researching. It was good for me”

Behavioral

- Interested in results of other groups
- Trying hard to collect data

Discussion & Conclusion

- Industry sample:
  - Dimensions: digitalized companies perceive significantly lower barriers -> confirmed by other studies; here high amount of Financial industry participants
  - Items: highly negative perception of the involvement of employees in decision on implementation -> Not as much in other studies
- Student sample:
  - RBL: Good concept -> very structured, not covering the whole RBL process
  - Didn’t feel like homework -> but right degree of pre-knowledge needed
- RBL good enrichment (also during Covid-19)
- Planning: Instructors need to be researches in the same field as the area of the course

Thank you for listening - About us

Tie together academia and application –

To impact Digital Transformation in organizations

- *Applicable research*
- *Sociotechnical view*
- *Transfer through cooperation*
- *Open-Science thinking*

→ www.kompetenzzentrum-digitale-transformation.org

Henning Brink

Nicole Draxler-Weber

Dr. Sven Packmohr

Fynn-Hendrik Paul

„Data Reports with Dynamic Documents“ –

Prof. Dr. Wolfgang Kohn, Bielefeld University of Applied Sciences, Germany

11.10-11.30

Data Reports with Dynamic Documents

Wolfgang Kohn
Fachbereich Wirtschaft
Fachhochschule Bielefeld

06 05 2022

This is a static version of my presentation!!

A dynamic document is a digital document that collects information from a database and then inserts it into a present template.

In my talk I will shortly present how powerful R, Markdown and Shiny is to create dynamic documents.

Contents

→ Using R: Getting Data Online

Data Reports with Dynamic Documents

Prof. Dr. Wolfgang Kohn

06 05 2022

Using R: Getting Data Online

R is a free software environment for statistical computing and graphics.

We download online from Eurostat database data on the distribution of income by quintiles (share of national equivalised income) for Germany.

```
library(eurostat)

# connetcion to Eurostat
inc.qu <- get_eurostat(id = "ilc_di01",
    filters = list(quantile = c("QU1","QU5"), indic_il = "SHARE", currency = "EUR", geo = "DE"), tim

# tail of inc.qu
tail(inc.qu)
```

```
## # A tibble: 6 × 6
##   quantile indic_il currency geo   time       values
##   <chr>    <chr>    <chr>    <chr> <date>      <dbl>
## 1 QU5      SHARE    EUR      DE    2015-01-01   38.1
## 2 QU5      SHARE    EUR      DE    2016-01-01   37.8
## 3 QU5      SHARE    EUR      DE    2017-01-01   37.5
## 4 QU5      SHARE    EUR      DE    2018-01-01   38.9
## 5 QU5      SHARE    EUR      DE    2019-01-01   37.5
## 6 QU5      SHARE    EUR      DE    2020-01-01   41.1
```

→ Using R: Editing Data

← Contents

Data Reports with Dynamic Documents

Prof. Dr. Wolfgang Kohn

06 05 2022

Using R: Editing Data

tidyverse is a relative new collection of R packages designed for data science. An online version of the book is available (R for Data Science).

With tidyverse a pipe `%>%` is introduced to the R code. Pipes are a powerful tool for clearly expressing a sequence of multiple operations. The meaning of `x %>% f()` is $f(x)$ and `x %>% f() %>% g()` turn into $g(f(x))$.

```
library(tidyverse)

# select time, QU1 and QU5 from inc.qu
inc.qu <- inc.qu %>%
  spread(key = quantile, value = values) %>%
  select(c(time, QU1, QU5))

# add S8020 ratio to inc.qu
inc.qu <- inc.qu %>% mutate(S8020 = QU5/QU1)

inc.qu <- na.omit(inc.qu)

# head of inc.qu
inc.qu
```

```
## # A tibble: 23 × 4
##    time         QU1   QU5 S8020
##    <date>     <dbl> <dbl> <dbl>
##  1 1995-01-01   8    37    4.62
##  2 1996-01-01   9    36    4
##  3 1997-01-01  10    35    3.5
##  4 1998-01-01  10    35    3.5
##  5 1999-01-01  10    35    3.5
##  6 2000-01-01  10    35    3.5
##  7 2001-01-01  10    35    3.5
##  8 2005-01-01   9.5  35.9  3.78
##  9 2006-01-01   8.9  36    4.04
## 10 2007-01-01   7.8  38.5  4.94
## # … with 13 more rows
```

→ Markdown

← Using R: Getting Data Online

Contents

Data Reports with Dynamic Documents

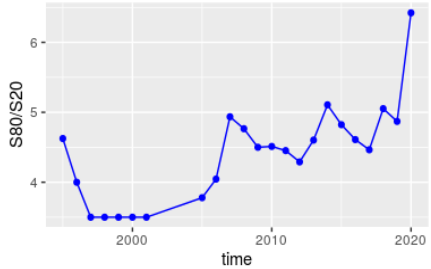
Prof. Dr. Wolfgang Kohn

06 05 2022

Using R: Creating Plots

`ggplot` is the plotting operator in **tidyverse**. Even though the original plotting commands in R are very powerful, the new `ggplot` commands are maybe easier to use for beginners.

```
ggplot(data = inc.qu, mapping = aes(x = time, y = S8020)) +
  geom_point(color = "blue") +
  geom_line(color = "blue") +
  ylab("S80/S20")
```



Income Quintile Share Ratio of Germany

→ Markdown

← Using R: Editing Data

Contents

Data Reports with Dynamic Documents

Prof. Dr. Wolfgang Kohn

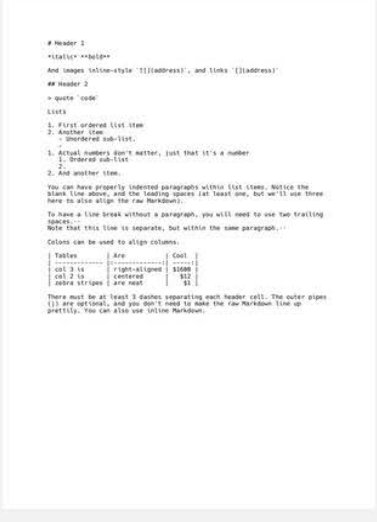
06 05 2022

Markdown

Markdown is a lightweight markup language for creating formatted text using a plain-text editor. John Gruber and Aaron Swartz created Markdown in 2004 as a markup language that is appealing to human readers in its source code form.

Simple characters like `#`, `*`, `-` are used to insert a header, change the text attribute, or start a list. An overview of the commands can be found online under Markdown Scriptguide.

Commands | **Output**



```
# Header 1

*italic* **bold**

And images inline-style `![](address)`, and links `[](address)`

## Header 2

> quote `code`

Lists

1. First ordered list item
2. Another item
    - Unordered sub-list.
1. Actual numbers don't matter, just that it's a number
    1. Ordered sub-list
    2.
2. And another item.

You can have properly indented paragraphs within list items. Notice the
blank line above, and the leading spaces (at least one, but we'll use three
here to also align the raw Markdown).

To have a line break without a paragraph, you will need to use two trailing
spaces.··
Note that this line is separate, but within the same paragraph.··

Colons can be used to align columns.

| Tables        | Are           | Cool  |
| ------------- | ------------- | ----- |
| col 3 is      | right-aligned | $1600 |
| col 2 is      | centered      |   $12 |
| zebra stripes | are neat      |    $1 |

There must be at least 3 dashes separating each header cell. The outer pipes
(|) are optional, and you don't need to make the raw Markdown line up
prettily. You can also use inline Markdown.
```

Header 1

italic **bold**

And images inline-style `![](address)`, and links `[](address)`

Header 2

> quote `code`

Lists

1. First ordered list item
2. Another item
    - Unordered sub-list.
    -
3. Actual numbers don't matter, just that it's a number
    1. Ordered sub-list
    2.
4. And another item.

You can have properly indented paragraphs within list items. Notice the blank line above, and the leading spaces (at least one, but we'll use three here to also align the raw Markdown).

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Tables	Are	Cool
col 3 is	right-aligned	$1600
col 2 is	centered	$12
zebra stripes	are neat	$1

There must be at least 3 dashes separating each header cell. The outer pipes (|) are optional, and you don't need to make the raw Markdown line up prettily. You can also use inline Markdown.

→ Dynamic Documents with RMarkdown

← Using R: Editing Data

Contents

Data Reports with Dynamic Documents

Prof. Dr. Wolfgang Kohn

06 05 2022

Dynamic Documents with RMarkdown

RStudio is an integrated development environment for R.

An RMarkdown document starts with metadata that can specify (among other things) the title, author, and date of the document.

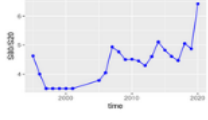
```
---
title: "Document"
author: "Kohn"
author: W. Kohn
date: Jan 19th, 2022
output:
  pdf_document:
    toc: yes
---
```

Right after the metadata head you start writing. A chunk is an R section in the RMarkdown file. A R chunk starts with three backticks followed by curly brackets and a lowercase r.

```
text
```{r chunkname, options}
# comments
r code
---
text
```

A figure is inserted with

```
```{r eSS20plot, fig = TRUE, echo = FALSE, fig.cap = "Income Quintile Share Ratio of Germany",
   fig.width = 4, fig.asp = 3/(1+sqrt(5))}
ggplot(data = inc.qu, mapping = aes(x = time, y = S8020)) +
  geom_point(color = "blue") +
  geom_line(color = "blue") +
  ylab("S80/S20")
---
```



Income Quintile Share Ratio of Germany

A formatted output of `inc.qu` in a table is possible with `kable` in `library(knitr)`.

```
```{r tab-inc-qu}
inc.qu %>%
  head() %>%
  knitr::kable(format = "pipe",
    caption = "Income Quintile Share Ratio of Germany",
    col.names = c("Time", "20% Quantile", "80% Quantile", "Ratio S8020"))
---
```

Income Quintile Share Ratio of Germany

Time	20% Quantile	80% Quantile	Ratio S8020
1995-01-01	8	37	4.625
1996-01-01	9	36	4.000
1997-01-01	10	35	3.500
1998-01-01	10	35	3.500
1999-01-01	10	35	3.500
2000-01-01	10	35	3.500

An extension of RMarkdown is **bookdown**. bookdown allows references to figures and tables and adding a bibliography.

→ Interactive Documents with Shiny

← Markdown

Contents
```

Data Reports with Dynamic Documents

Prof. Dr. Wolfgang Kohn

06 05 2022

Interactive Documents with Shiny

Shiny is an R package that allows you to create **interactive web apps**. It allows you to take your work in R and expose it via a web browser and is controlled by an application server processing server-side scripts. Here I use a local server address 127.0.0.1. With the server version of RStudio the use of public URLs is possible. It is clear, that Shiny only runs for HTML output.

An introduction to Shiny.

The basic structure of Shiny is to create a user interface (ui), a server function, and let the Shiny app run with `shinyApp(ui, server)`.

```
ui <- fluidPage(
  # input panels to define
)

server <- function(input, output){
  # render of output
}

# running shiny app
shinyApp(ui, server)
```

Shiny application can be combined with RMarkdown. `runtime: shiny` must be placed in the metadata header so that the above shiny chunks can be rendered.

→ Shiny Example

← Dynamic Documents with RMarkdown

Contents

Shiny Application

Prof. Dr. Wolfgang Kohn

06 05 2022

Example: Shiny

```
## PhantomJS not found. You can install it with webshot::install_phantomjs(). If it is installed, pl
```

Shiny applications not supported in static R Markdown documents

← Interactive Documents with Shiny

Contents

Session 2 chair : Prof. Dr. Ela Sibel Bayrak Meydanoglu

11.40-12.40

„Process Mining as a Tool to Corporate Value Production“ –

Prof. Dr. Alessandro Spano,
M. Sc. Serena Racis,
M. Sc. Sonia Cocco, University of Cagliari, Italy

11.40-12.00

Bicab Conference 2022 – Bielefeld - 6 May

Process Mining as a Tool for Corporate Value Production

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University of
Applied Sciences

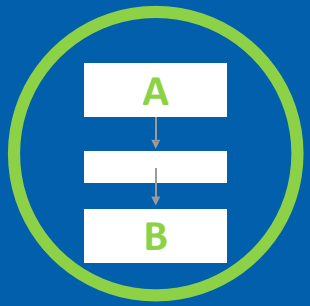
BICAB
Bielefeld International Conference on Applied Business

Summary

1. Introduction
2. Aim of the research
3. Theoretical framework
4. Methodology
5. Sample
6. Process Mining strengths and limitations
7. Conclusions

Introduction

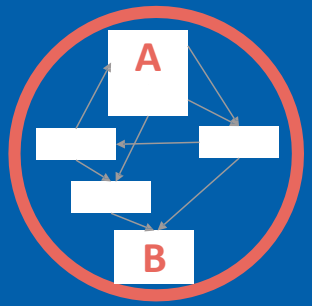
- **Process Mining (PM)**: new branch of Business Analytics that combines Data Mining and Artificial Intelligence to extract knowledge **directly** and **automatically** from existing information systems (Aalst et al., 2011)
- **Objective** and **better** understanding of business processes



How things should be

“business as designed”

simple, standardized, fast



How things really are

“Day-to-day reality”

complex, inefficient, slow

Introduction/cont'd

Order No.	Activity	Time	User	Quantity
10001	Create purchase order	01-01-2009, 8:35 am	Sara Jones	1
10001	Print and send purchase order	03-01-2009, 12:13 am	Sara Jones	1
10001	Goods receipt	07-01-2009, 07:01 am	Pete Scott	1
10001	Scan invoice	09-01-2009, 2:00 pm	Sara Jones	1
10001	Book invoice	10-01-2009, 10:30 am	Carol Hope	1
10002	Create purchase requisition	02-02-2009, 1:17 pm	John Farmer	15
10002	Create purchase order	04-02-2009, 9:15 am	Sara Jones	15
10002	Print and send purchase order	07-02-2009, 4:41 pm	Sara Jones	15
10002	Goods receipt	27-02-2009, 6:53 am	Frank Miller	15
10002	Scan invoice	28-02-2009, 1:00 pm	Sara Jones	15
10002	Book invoice	13-03-2009, 11:59 am	Carol Hope	15
10003	Scan invoice	13-04-2009, 10:00 am	Sara Jones	23
10003	Create purchase order	17-04-2009, 3:47 pm	Sara Jones	23
10003	Print and send purchase order	17-04-2009, 5:30 pm	Carol Jope	23
10003	Goods receipt	27-04-2009, 4:23 pm	Pete Scott	23
10003	Book invoice	30-04-2009, 8:50 am	Sara Jones	23
...	...	...	...	...

Event

Trace

Case ID

Activity name

Timestamp

Resource

Other data

Case ID Indicates which process instance the event belongs to. A case usually consists of multiple events

Activity Describes the action that is captured by the event

Timestamp Indicates the time when the event took place

Trace A sequence of events, ordered by their timestamps, that belong to the same case

Variant The traces of all the different cases with the same activity sequence

Based on van der Aalst (2016)

Process mining extracts relevant data from IT systems in the form of an event log. An event log stores the data that is required for Process Mining. **At the minimum**, the event log covers **three columns**: case ID, activity name, timestamp. There may be other optional columns.

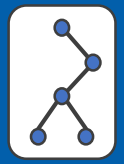
Introduction/cont'd

- Increasing number of companies adopt PM
- By 2018, more than 30 commercially available process mining tools are available (Gartner (2019)
- By 2022 PM market is expected to grow around **40%** to **50%**, reaching more than **$1 billion** in value
- The entire global process analytics market size is expected to grow to **$1.42** billion by 2023
- It is thus fundamental that companies become aware of the PM's tools if they want to exploit this potential

Three types of analysis

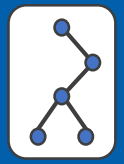
Event Log

Discovery

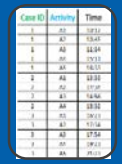


Model

Generate a theoretical model from processes in reality without using any a-priori information



Model

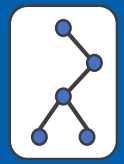


Event Log

Conformance

Diagnosis

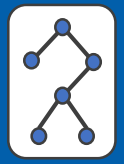
Compare reality and process model



Model

Event Log

Enhancement



New Model

Enhance or extend an a priori model using information about the actual process recorded in some event log

Aim of the research

- This article reviews the literature on the **benefits** and the **limitations** of PM implementation by companies
- Some **benefits** descend from the possibility to fathom a process as it is executed to identify bottlenecks or inefficiencies (Araghi et al., 2018; Birk et al., 2021)
- **Critical aspects** related to:
  - Data quality and availability (De Weerdt et al., 2013)
  - Need for cooperation between different stakeholders (Pereira et al., 2020)
  - Difficulties in dealing with unstructured, highly complex and variable processes (Wang et al., 2014)
  - Lack of standard procedures and methodologies (Pereira et al., 2020)

Theoretical framework

- Many studies on process mining applications from a **technical perspective** (Rojas et al., 2016, Thiede et al., 2018; Dakic et al., 2018)
- Limited studies on the potential value from process mining adoption (Eggers & Hein, 2020; Zerbino et al., 2021; Grisold et al., 2021; Martin et al., 2021)
- Process mining implementation into organizations depends on available **Information Systems**, **data quality**, **cultural organization** (Van der Aalst, 2016)

Methodology: Systematic Literature review

Identification

- Key words search: “**Process mining**” AND “**benefits**”, OR “**application**”, OR “**sector**” in title, abstract, keywords
- Launched at February 2022
- Within 2 electronic databases: Web of Science: n= 498 and Google Scholar: n=195

Inclusion criteria

- Language: only documents written in English
- Type of documents: only articles published in **peer-reviewed journals**
- Type of studies: empirical studies
- Web of Science: n= 54 and Google Scholar: n=23

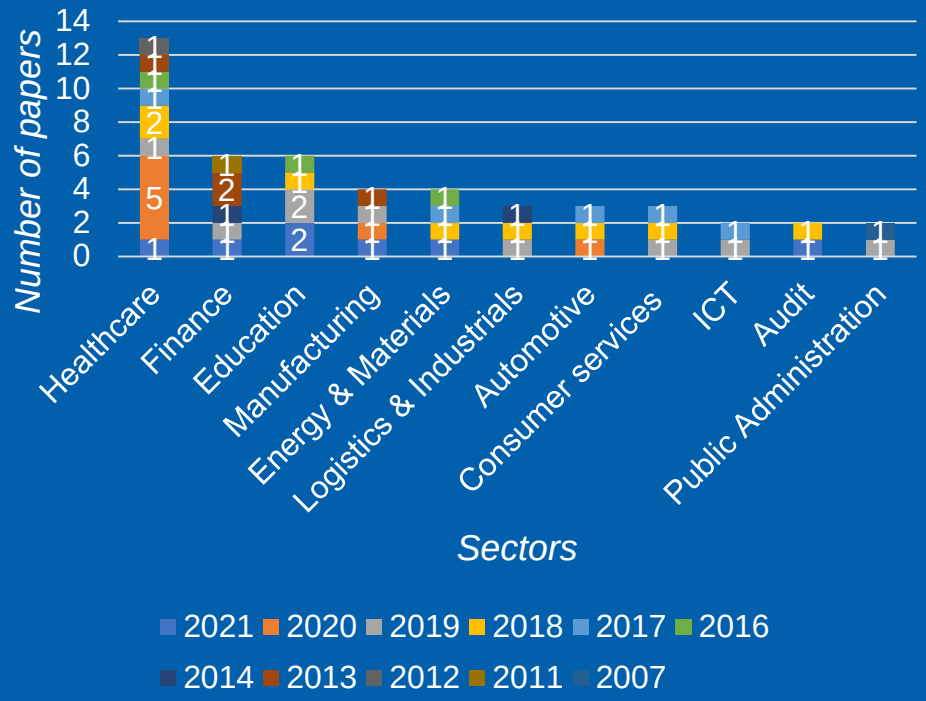
Screening criteria

- Records after duplicated removes: n=63
- Full-text articles excluded due to no process mining application in the organization: n=15
- Studies included in qualitative synthesis: n=48

Qualitative analysis

- Scope: corporates’ organizational **benefits** and **limitations** from process mining
- Focus: **sector** of application, **process** selected, **aim** of application, process mining **software tools**, **algorithms**

Sample



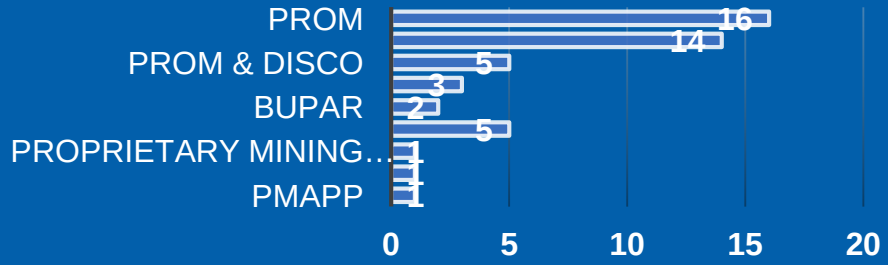
Sector	Application
Healthcare	Higher quality and safer services
Finance	Deal with a massive amount of data and uncertainty
Education	Evaluate and understand students' performance and behaviours
Manufacturing	Accurate and timely monitoring
Energy and Materials	Safer working environment and less inefficiencies, waste, costs
Logistics and Industrial	Mitigate uncovered risks and create strategic advantages
Automotive	Support capacity planning decisions and monitoring, safety requirements
Consumer services	Understanding of consumers' behaviours and needs
ICT	Detect technological threats
Audit	Detect deviations, frauds and abuses
Public Administration	Better management of administrative processes

Sample

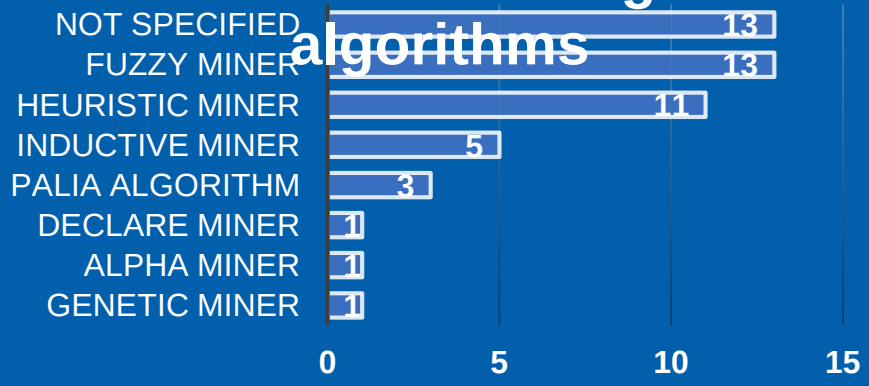
PM applications for countries

Europe
Latin America
China
Australia
Turkey
India
Indonesia
Korea
Not specified

Process Mining software tools



Process Mining algorithms



Process mining strengths

Process discovery in real-time (58%)

Improved data visualization (48%)

Dynamic strategies (17%)

Bottlenecks and inefficiencies detection (70%)

Timely analysis of large amounts of data (25%)

More effective processes (13%)

Root causes identification (19%)

Analysis from different perspectives (23%)

Higher efficiency (19%)

Process mining limitations

Data quality, availability and extraction (54%)

PM implementation planning (25%)

Information Systems (IS) memory (2%)

Employees awareness and training (10%)

Noise data and outliers (10%)

Need for cooperation between stakeholders (23%)

Unstructured, complex and variable processes (42%)

Collection problems with Bluetooth and WiFi (4%)

Conclusions

- PM is a powerful tool for **corporate value production**, but its potential has yet to be fully explored
- PM has been implemented in many **different sectors**, especially in health care
- Little PM use in the **public sector**, which could instead benefit greater transparency, data-driven decision-making, better quality of services and greater citizen satisfaction
- PM may positively **impact** also business functions not directly related to the analysed process(es)
- Several **benefits** can derive from PM if organizations are capable of ensuring **conditions** such as efficient ISs, suitable data and collaboration
- The difficulty of meeting these conditions may be the main reason why PM is scarcely spread among **SMEs** despite the significant advantages it could bring them

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„Data-Driven Security“ –

Prof. Dr. Achim Schmidtmann, Bielefeld University of Applied Sciences, Germany

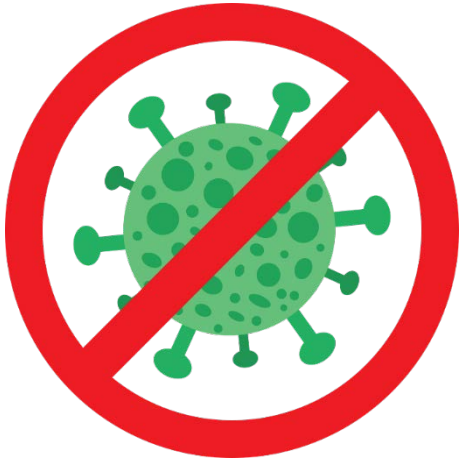
12.00-12.20

Data Driven Security

Security with Big Data and Protection of Big Data

Prof. Dr. Achim Schmidtmann

History of Antivirus Software



- First known computer virus appeared in 1971:
  "Creeper virus"

- How were computer viruses spread during this time?

- When was the first antivirus software developed?
  In 1987, Andreas Lüning and Kai Figge, who founded G Data Software in 1985, released their first antivirus product for the Atari ST platform.

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Source: https://pixabay.com/de/vectors/virus-keim-symbol-unterzeichnen-5224106/, https://geschichte.inf.tu-dresden.de/?q=DE/NORMAL/expo08/03

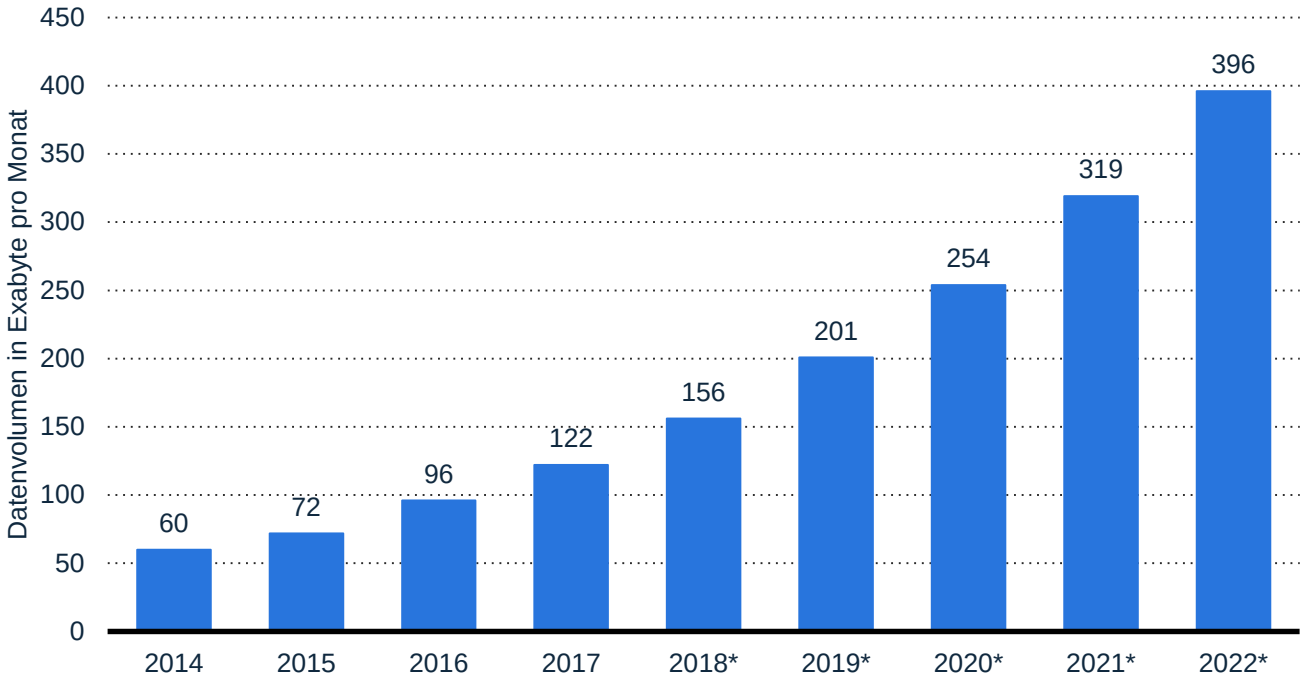
Early Heuristic Approach

- Dividing the binary into different sections:
  data sections or code sections
- A very specific pattern:
  malicious code was often located at the very end of file

- Other kinds of more advanced heuristics:
  - suspicious section names,
  - incorrect header size,
  - regular expressions,
  - and partial pattern in-memory matching

- **As you see, this is definitely data driven!**

Data volume of global IP traffic from 2014 to 2017 and a forecast to 2022 (in exabytes per month).



Note(s): Worldwide; 2014 to 2017
For more information on these statistics, as well as explanations of footnotes, see page 8.
Source(s): Cisco Systems; ID 266869

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Cyber Security – Top Attack Actions

- According to Verizon Data Breach Investigation Report (DBIR) 2021 about 80% of all security incidents:
  - 60% - DoS (Hacking)
  - 10% - Phishing (Social)
  - 5% - Ransomware (Malware)
  - 5% - DoS (Malware)

- **The goal of cybersecurity is to reduce the points of attack to a minimum, since it is impossible to prevent attacks completely.**

Source: https://pixabay.com/de/photos/dieb-einbruch-einbrechen-r%c3%a4uberhut-1562699/

Big Data as a Security Solution

- Specific methods and approaches for
  - distributed denial of service and denial of service (DDoS/DoS) detection and prevention,
  - intrusion detection and prevention systems (IDS/IPS) and
  - anomaly detection

- **A wide variety of methods and approaches of data-driven security that can effectively contribute to increasing cybersecurity.**

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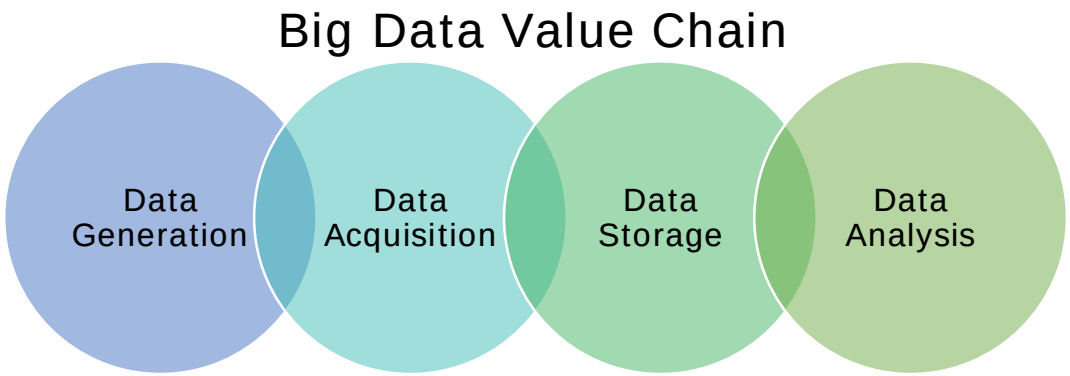
Source: https://pixabay.com/de/photos/sicherheit-alarm-monitor-cyber-5043368/

Security Attacks in Big Data

- Types of attack:
  - False data injection attack
  - Access control attack
  - Encryption based security attack
  - DDoS/DoS attack



Source: https://pixabay.com/de/photos/sicherheit-alarm-monitor-cyber-5043368/

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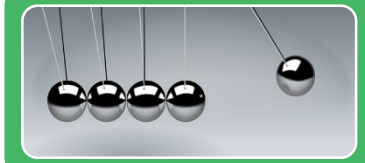
Summary

Many new possibilities for improvement of traditional algorithms and solutions

Enormous potential of security data science

New challenges and

the data itself must be protected.



Not yet widespread

Used primarily reactively and only rarely proactively.

Earlier consideration of security aspects and

more research necessary

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Source: https://pixabay.com/de/photos/newtons-wiege-b%c3%a4lle-ball-teilen-256213/, https://pixabay.com/de/photos/flo%c3%9f-wildwasserflo%c3%9f-boot-1429872/, https://pixabay.com/de/photos/konzept-mann-papiere-person-planen-1868728/, https://pixabay.com/de/photos/motivationszitat-whiteboard-3550403/

Even though data-driven security is getting better, stay vigilant!

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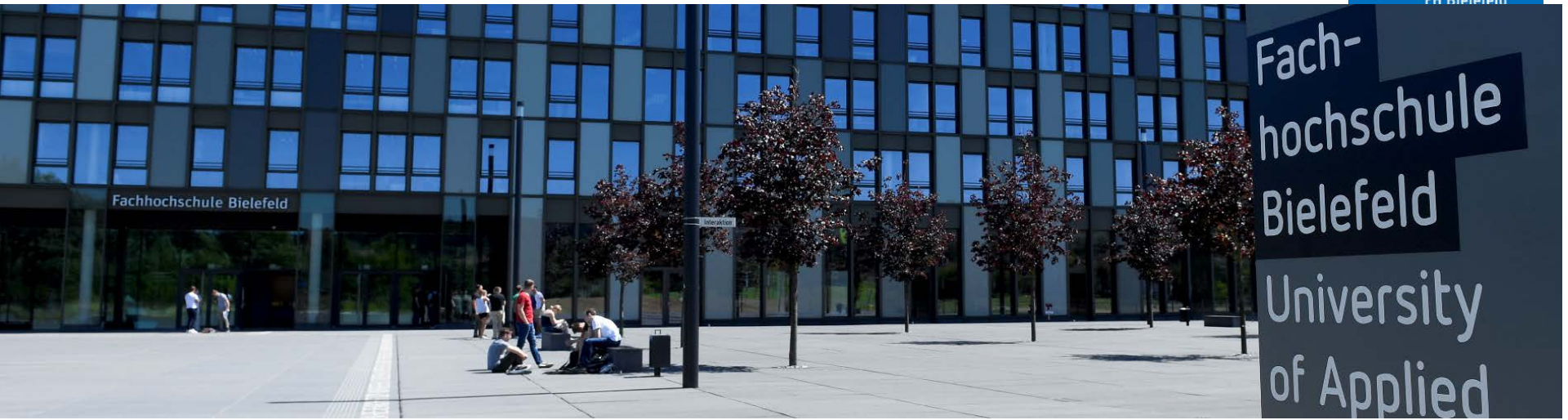
Source: https://pixabay.com/de/illustrations/hund-kopf-%c3%b6lgem%c3%a4lde-haustier-tier-5812493/

Zoom!

„A Constructive Learning Model for Data Analytics in Treasury“ –

Prof. Dr. Andreas Uphaus, Bielefeld University of Applied Sciences, Germany

12.20-12.40



A Constructive Learning Model for Digital Skills in Treasury

BiCAB 06.05.22
Faculty of Business

Welcome all ☺

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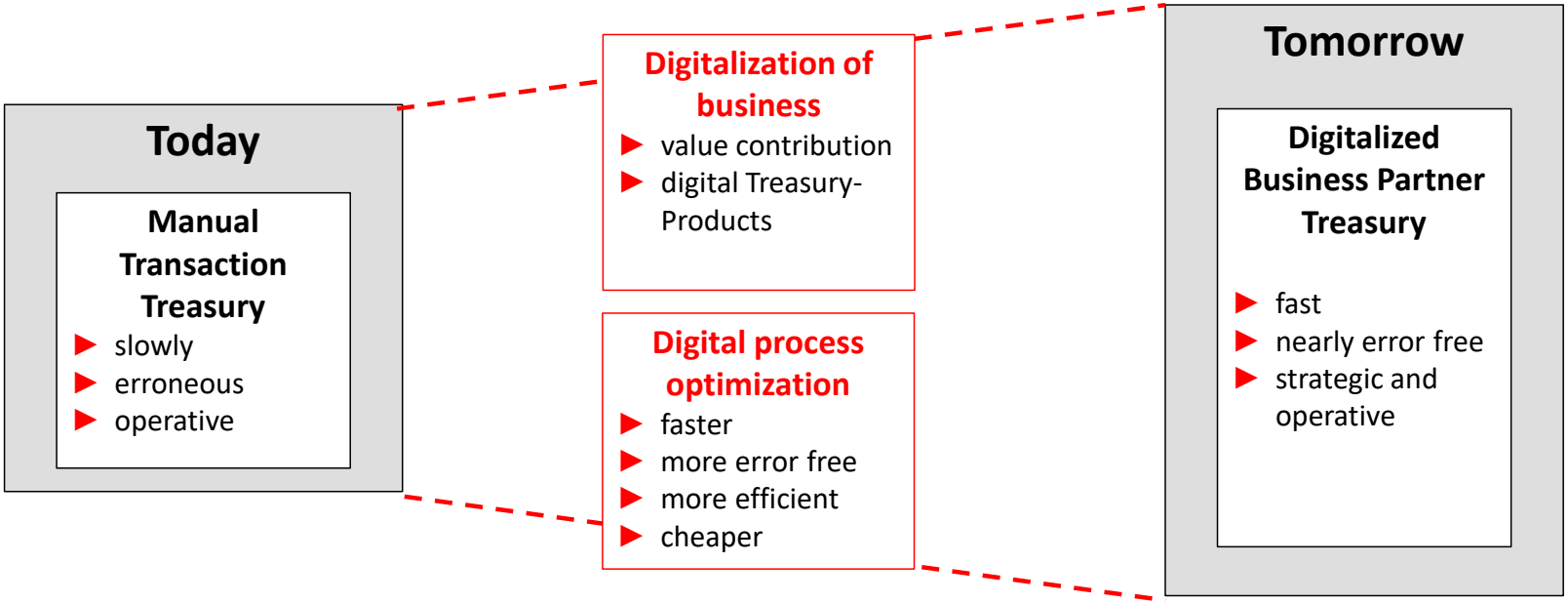
Treasury and Digital Skills

**“One of the core tasks of corporate management.
The focus: financing the operational value chain and ensuring current and future solvency in any currency required.”**

- Cash & Liquidity Management,
- Financing & Financial Asset Management and
- Financial Risk Management
- Working Capital Management,
- Insurances
- Accounts/Receivable, Accounts/Payable.

- Business and Data Analytics, predictions
- Artificial Intelligence: Machine and deep learning
- ERP-systems
- Automation of operations using digital process optimization
- Robotic process automation
- Blockchains
- Programming
- NFTs
- Decentralized finance

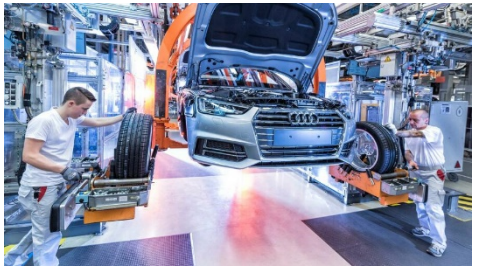
A Digital Treasury Journey



Snapshots

BASF

- “Treasurer of the year 2020” by “Finance Magazine”
- For an innovative use of Artificial Intelligence
- Development of a “smart credit optimizer”
- High automized and efficient customer credit decisions
- Realizing real time risk control
- Millions of EUR cost saving
- Helps to avoid blocking of customer orders



Audi

- “Treasurer of the year 2021” by “Finance Magazine”
- ePayment Project „audiPay“ for B2C relations
- customers can buy „Functions on Demand“ and pay directly
- value added contribution
- together with Payment-Service-Provider VW Payment
- development of an app for invoicing and payment for digital services
- including complex financial, tax, law requirements to be taken into account

snapshots

Deutsche Bahn

- Predictive Analytics approaches for liquidity planning
- Detection of credit risks of mid size companies using webcrawler
- Open source technology
- Fraud monitor for payments with an API interface to ERP-systems
- Robotics approach: automated login + comparison of payment information for treasury transactions > 1 Mio. EUR, for operative payments using predictive analytics
- Alarm: new payment

Microsoft

- started journey already in 1995 and nearly finished yet in 4 steps:

(1) standardized worldwide IT-systems with a unique chart of accounts,

(2) one worldwide Treasury shared service center,

(3) one flexible standard reporting system in combination with automized treasury processes and

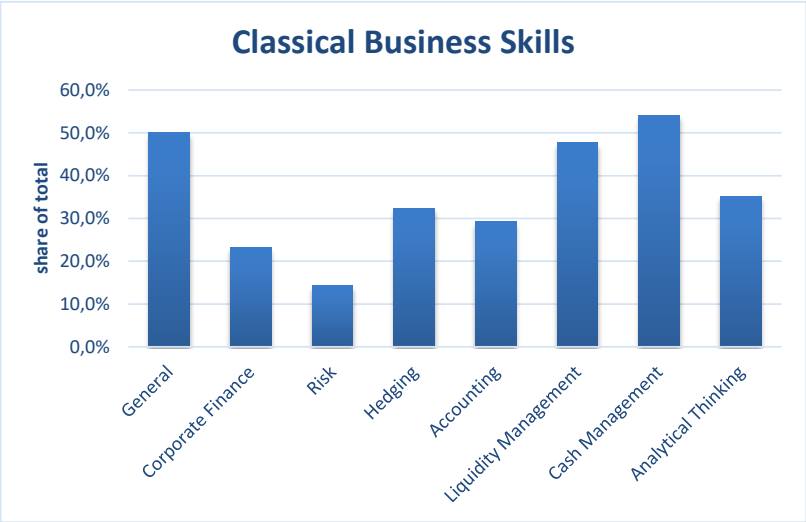
(4) one cloud based financial data analytics approach for strategy, forecasting and risk management.

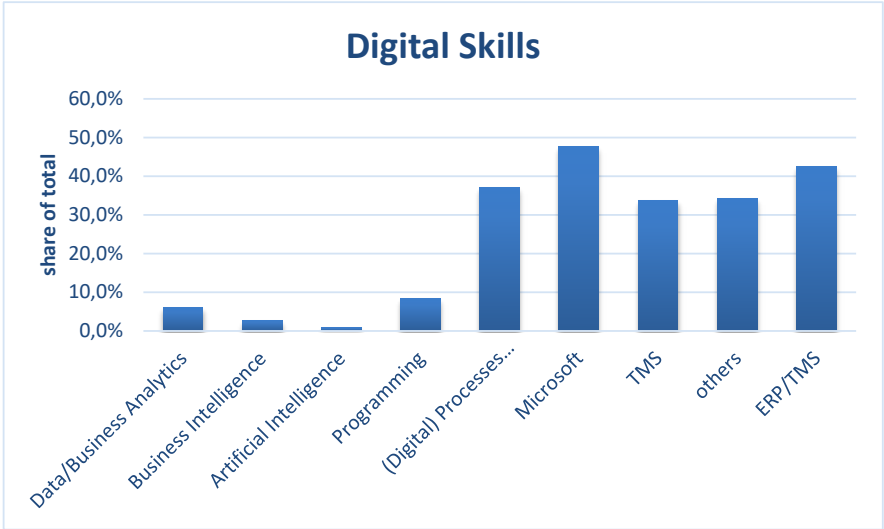
conclusion

- Predictive + Business Analytics, AI
- Digital process optimization
- Software development (projects)
- ERP
- RPA

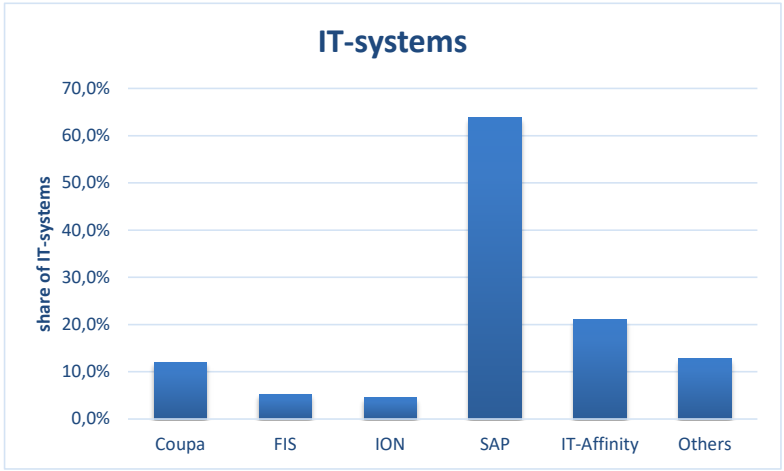
Analysis of job advertisements

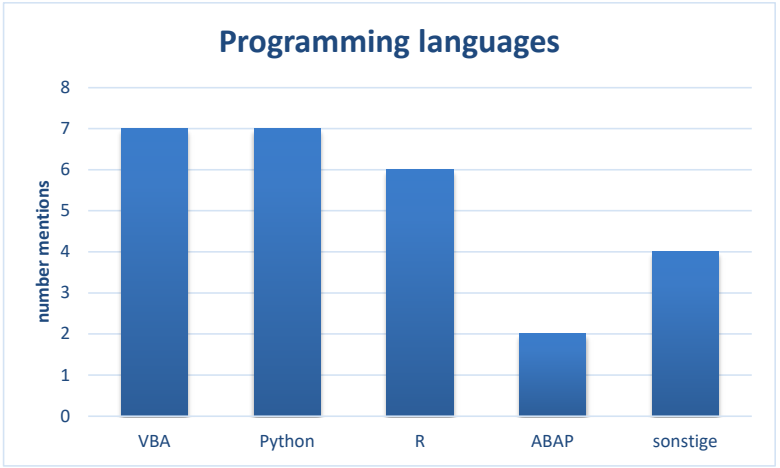
- 217 current job advertisements
- 3 portals: Indeed, Stepstone, Jobware
- Search „Treasury“





Analysis of job advertisements





(Digital) Treasury problems

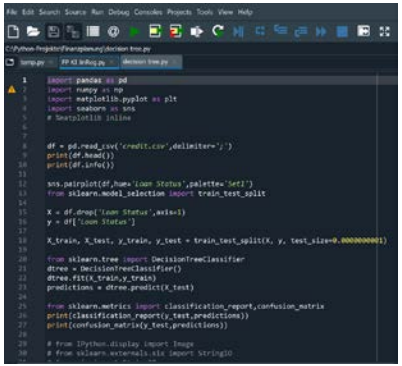
Treasury problems

- (Liquidity) Forecasting
- Fraud detection
- Credit limit decisions
- Automated payment flows
- Automated decisions
- Strategic decision support
- Digital Euro

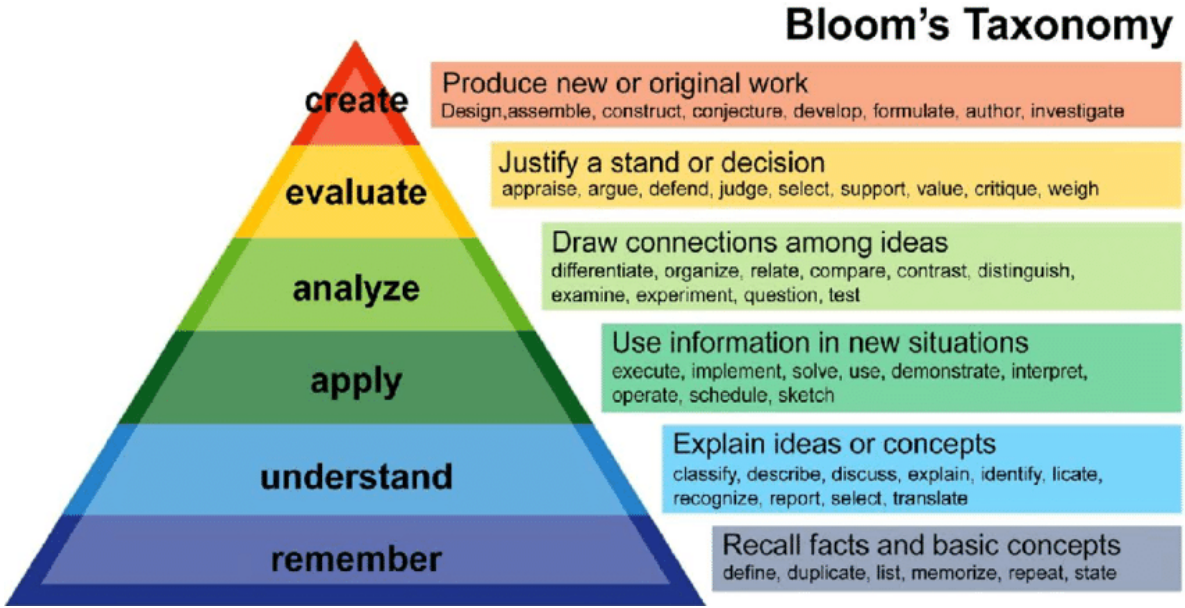
Methods ~ digital skills

- Business and Data Analytics, predictions
- AI: Machine and deep learning
- ERP-systems
- Digital process optimization
- Robotic process automation
- Blockchains
- Programming
- NFTs
- Decentralized finance

Solutions



High level digital skills



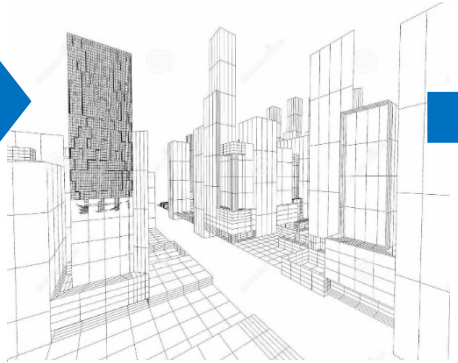
- Highest levels of taxonomy
- Complex methods and outcomes
- Not interesting for all students
- Special learning approach is needed

Source: https://www.researchgate.net/figure/Blooms-Taxonomy-is-a-classification-of-human-cognition-critical-to-the-process-of_fig1_312261689

Construction of complex solutions

Students

(1) Plan



(2) Perform

(3) Evaluate

Constructive learning model

Teaching

Encourage interaction

Request reflection

Reflection

(4) Check and Control

Action

Students

(1) Plan

(1a) Problem
(1b) Requirements
(1c) Participants
(1d) Strategy
(1e) Situation
(1f) Conditions

(2) Perform

(2a) Methods
(2b) Strategies

(3) Evaluate

(3a) Learning content
(3b) Learning success
(3c) Learning results

Support context analysis and planning

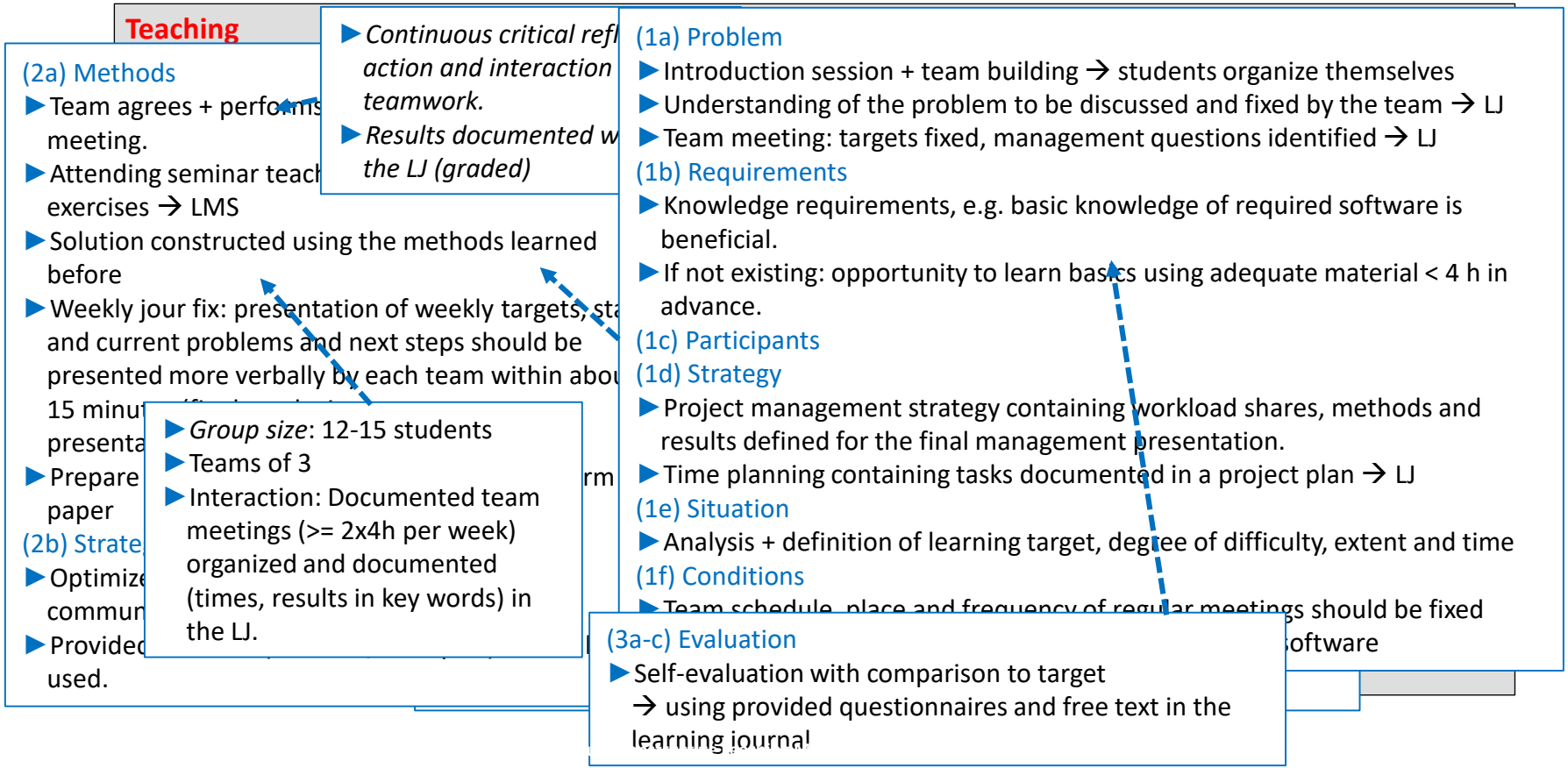
Accelerate actions and discussion

Support realistic evaluation

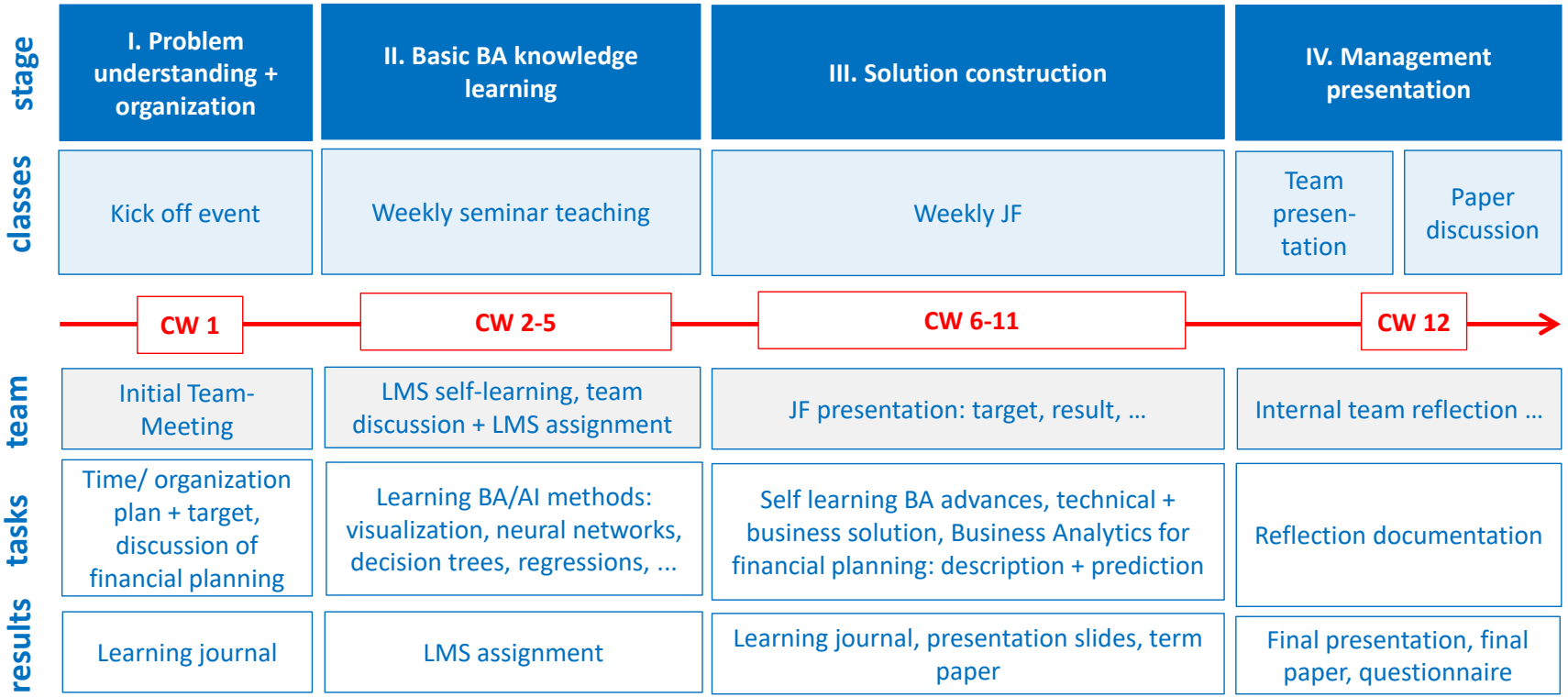
Treasury constructive learning model

Framework		
1	General conditions	▶ *Extent*: about 6 ECTS (= 180h) per participant ▶ *Group size*: 12-15 students ▶ *Time schedule*: 1 semester (12 calendar weeks) in 4 stages (see below) ▶ *Result*: problem solution concept for *financial planning including situation descri-ption, prediction and business implications for management*. ▶ *Exam*: (management) presentation including a written report and learning journal ▶ *Resources*: ▶ generated large *data set* of financial past (daily) cashflows over some periods: containing some "built-in" features like inflation factor, season-alities, external shocks, GDP increases → to be detected by the students and predicted for future periods. ▶ A *learning management system (LMS) including learning journal* ▶ Adequate *Business Analytics software* (e.g. Python/R or Tableau/Power BI)
2	Content	▶ Liquidity planning is based on a large volume of data ▶ Analyze past data to detect and show structures using BA + future liquidity positions prediction using AI as exact as possible.
3	Situation	▶ Teamwork ▶ A variety of learning locations on and off-campus or digitally

Treasury constructive learning model



Treasury constructive learning model



Conclusion

… Treasury needs extensive digital skills

… espec. BA + digital process optimization (snapshots + job advertisments)

… this knowlegde is creative and constructive

… and needs specific learning

… the developed Treasury constructice learning model might be adequate

Finish

… Thanks so much for listening ☺

… questions … ?

Session 3 chair: Prof. Dr. Alessandro Spano

13.30-14.30

„Applying Situated Analytics for Supporting Consumer Decision-Making“ –

Prof. Dr. Ela Sibel Bayrak Meydanoglu,
Turkish-German University, Turkey

13.30-13.50

Applying Situated Visualization for Supporting Consumer Decision Making

Ela Sibel Bayrak Meydanoğlu
meydanoglu@tau.edu.tr
Turkish-German University, Istanbul
BiCAB 2022, Bielefeld, 6. May 2022

Agenda

- Introduction & Methodology
- AR-Based Situated Visualization Systems
- Findings of the Study
- Concluding Remarks

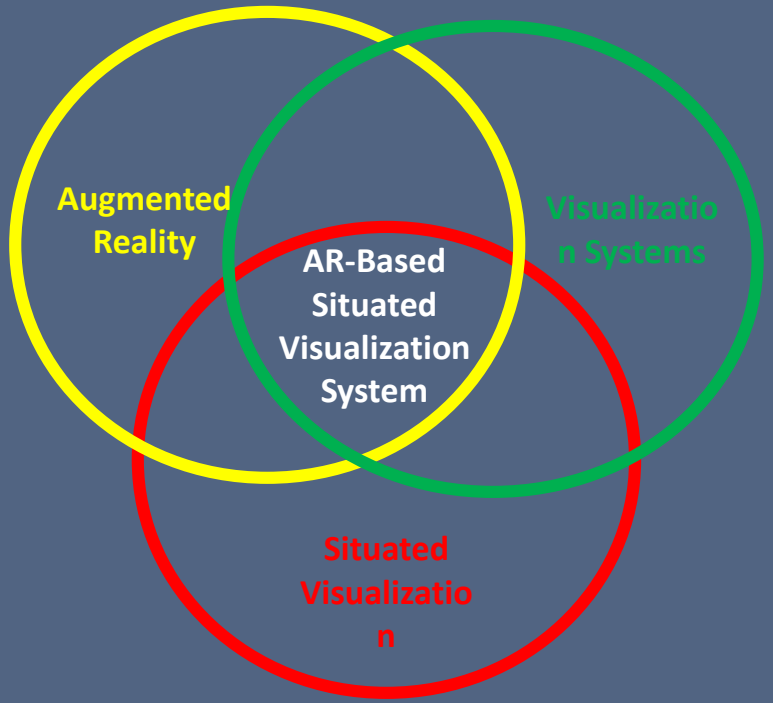
Introduction & Methodology

- The number of studies regarding the use of AR-based situated visualizations sytems in the business context is limited -> *ElSayed N. A. M., Thomas, B. H., Marriott K., Piantadosi J., & Smith R. T. (2016). Situated Analytics: Demonstrating immersive analytical tools with Augmented Reality. Journal of Visual Languages and Computing, 36, 13-23.*

- Research Question: Can AR-based situated visualization systems support consumers in their buying decisions?

- The study is an exploratory and a conceptual study based on a literature review.

AR-Based Situated Visualization Systems



Augmented Reality (AR)

Augmented reality is *"a novel human machine interaction tool that overlays computer-generated information in the real-world environment."* (Nee et al. 2012, p. 657)

Context-driven visualization techniques *"allow to automatically adapt AR visualizations to their real world surroundings …"* (Kalkofen et al., 2011, p. 68)

Nee A. Y. C., Ong S. K., Chryssolouris G., & Mourtzis D. (2012). Augmented reality applications in design and manufacturing. CIRP Annals Manufacturing Technology, 61(2), 657–679.

Kalkofen D., Sandor C., White S., & Schmalstieg D. (2011). Visualization Techniques for Augmented Reality. In Borko Furht (Ed.), Handbook of Augmented Reality (pp. 65-98), Springer Science+Business Media.

Context-Driven Visualization Techniques

- ❑ Visualization based on the physical (real-world) object as context
- ❑ Visualization based on the real-world scene as context
- ❑ Visualization based on the sensor data as context
- ❑ Visualization based on uncertainty as context
- ❑ **Situated visualization**

Situated Visualization & Situated Visualization Systems

"Situated visualization refers to a visualization related to its environment" (Martins et al., 2021, p. 7)

Situated visualization systems explore and analyze information about the objects in the user's physical environment by using real-time interaction, visualization, and analytical reasoning techniques.

Martins N. C., Marques B., Alves J., Araújo T, Dias P., & Santos B. S. (2021). Augmented reality situated visualization in decision-making. Multimedia Tools and Applications, 5, 1-24.

Types of Situated Visualization

- ❑ Spatially Situated Visualizations
- ❑ Perceptually Situated Visualizations
- ❑ Embedded Visualizations
- ❑ Temporally Situated Visualizations

Spatially Situated Visualizations

"*A visualization is spatially situated if its physical presentation [physical data presentation] is close to the data's physical referent.*" (Thomas et al., 2018, p. 194)

"*A physical presentation is the physical object or apparatus that makes the visualization observable.*" (Jansen and Dragicevic, 2013, p. 2397)

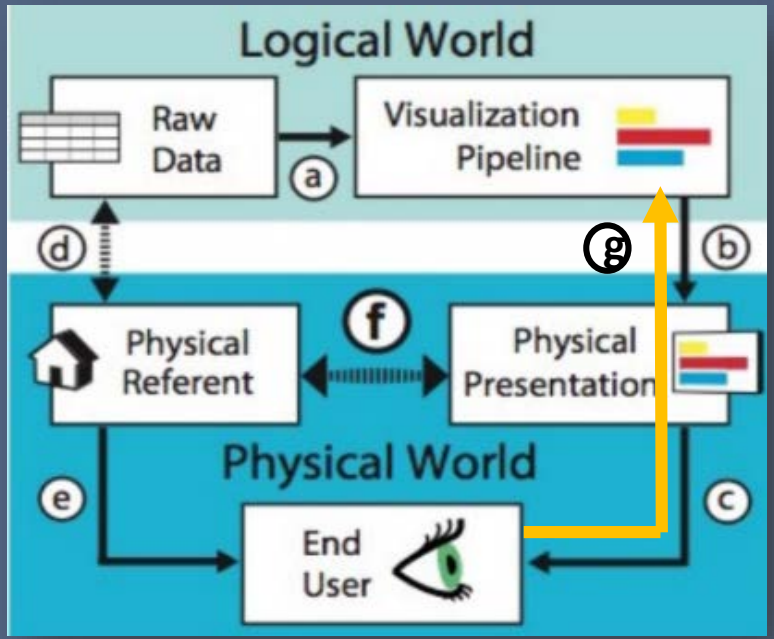
"*A physical referent is a physical object or physical space to which data refers.*" (Willett et al., 2017, p. 462)

Thomas B. H., Welch G. F., Dragicevic P., Elmqvist N., Irani P., Jansen Y., Schmalstieg D., Tabard A, ElSayed N. A. M., Smith R. T., & Willett W. (2018). Situated Analytics. In Kim Marriott, Falk Schreiber, Tim Dwyer, Karsten Klein, Nathalie Henry Riche, Takayuki Itoh, Wolfgang Stuerzlinger & Bruce H. Thomas (Eds.). *Immersive Analytics (Lecture Notes in Computer Science 11190*) (pp. 185-220). Springer.

Jansen, Y., & Dragicevic, P. (2013). An interaction model for visualizations beyond the desktop. IEEE Transactions on Visualization and Computer Graphics, 19(12), 2396–2405.

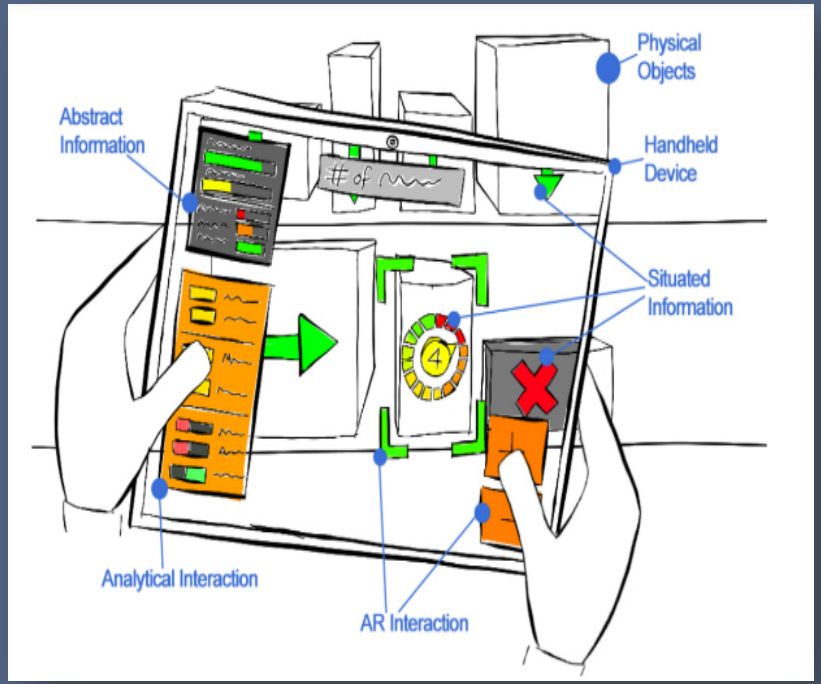
Willett W., Jansen Y., & Dragicevic P. (2017). Embedded Data Representations. IEEE Transactions on Visualization and Computer Graphics, 23(1), 461-470.

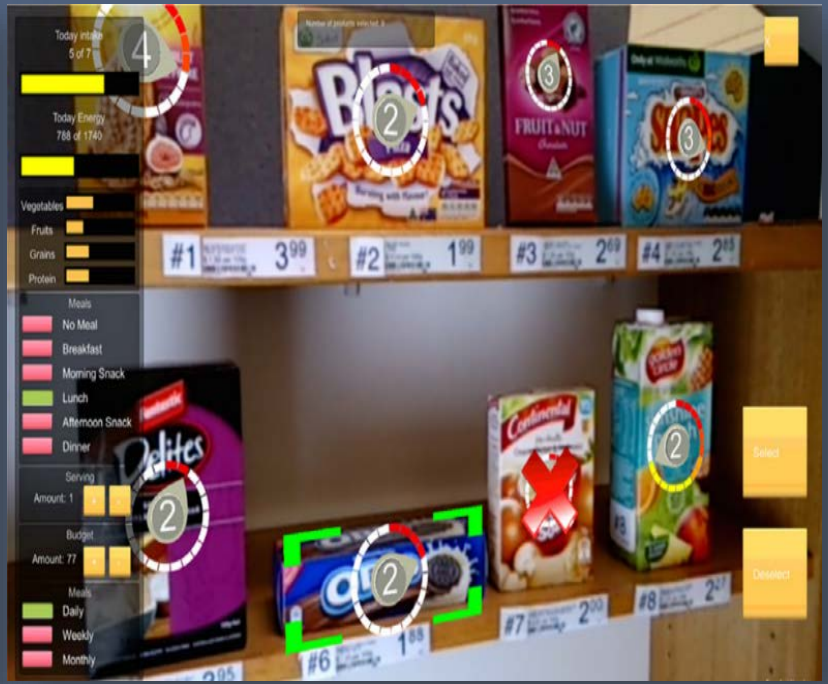
Conceptual Model of a Spatially Situated Visualization System



Thomas B. H., Welch G. F., Dragicevic P., Elmqvist N., Irani P., Jansen Y., Schmalstieg D., Tabard A, ElSayed N. A. M., Smith R. T., & Willett W. (2018). Situated Analytics. In Kim Marriott, Falk Schreiber, Tim Dwyer, Karsten Klein, Nathalie Henry Riche, Takayuki Itoh, Wolfgang Stuerzlinger & Bruce H. Thomas (Eds.). *Immersive Analytics (Lecture Notes in Computer Science 11190*), Springer, p. 192.

AR-Based Situated Visualization Systems

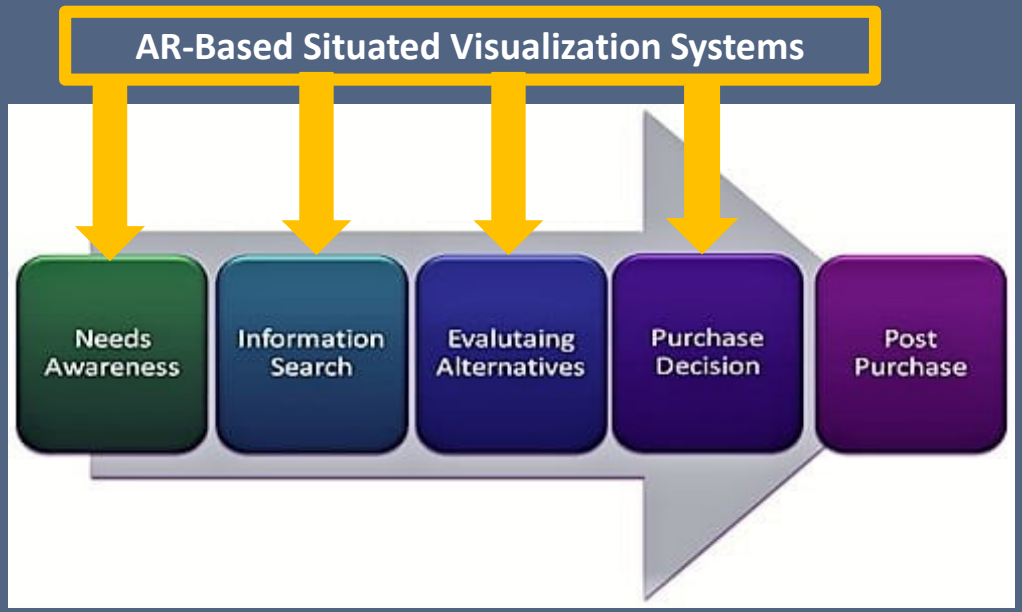




ElSayed N. A. M., Thomas, B. H., Marriott K., Piantadosi J., & Smith R. T. (2016a). Situated Analytics: Demonstrating immersive analytical tools with Augmented Reality. Journal of Visual Languages and Computing, 36, p. 16.

ElSayed N. A. M., Thomas, B. H., Marriott K., Piantadosi J., & Smith R. T. (2016a). Situated Analytics: Demonstrating immersive analytical tools with Augmented Reality. Journal of Visual Languages and Computing, 36, p. 18.

Findings of the Study



Findings of the Study

- Reducing the completion time of the subprocesses of the buying process and enabling an informed buying decision.
- Improving sense-making by providing information in an easily understandable way.
- Enabling users to gain information about the products that they did not intend to buy previous to information search.
- Affecting consumers' buying decisions by creating sensory and affective consumer experiences.

Increased customer satisfaction, customer loyalty, repetitive purchases, turnover, market share & gained competitive advantage

Concluding Remarks

- The findings of this study have the feature of preliminary information for comprehensive future studies and can provide the basis for future research.

- AR-based situated visualization systems are still in the early stages of development. Real life applications will certainly give essential feedback on the benefits of these systems in practice and on the need for their improvement.

- The findings of the study rely on the exploratory studies in the relevant literature. They have to be validated by using relevant quantitative and qualitative methods in future work.

Thanks for your attention !

Zoom!

„AI Enabled “Just Walkout Technology” in shopping malls: Empirical evidence to predict consumer purchase intention with moderating role of shopping convenience“ –

Prof. Dr. Suraj Shah,
Prof. Dr. Maurvi Vasavada,
Dr. Sameer Rohadia,
Dr. Mahendra Sharma, Ganpat University, India

13.50-14.10

"AI Enabled "Just Walkout Technology" in shopping malls: Empirical evidence to predict consumer purchase intention with moderating role of shopping convenience"

Presented To:-

Honorable Track chairs at Bielefeld International Conference on Applied Business

Presented By:

Dr. Suraj Shah, Assistant Professor, Program Coordinator,

Ganpat University- Centre for Management Studies and Research,

Mehsana, Gujarat, India

Dr. Sameer Rohadia, Adjunct Professor,

Ganpat University, Mehsana, Gujarat, India

Authored by:

Dr. Suraj Shah, Dr. Sameer Rohadia

Dr. Maurvi Vasavada, Dr. Mahendra Sharma

Flow of Presentation

1. INTRODUCTION
2. LITERATURE REVIEW
3. RESEARCH METHODOLOGY
4. DATA ANALYSIS
5. FINDINGS & DISCUSSION
6. THEORITICAL & MANAGERIAL IMPLICATION
7. CONCLUSION
8. FUTURE SCOPE OF STUDY

Introduction

What is AI Enabled “Just Walkout Technology”?

1

Just Walk Out (JWO)/ Just Go Out (JGO) technology allows customers to walk into a business, grab whatever they want, and walk out, resulting in a smooth shopping experience. Artificial intelligence, image recognition, and sensors are all used in JWO. These precise sensors are often put on the shop's aisles/shelves to track what the consumer selects and where the merchandise is moved or placed (Qin and Jiang 2019).

2

Best Example is a cashier less business by Amazon Go that uses artificial intelligence, vision sensors, along with ML algorithms to allow customers to purchase without queue or check out. Consumers scan their mobile apps when they enter the mall or shop, take what they need (acquired merchandise monitored by cameras and sensors), depart the store, and have their associated account paid.

Literature Review

Literature Review- From traditional Checkout to AI Enabled Checkout

Mall customers have moved to traditional check out to Self-Checkout systems (Vojvodic, 2019). The main objective behind adoption of the Self-Checkout systems was to reduce the retailer's cost (Iqbal et al., 2018).

New advancement of the technology has reshaped the shopping habits and practice of the retail shoppers (Hristov& Reynolds, 2015). Expectation of the customers has increased and seek for more personalized services and shopping experience with advancement of technologies retail industry (Kozup et al., 2003; Tybout et al., 2005).

Self-Checkout systems will enhance the shopping experience which ultimate increase customer satisfaction and loyalty (Mariani et al., 2018; Orel & Kara, 2014; Cebeci et al., 2020;).

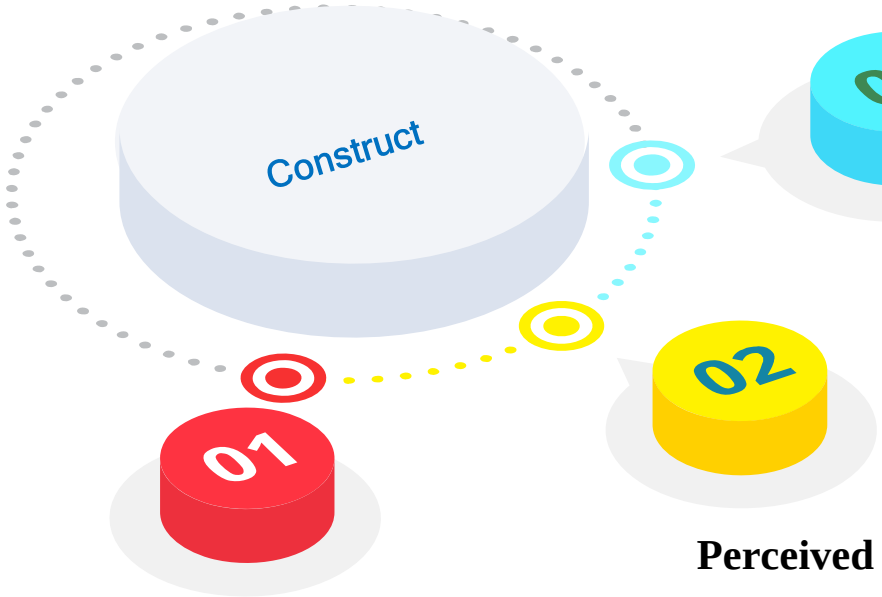
Literature Review- Shopping convenience

By integrating modern digital technologies into retail businesses, AI can provide individualized experiences for customers (Perry et al., 2019). In the present e-commerce ecosystem, AI-driven technologies and gadgets are the most common (Cha et al., 2019).

Customers find shopping using AI-driven technology and gadgets to be simple and convenient (Kumar, 2007). The main motive of moving from the traditional checkout to the self-checkout system was convenience and AI-enabled checkout has assumed to be deliver even better convenience compare to others (Burke, 1997; Seiders et al., 2005).

Artificial intelligence (AI) improves and promotes a better user experience in e-commerce and physical retail establishments (Cha et al., 2019). AI also assists organizations in adopting more sustainable production techniques (Di Vaio et al., 2020)

Construct Used in Study based on Literature Review



Attitude towards the checkout type (Tybout et al., 2005).

Perceived shopping convenience (Seiders et al., 2005; Vaio et. al., 2020)

Purchase intentions (Burton et al., 1999; Van et. al., 2021)

Scope of the Study

1. Scope of the study is limited to selected six major cities of India and Germany each.

2. The conceptual scope is also limited to Just walkout technology, Shopping Malls, Artificial Intelligence, Perceived Shopping Convenience, Attitude and Purchase Intention.

3. Various demographic factors and variables are also taken into consideration based on literature review.

Research Gap and Need for Study

Population gap

Theoretical gap

Research evidence gap

Contradictory evidence gap

Original Contribution of the study

Current Study is the original contribution of the study. The findings of the study provides novel practical and managerial Implications.

Study Design

Sampling technique: Purposive Sampling

Sample size : 576

Inclusion criteria: Specific Respondents associated with Just walkout technology

Participants (Specifically Associated with Just Walkout Technology) from varied sectors like education and training, Information technology, Banking, Aviation, Consumer Durables, E-Commerce, Health Care, Insurance, Media and Entertainment, Pharmaceuticals, Retail, services along with tourism and hospitality took part in the survey.

Research Methodology

Research Objective

- The primary goal of the study is to predict purchase intention through AI Enabled technology in shopping malls. This study has unique findings concerning to moderating effect of shopping convenience in relationship between AI Enabled shopping behavior and purchase intention."

Research design

- Exploratory → Conclusive Descriptive Research → Single Cross Sectional

Data Collection:

Secondary → E – Journals; Library of various institutes by taking membership; Websites; various books, research papers, newspapers, report , conference proceedings and reports published by Government and private research firms.

Primary data → Interviewer administered questionnaire having close-ended questions

The Sampling Methodology:

Target Population: Respondents aware and associated with Just Walkout Technology

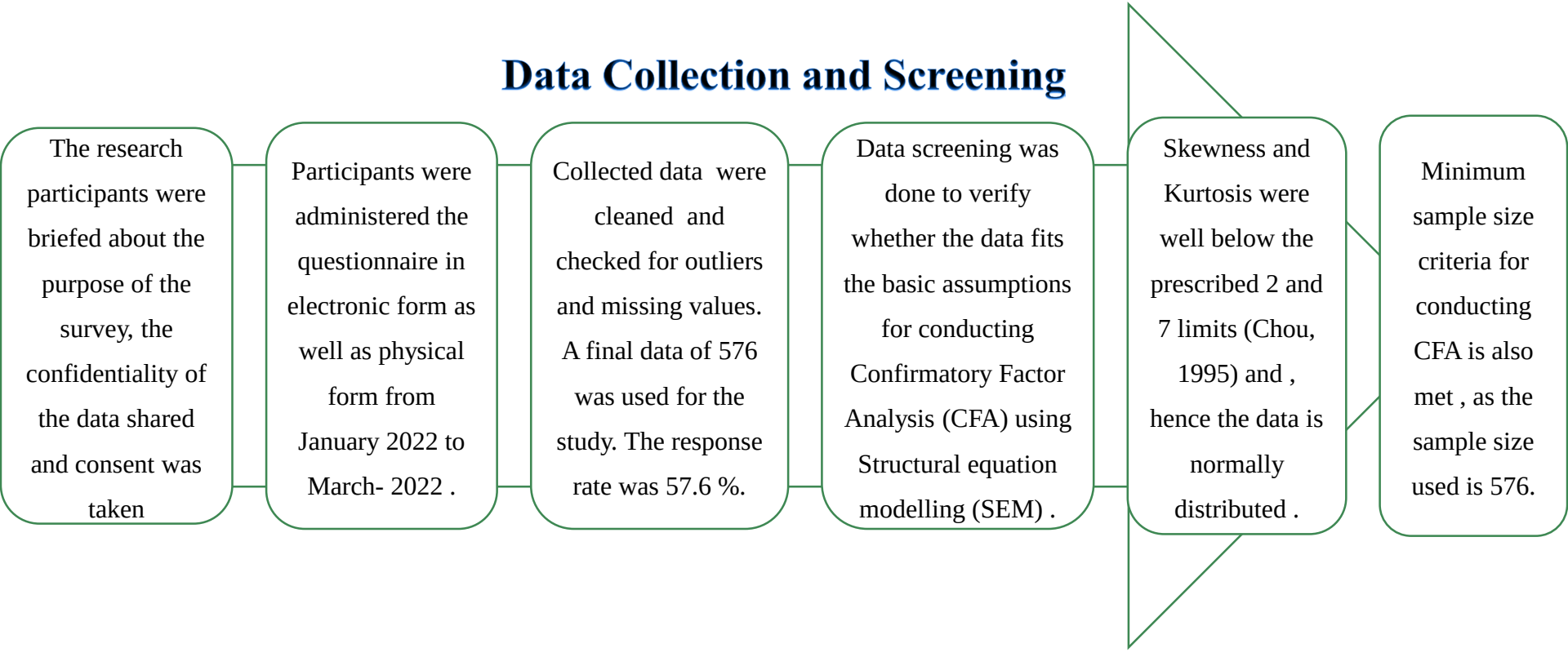
Sampling Method: Purposive Sampling

Sampling Size: 576 respondents → (India and Germany)

Data Analysis:

Descriptive statistics, Inferential statistic- Cronbach's Alpha using SPSS, CFA, SEM using AMOS.

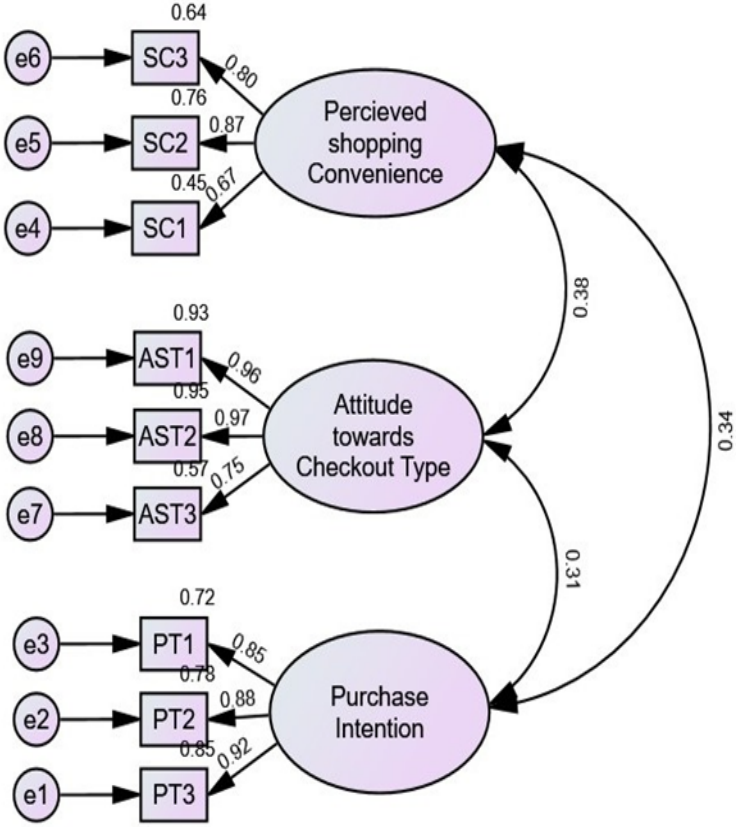
Data Collection and Screening



Pilot study with 30 responses was also undertaken to check the reliability of the data and to finalize the questionnaire.

Data Analysis

Measurement Model (CFA)



Convergent validity and Reliability

Factor	Items	Factor Loading	CR	AVE	Cronbach's alpha
Purchase Intention	PT3	0.923	0.915	0.782	0.914
	PT2	0.882			
	PT1	0.846			
Perceived shopping Convenience	SC1	0.67	0.828	0.618	0.821
	SC2	0.873			
	SC3	0.803			
Attitude towards Checkout Type	AST3	0.752	0.929	0.815	0.922
	AST2	0.975			
	AST1	0.964			

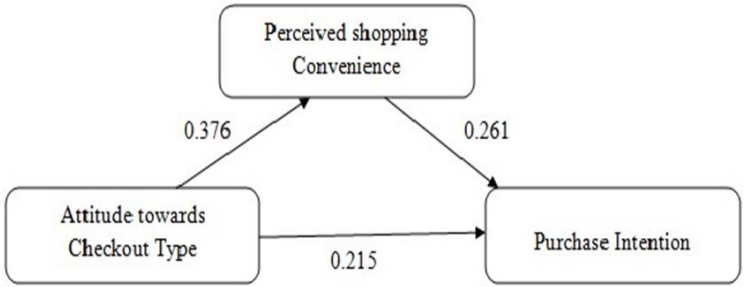
Discriminant Validity

	MSV	AVE	Purchase Intention	Perceived shopping Convenience	Attitude towards Checkout Type
Purchase Intention	0.117	0.782	**0.884**		
Perceived shopping Convenience	0.141	0.618	0.342***	**0.786**	
Attitude towards Checkout Type	0.141	0.815	0.313***	0.376***	**0.903**

Model Fit Indices

Normed Chi-square	GFI	TLI	CFI	RMSEA
3.229	0.971	0.979	0.986	0.062

Path Analysis



- The model coefficients are significant and acceptable. Nevertheless, the model results depict that Customers' purchasing intent ones are positively influenced by their attitude regarding checkout types. ($\beta = 0.215$, CR = 4.697, $p < 0.001$). This model also indicates that Attitude towards the checkout type has the positive and statistically significant impact on the perceived shopping convenience ($\beta = 0.376$, CR = 7.704, $p < 0.001$). Furthermore, it was shown that customers' perceptions of shopping convenience have a favorable and statistically significant influence on their purchase intentions. ($\beta = 0.262$, CR = 5.248, $p < 0.001$).

Mediating effect of perceived shopping convenience

Effect		Standardized weight	P Value
Direct Effect	Attitude towards the checkout type → Purchase Intention	0.215	<0.001
Indirect Effect	Attitude towards the checkout type → perceived shopping convenience → Purchase Intention	0.098	0.005

- The attitude toward checkout type has a favorable direct influence on purchase intent and statistically significant with beta weight of 0.215 and p value less than 0.001. Where, indirect effect of attitude towards checkout type on the purchase intention through the perceived shopping convenience was also found positive and statistically significant with the beta weight of 0.098 and p value of 0.005. Both the effect, Direct and indirect effect were statistically significant so it concludes that the customer's attitude toward the checkout type and intention to buy are partially mediated by perceived shopping convenience.

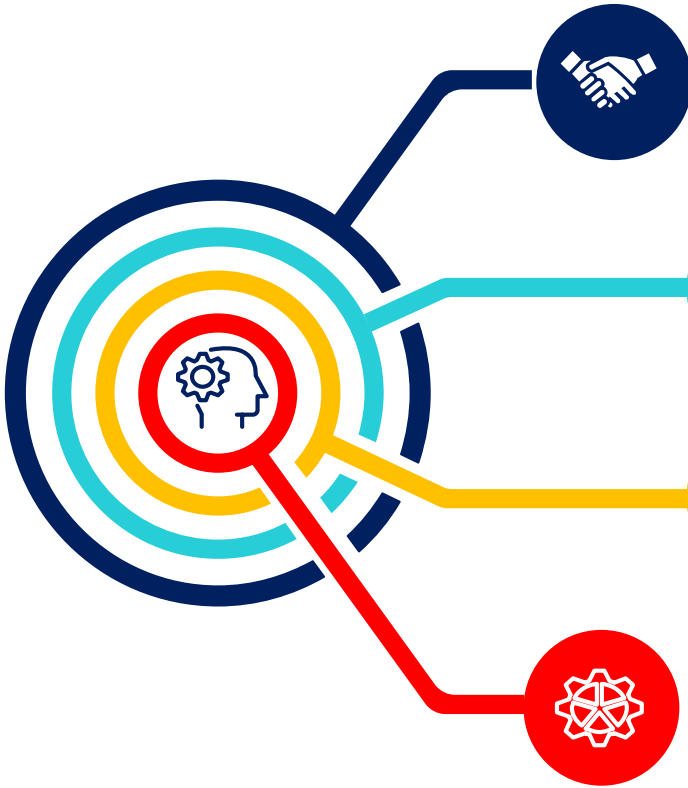
Key Findings and Discussion

Key Findings & Discussion

- Academics and marketers must comprehend the attitudes and perspectives of purchasers about artificial intelligence (AI) technologies because of its rapid growth and ramifications for the retail environment.
- Previous studies have found that using AI-enabled checkouts has a substantial impact on customer sentiments. Current study has extended the research for novel findings.
- The findings gives marketers with an important factor to consider when developing Retailers' marketing strategy for using AI-enabled checkouts.
- According to the statistical research, adoption of AI-enabled checkout lines in a shopping landscape can boost the number of customers due to the direct association between purchase intent and AI-enabled checkouts.
- customer's attitude toward the checkout type and intention to buy are partially mediated by perceived shopping convenience.
-

Theoretical, Managerial and Practical Contributions

Theoretical and Managerial Implications



Contributes to the repertoire of research (Theoretical Implication)

Strong Implications for Retail sector and malls with strong statistical model with validated outcomes for strategy building.

This study will be beneficial to marketers, consumers, and policymakers alike.

Study presents a very strong evidence - primarily based on advertising and marketing and control insights that may be used to create a hit interventions and increases the chance of AI adoption (e.g., emphasizing "AI–physical–human" ecosystem (Van Esch et al., 2020).

Theoretical and Managerial Implications

The researcher employed SEM (Structural Equation Modeling) and CFA (Confirmatory Factor Analysis), both of which are highly effective statistical tools for ensuring the validity and reliability of the findings.

Value addition to the current pool of literature to Researchers and students as a whole.

Contribution to Academia: Data is New Oil and AI is considered as major breakthrough.

Time, Cost and Resource Effectiveness (Practical Implications)

Conclusion

Conclusion

- AI Enabled shopping environment leads to more positive purchase intention compare to the traditional checkout type of shopping environment which is inline of Pillai et al. (2020). Perceived ease of use and usefulness, influences consumers' buying intentions in such places. Customer creativity and optimism are important predictors of perceived ease of use and usefulness.
- Shopping convenience changes the relationship between AI-enabled shopping and purchase intent. In line of (Pillai et al., 2020).
- Customers accustomed to technological advances and innovations appear to buy more aggressively (Van Esch et al., 2021).

Future Scope of Study

Future Scope of Study

•Like other empirical investigations, our study also possesses certain limitation which needs to be acknowledged. This research was carried out in major cities of the two different countries i.e., India and Germany which has different culture altogether.

•Future studies may introduce cultural factors into this study and expand the results of the study.

•This study has taken into consideration attitude and shopping convenience as the predicators of the purchase intention where future research can be carried out by taking other variables and theatrical aspect like anxiety, self-efficacy, Locus of control, TAM, Technology Resistance model etc.

•Limitations related to the methodology and applied statistical tool is applicable to this research study as well.

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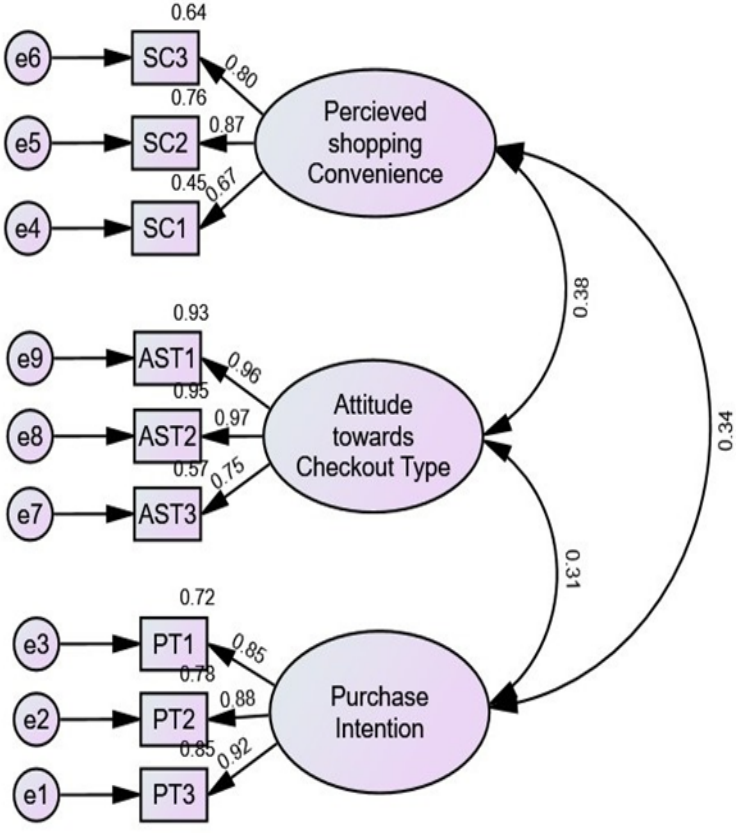
Any Questions???

Thank You

ANNEXURE

Demographic Profile of Respondents

Factors	Particulars	India	Germany	Frequency	Percent	Cumulative Percent
Gender	Male	159	158	317	55.03	55.74
	Female	122	137	259	44.97	100.0
	Total	281	295	576	100.0	
Age	18-30	97	103	200	34.72	34.72
	31-42	84	97	181	31.42	66.14
	43-55	77	69	146	25.34	91.48
	Above 55	23	26	49	8.506	100.0
	Total	281	295	576	100.0	
Occupation	Student	84	91	177	30.38	30.38
	Self Employed	78	87	165	28.64	59.02
	Salaried	119	117	236	40.97	100.0
	Total	281	295	576	100.0	
Members in Household	1-2	47	61	108	18.75	18.75
	3-4	178	217	395	68.57	87.32
	5-6	39	15	54	9.375	96.695
	More than 6	17	2	19	3.29	100.0
	Total	281	295	576	100.0	



Measurement Model

- **Confirmatory factor analysis (CFA)** verified the manifest variables load upon the proposed constructs and indicated these constructs.
- The combination of CFA and construct validity assessments allows the researcher to evaluate the quality of their measures within a measurement model before testing the structural model.
- **Maximum likelihood estimation** procedures are considered for this study to estimate the parameter of the complete measurement of the model.
- The measurement model consists of **three first-order latent variables and 9 indicators.**

Reliability and Validity

&

Table 1 Convergent validity and Reliability

Factor	Items	Factor Loading	CR	AVE	Cronbach's alpha
Purchase Intention	PT3	0.923	0.915	0.782	0.914
	PT2	0.882			
	PT1	0.846			
Perceived shopping Convenience	SC1	0.67	0.828	0.618	0.821
	SC2	0.873			
	SC3	0.803			
Attitude towards Checkout Type	AST3	0.752	0.929	0.815	0.922
	AST2	0.975			
	AST1	0.964			

- The factor loading was evaluated after the measurement model was run. All of the factor loadings are close to the 0.7 cut-off level. Overall, the loading of all components is within acceptable limits (above 0.50).
- Confirmatory factor analysis is used to determine the SEM measurement model (CFA). All items are loaded higher based on the factor loading score for each configuration and are assumed to be above 0.7 (set to> 0.5) and very significant (p <0.001) (Table 1).Convergent validity was established because the AVE score is greater than 0.5 for all three components (Bagozzi et al., 1991).

The reliability of the model discussed (Table 1) is satisfactory (default value Cronbach's alpha> 0.7, composite reliability> 0.6). All AVE scores were higher than MSV scores, establishing the validity of the discrimination between the three potential factors.(Hair et al.,1998 and Bagozzi and Yi, 1988).

Table 2 Discriminant Validity					
	MSV	**AVE**	**Purchase Intention**	**Perceived shopping Convenience**	**Attitude towards Checkout Type**
Purchase Intention	0.117	0.782	**0.884**		
Perceived shopping Convenience	0.141	0.618	0.342***	**0.786**	
Attitude towards Checkout Type	0.141	0.815	0.313***	0.376***	**0.903**

- Outer loading, average variance extracted, and composite reliability are crucial in evaluating the reflective measurement model. According to Joe F Hair, et al., outer loading should be more than 0.7, AVE should be greater than or equal to 0.5, and Composite Reliability should be greater than 0.7. Table shows the quality measurement for the model. AVE, composite reliability provides a good model fit as all the criteria are above the standard cut-off.

Table 3 Model fit indices				
Normed Chi-square	GFI	TLI	CFI	RMSEA
3.229	0.971	0.979	0.986	0.062

- This table reports that the overall **chi-square value** is **908.277** with a **p-value of 0.000**, lower than the significant level of 0.05.
- A value of 2.409 **for CMIN/DF** indicates an **excellent fit** for the model. **GFI is 0.971, TLI is 0.979** , **RMSEA is 0.062**, which is within the threshold level and makes the model an excellent fit.
- **CFI, TLI, NFI, and IFI values** also conclude that the estimated model excellently fits the proposed model.

„Analyses of a SME Company using Altman Z-Score Model“,

Prof. Dr. Arjeta Hallunovi, University Aleksander Moisiu Durres, Albania

14.10-14.30

Analyses of a SME company using Altman Z-Score Model

Dr. Arjeta HALLUNOVI

University Aleksander Moisiu Durres

The main objective of the study is to examine the financial distress and bankruptcy of a SME Company by using Altman Z-Score Model.

In the research paper, for the analyses are taken in consideration 5 years (2015-2020).

- It has been observed that the bankruptcy situation of the company, it is in the Grey Zone which mean that the company may or may not go into a bankruptcy area.

By collecting and systematizing different types of economic, financial and personal characteristics of the borrower, the specialized manager of the banking or financial institution has the opportunity to (Shisia, 2014):

a) quantify which factors are most important in explaining the risk of non-repayment of the loan;
b) assess the relative degree of importance of these factors;
c) improve the size of the value of the risk of loan default;
d) sift those loan applicants with high risk of failure;
e) calculate the size of reserves needed to cover future losses from non-repayment of loans.

All of this can be accomplished by using a model called the Credit Scoring Model.

Z-Score bankruptcy model:

X_1 = (Current Assets − Current Liabilities) / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = Earnings Before Interest and Taxes / Total Assets

X_4 = Book Value of Equity / Total Liabilities

$$Z = 6.65\,X_1 + 3.26\,X_2 + 6.72\,X_3 + 1.05\,X_4$$

Zones of discriminations:

Z > 2.6 -“Safe” Zone

1.1 < Z < 2.6 -“Grey” Zone

Z < 1.1 -“Distress” Zone

DATA ANALYSES

Results of X_1

Years	Working Capital	Total Assets	X_1=WC/TA	6.65 X_1
2015-2016	1 888 500	61 564 558	0.031	0.20615
2016-2017	3 105 830	58 554 464	0.053	0.35245
2017-2018	3 765 554	44 548 850	0.085	0.56525
2018-2019	6 205 535	62 085 450	0.1	0.665
2019-2020	8 402 050	78 035 868	0.108	0.7182

Results of X_2

Years	Retained Earnings	Total Assets	X_2=RE/TA	3.26 X_2
2015-2016	8 101 170	61 550 554	0.132	0.43
2016-2017	9 212 200	54 590 353	0.169	0.551
2017-2018	10 233 458	44 530 650	0.23	0.7498
2018-2019	12 150 555	61 080 430	0.2	0.652
2019-2020	12 365 415	75 435 787	0.164	0.535

Results of X_3

Years	EBIT	Total Assets	X_3=EBIT/TA	6.62 X_3
2015-2016	9 156 502	61 550 665	0.149	0.986
2016-2017	1 756 630	58 580 656	0.03	0.1986
2017-2018	2 154 460	44 545 840	0.048	0.31776
2018-2019	2 356 065	62 075 340	0.038	0.25156
2019-2020	779 510	60 354 499	0.013	0.086

Results of X_4

Years	Market Value of Equity	Book Value of Total Liabilities	X_4=MVE/TL	1.05 X_4
2015-2016	15 155 588	46 420 353	0.326	0.3423
2016-2017	14 050 055	55 334 585	0.254	0.2667
2017-2018	15 533 454	25 035 434	0.62	0.651
2018-2019	17 550 555	44 530 656	0.394	0.4137
2019-2020	18 890 454	60 545 580	0.312	0.3276

DATA ANALYSES

Calculation of Z-score

Years	X_1	X_2	X_3	X_4	Z-score	Discrimination
2015-2016	0.20615	0.43	0.986	0.3423	1.96445	Grey Zone
2016-2017	0.35245	0.551	0.1986	0.2667	1.36875	Grey Zone
2017-2018	0.56525	0.7498	0.31776	0.651	2.28381	Grey Zone
2018-2019	0.665	0.652	0.25156	0.4137	1.98226	Grey Zone
2019-2020	0.7182	0.535	0.086	0.3276	1.6668	Grey Zone

The Z-score of the company indicate a "Grey Zone" form the year 2015-2016 to 2019-2020, it means that there is a possibility for the company to get into bankruptcy position.

CONCLUSIONS

- The investors can use this model to determine whether to buy or sell a particular stock /to invest, if they are concerned about the financial strength of the organization.
- The Altman Z-score can be used to evaluate the company credit risk.

- The use of Altman's Credit Scoring Model allows the size of "Z" to quantitatively express the level of risk of non-repayment of loans by large trading companies, but does not always help to take practical measures for all customers.
- It is not possible to accept that from the economic-financial point of view the weight of the impact of each indicator on the size of the value "Z", to be equal for all borrowing clients and for all data periods from view of the degree of insolvency of the loan amount and their interest.
- In large commercial and industrial companies there are a large number of factors that can not be quantified.
- Finally, it should not be forgotten that accounting data for large commercial and industrial companies may not be available in very short daily, weekly or monthly periods.

Thank you!

Session 4 chair: Prof. Dr. Vivian Carstensen

14.40-15.20

„Business Valuation Methods in Europe - Similarities and Differences“,

MBA Thomas Walther, WP Walther, Germany

14.40-15.00

BUSINESS VALUATION METHODS IN EUROPE - SIMILARITIES AND DIFFERENCES

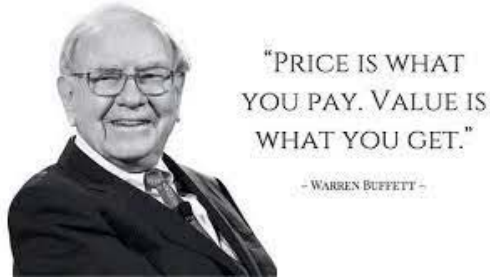
MBA THOMAS WALTHER
CHARTERED ACCOUNTANT / TAX CONSULTANT /
LECTURER BIELEFELD UNIVERSITY OF APPLIED SCIENCE

BICAB 2022

CONTENT

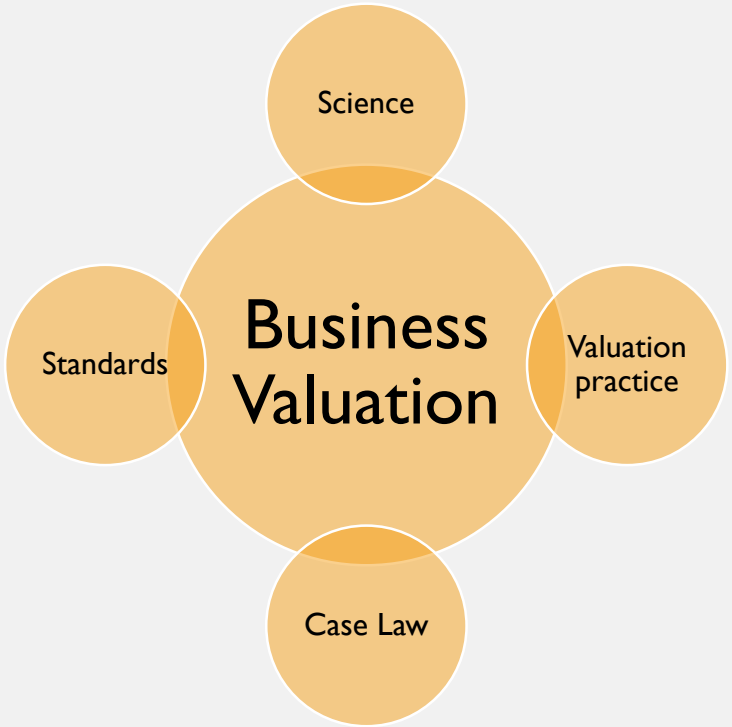
INTRODUCTION

Is there the „objective“ value ?



Business valuations: Data driven decisions

INTRODUCTION



INTRODUCTION
NEED FOR STANDARDISATION?

Dec 2019:
EU-Directive from 2019 regarding cross border conversions, mergers and divisions
-> to be transformed in national law until 2023

→ German draft transformation act: published April 23rd 2022

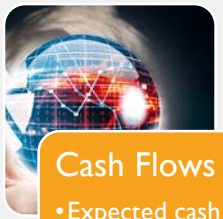
BUSINESS VALUATION IN GERMANY

II. BUSINESS VALUATION METHODS IN GERMANY

Individual Valuation Methods	Income Approach	Market Methods	Mixed methods
• book value • Substance Value • Liquidation value	• Discounted Cash-Flow (DCF)	• Multiples • Stock Prices	• Excess profit method • Combined Methods

IDW
INSTITUT DER WIRTSCHAFTSPRÜFER

Dominant
- DCF
- IDW S 1



Cash Flows
- Expected cash flows
- subjective

Discount
- Cost of capital
- subjective

BUSINESS VALUATION METHODS IN GERMANY

Guidlines, how to use DCF in individual situations:

• § 199 • BewG	• IDW RS HFA 10 / 40	• IDW S 13	• IDW BStBK 2014
tax 	accounting 	divorce 	SME 

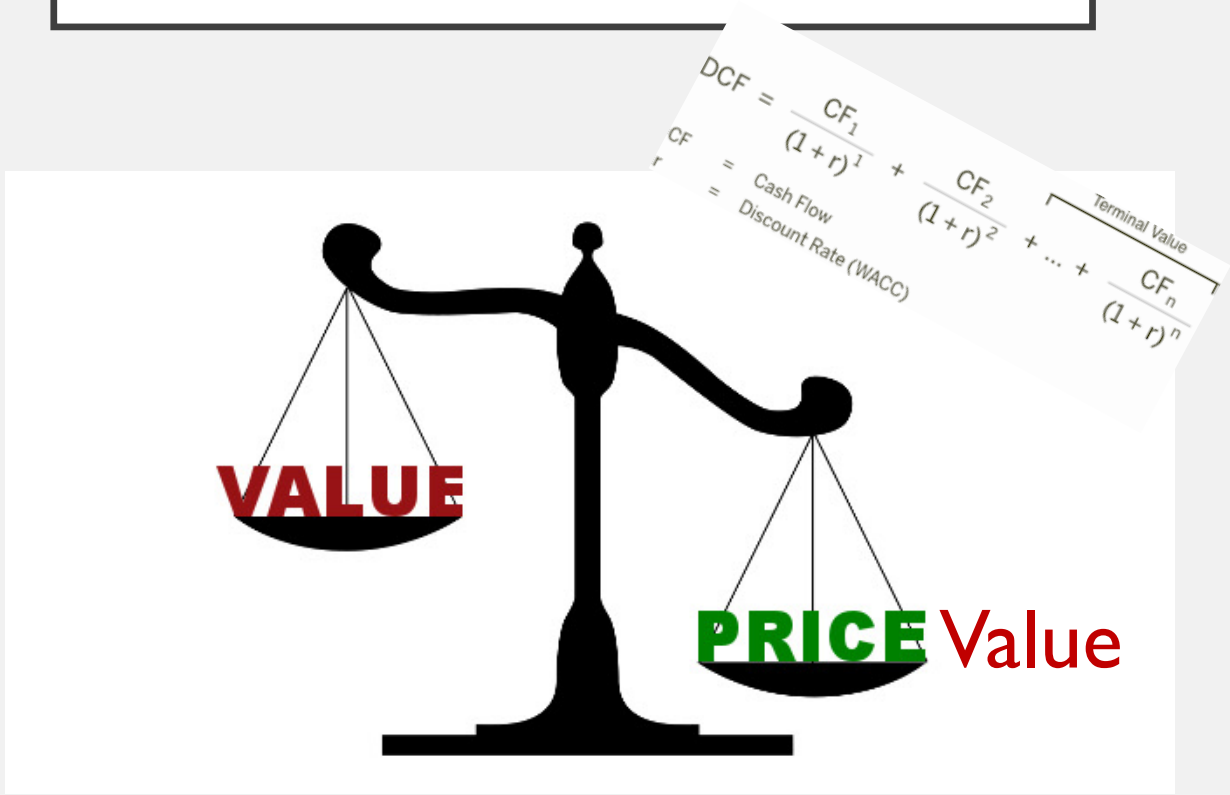
FUNCTIONAL VALUE THEORY

Valuation of Automotive Bielefeld GmbH:

Purpose:	Expert function: Neutral expert	consultant
Tax	2.750	2.100
Accounting	2.213	2.517
Divorce	1.602	1.250
SME	…	…

DCF-Values are not „objective“, the value does not exist

BUSINESS VALUATION IN GERMANY



IVS / BUSINESS VALUATION METHODS EUROPE

INTERNATIONAL VALUATION STANDARDS COUNCIL

IVS 105 „Valuation Approaches and Methods“

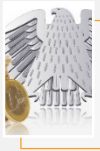
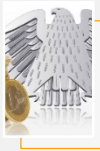
- Market Approach
- Income Approach
- Cost Approach

→ Market approach favourable, but all approaches accepted, possible (!!)

VALUATION METHODS ACCROSS EUROPE

Adopt / Orientation to IVS	Own Standards	„Orientation“ to Germany
UK	Italy (Income Approach favourable)	Austria
Scandinavia	France (freedom of methods)	Czech Republic
Bulgaria	Spain (pluralistic approach)	(Poland)

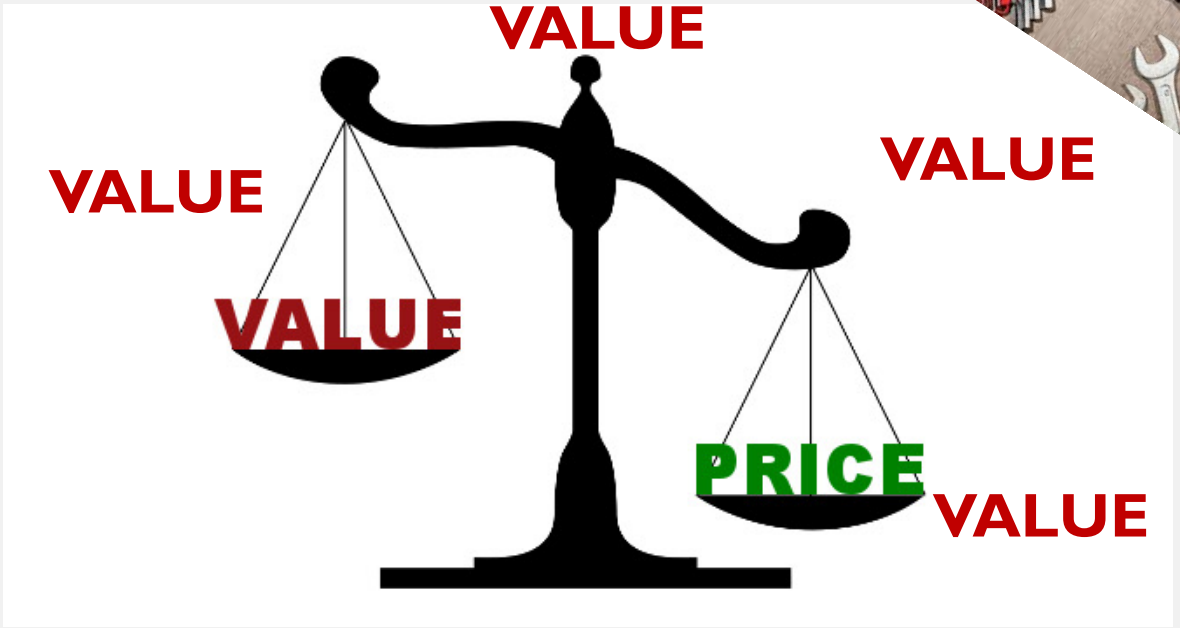
BUSINESS VALAUTION IN EUROPE / UNTER IVS

Expert function: / Purpose / method:	 Neutral expert	 consultant
 Tax / income approach	2.750	2.100
 Tax / market approach	2.350	2.915
 Tax / cost approach	1.200	1.380
 Accounting / income approach	2.213	2.517
 Accounting / market approach	2.514	2.415

BUSINESS VALAUTION IN EUROPE / UNTER IVS

Expert function: / Purpose / method:	 Neutral expert	 consultant
 Accounting / cost approach	1.351	1.452
 Divorce / income approach	1.602	1.270
 Divorce / market approach	…	…
 Divorce / cost approach	…	…
…..		…

VALUATION METHODS ACCROSS EUROPE / IVS



Conclusions

Plurality of methods - DCF favourable?

IVS and European harmonisation of valuation methods in their infancy

Further research required (Independance of valuation expert / harmonisation of tax / company law …)

Zoom!

„A Cross-Sector Comparative Analysis of a Multi-Dimensional Framework Of Value Creation Through Big Data“,

Margareta Teodorescu, Hochschule Koblenz, Germany,
Ela Sibel Bayrak Meydanoglu, Turkish-German University, Turkey

15.00-15.20

A Cross-Sector Comparative Analysis of a Multi-Dimensional Framework of Value Creation Through Big Data

Margareta Teodorescu
Koblenz University of Applied Sciences

Ela Sibel Bayrak Meydanoğlu
Turkish-German University, Istanbul

Bielefeld International Conference on
Applied Business

6th Mai 2022 | Bielefeld University of Applied Sciences

Overview

Big Data

“The world has become excited about

big data and advanced analytics

not just because the data are big but also

because the *potential* for impact is big.“

McKinsey Quarterly (2015)

References (i.a): *Getting big impact from big data*, McKinsey Quarterly (2015), https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/getting-big-impact-from-big-data (retrieved April 22), *The age of analytics: competing in a data-driven world*, McKinsey Institute (2016)

1. Introduction

Big Data

- **Big Data Analytics**
  - Has emerged as an increasingly important area of study for
    - both the academic *and*
    - the business community
  - Reflects the magnitude and significance of data-related problems that businesses and industries are challenged by (Arora & Malik, 2015)
- **Big Data Paradigm**
  - Commonly defined as
    - the generation and delivery of large amounts of data *(Volume)*
    - with a possible unreliability and uncertainty *(Variety)*
    - derived from structured or unstructured sources at high speed *(Velocity)* (Schroeck et al. 2012; Wamba et al., 2015; Elia et al. 2020)

1. Introduction

5V's Model (Dubey et al., 2017; Elia et al., 2020)

1	**Volume**	▪ refers to the initial size and amount of data that is stored, generated, and analyzed ▪ one of the fundamental terms related to big data
2	**Velocity**	▪ refers to the speed by which data is being generated and transmitted ▪ big data provides immediate information, enabling data analysis in real time
3	**Variety**	▪ refers to the diversity of data types (e. g. textual messages, social media conversations, images, sensor data, etc) managed by big data ▪ data collected may be unstructured, semi-structured or structured in nature
4	**Veracity**	▪ refers to the quality and accuracy of data ▪ big data makes it possible to manage the problem of unreliability and uncertainty inherent in some data sources
5	**Value**	▪ refers to the value that big data can provide by discovering hidden information to use intelligently for strategic and operational purposes ▪ expresses the insights and various benefits that an organization can gain from implementing big data solutions

1. Introduction

Research Gap

- **Big Data**
  - Only by virtue of its nature, big data does not automatically generate value for customers
  - It is what companies do that, ultimately, leads to value creation through big data
    - internally within the organization
    - externally across the data network
  - Quick spread of big data solutions across various economic sectors
  - Increasing interest towards value creation through the adoption and implementation of big data technologies
- **Purpose of the study**
  - The major purpose of this theoretical study is to investigate the element “Value”
    - particular focus lies on analyzing the potential of value creation embedded in the big data paradigm

Overview

2. Methods

Big Data

- **Framework for value creation**
  - Value creation via big data is a broad topic
  - Companies can define for themselves different values derived from big data
    - better-informed business decisions
    - enhanced strategic marketing
    - improved company performance
  - A reference framework for value creation, which enables a general taxonomy of business value derived from big data, is an important guide for companies
- **Relevant literature**
  - Several, different attempts to define a framework for value creation: Gregor et al., 2006; Wamba et al. 2015; Elia et al., 2020
  - In this study, the framework developed by (Elia et al. 2020) is adopted

2. Methods

Framework for Value Creation with five value dimensions (Elia et al., 2020)

1 Informational value

- By generating new information, big data can support the decision-making process in terms of both quality and speed
- Benefits
  - Faster and easier access to information
  - Information in more usable formats
  - Decision making support
  - Knowledge discovery through data analysis

2 Transactional value

- Big data has the potential to improve both operational and supporting processes, to change the organizational models
- Benefits
  - Cost reduction, cost efficiency and savings in operations
  - Revenue growth
  - More return on financial assets
  - Productivity gain through enhanced and improved efficiency

2. Methods

Framework for Value Creation with five value dimensions (Elia et al., 2020)

3 Transformational value

- Big data can generate innovation in products, services, customer segments, markets, or business models that can transform the operations
- Benefits
  - Reinforcement of organizational capabilities and benefits
  - Innovation in business models
  - Efficiency in organizational structure and processes
  - Enhancing operations
  - Sustaining and improving organization performance

4 Strategic value

- Through real-time data processing provided by big data, companies are able to adapt and respond strategically and quickly to market changes
- Benefits
  - New and sustainable competitive advantage and market positioning
  - Market responsiveness and rapid response to change
  - Enhancing customer relationships and customer loyalty
  - Increased value proposition
  - Alignment between IT and business strategies

Framework for Value Creation with five value dimensions (Elia et al., 2020)

5 **Infrastructural value**

- By enabling the development of new applications, tools and architectures, big data can enhance the quality and value of the existing infrastructure
- Benefits
  - Enhancing performance and scalability of data models
  - Reducing systems redundancy
  - Optimizing IT management costs
  - Simplifying IT management process
  - Facing future technological challenges

2. Methods

Methodology

- **Case study method**
  - Apply the framework proposed by (Elia et al., 2020) for analyzing possible differences and similarities between the practices of implementing big data technologies in two sectors
  - Theory-building approach based on qualitative analysis, totally ten cases
    - multiple case approach focusing on an analysis at two levels within a single study
    - firstly within-case analysis (company level), followed by cross-case comparison (industry level) of possible differences and similarities between the two sectors

- **Financial services & automotive sectors**
  - *Economically* → both sectors are highly representative and strategic for the German economy, being among the largest ones and having systemic relevance
  - *Technologically* → both sectors are well-known for their relatively quick adoption and implementation of new technologies

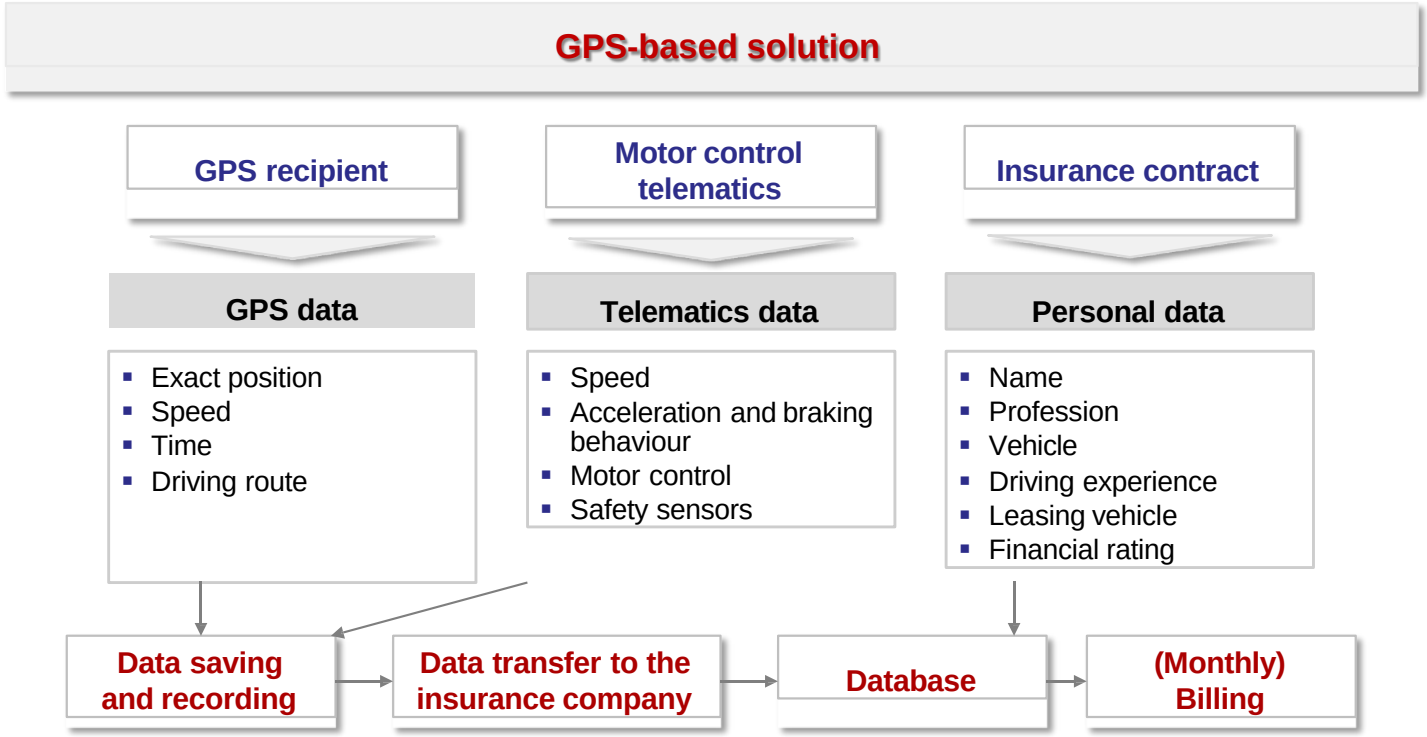
Overview

3. Cross-Sector Comparative Analysis

Value Dimension: Strategic Value

- **A) Financial services sector** → *Insurance companies (IT service provider: IBM in collaboration with Octo Telematics, among others)* (Bitkom, 2015a; BaFin, 2018)
  - Pay-as-you-drive (PAYD) insurance
    - generates an individual premium that complies with the risk profile of the insured, using accurate evaluation of
      a) driving behavior and
      b) driving situation characteristics
    - creates incentives to reduce the risk exposure of the insurance company
    - has the potential to bring about
      a) lower insurance premiums for the insured
      b) lower claims and operating costs for the insurer

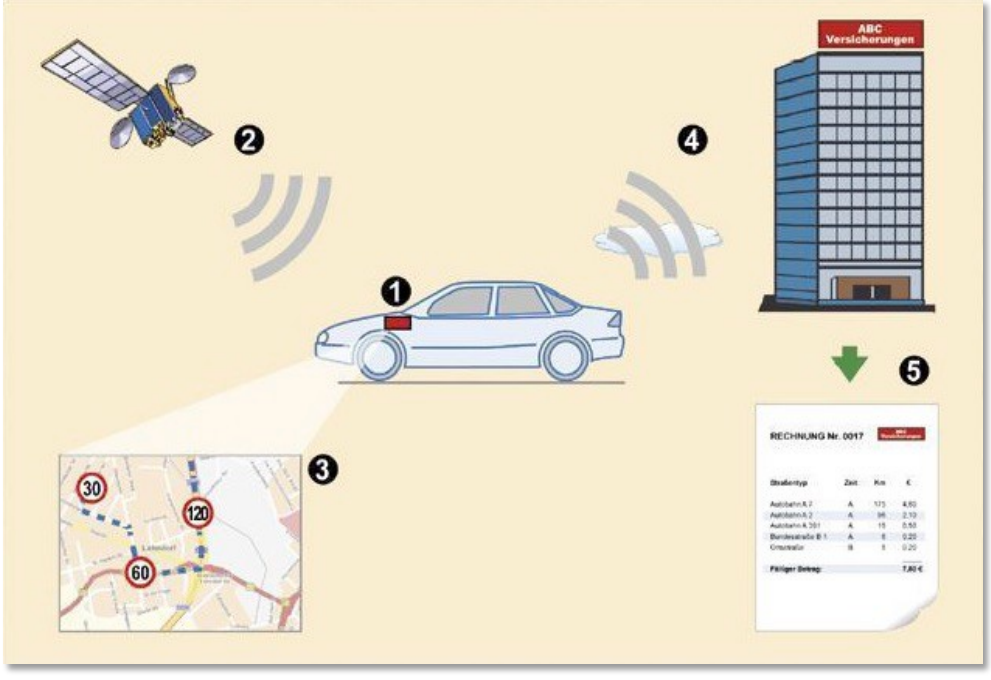
3. Cross-Sector Comparative Analysis



References (i.a.): Ippisch, T., Thiesse, F., *Das Pay-as-you-drive (PAYD)-Konzept in der Versicherungswirtschaft*, (2007), p. 9

3. Cross-Sector Comparative Analysis

Pay-as-you-drive



❶ GPS module/ telematics system (as on-board-unit or App)

❷ Satellites

❸ Map Matching

❹ Insurance company or IT service provider

❺ Individual risk premium or invoice

References (i.a.): Lochmaier, L., *Pay-as-you-drive: Auto-Versicherer planen User-Tracking via GPS*, in Bohman, R. (Hrsg.), *monitor – Das Magazin für Informationstechnologie* (2007), p. 41

Value Dimension: Strategic Value

- **B) Automotive sector** → *Mercedes AMG (IT service provider: SAP Deutschland SE & Co. KG)* (Bitkom, 2015a; Bitkom & GTAI, 2016)
  - One of the most important, complex and costly part of the vehicle development process
    - testing the new vehicle components
    - testing their development
  - Test and quality management means that time is critical
    - rapid test results mean lower costs as well as fast product launches
    - potential to bring the company one step ahead of the competition on the market
  - Use of SAP HANA in the test bench for engines
    - processing and visualization of thousands of data points in seconds
    - by comparing the data from the test bench with the existing records in real time, the employees can detect immediately even the smallest deviations

3. Cross-Sector Comparative Analysis

Value Dimension: Strategic Value

- **B) Automotive sector** → *Mercedes AMG (IT service provider: SAP Deutschland SE & Co. KG)*
  - Predictive analytics and real-time processing during vehicle engine testing may
    - save substantial time
    - avoid considerable costs
  - Rapid processing of data that makes the organization
    - more market responsive
    - more ready and quicker to change
    - more oriented to learn and to improve its products
    - result → consolidation of company's sustainable competitive advantage

3. Cross-Sector Comparative Analysis

Conclusion

1 Informational value

- **FS:** Big data helps combating fraud and money laundering, which attracts sophisticated criminal groups that are often very effective in evading detection of their fraud
- **AM:** Big data and data analysis allows companies to generate new information and discover hidden knowledge, and to optimize processes in the areas of product development, repair, and maintenance

2 Transactional value

- **FS:** Big data can help reinsurers identify and collect all relevant news and make it available to claims managers
- **AM:** Big data can help increase the process efficiency by reducing calibration steps while maintaining the quality of results and replacing previous methods of calibration

3 Transformational value

- **FS:** Big data allows for real-time analysis of the existing and potential new customers as well as targeting sales efforts more effectively
- **AM:** Big data solution results in a standardized analysis and reporting in the areas of after-sales in order to facilitate a higher efficiency, create synergies, and enhance operations

3. Cross-Sector Comparative Analysis

Conclusion

4 Strategic value

- **FS:** Use of the telematics technology and the near real-time data processing provided by big data solutions allow companies to respond more quickly to changes in the market and to better forecast customer needs
- **AM:** Major benefit brought by the big data solution consists, primarily, in the time saved during the engines testing and in the analysis of the data, which accelerates and improves the development

5 Infrastructural value

- **FS:** The problem of host-based IT being replaced by modern IT in terms of both hardware and software can be solved with the help of big data technologies
- **AM:** Smart data solutions can be implemented in smart ecosystems in order to manage and analyze the very vast amount of data along the whole supply chain

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Thank you for your attention!

Moderated discussion with the audience using a best-case example “Combining machine learning and knowledge-based approaches in B2B product consulting - a use case discussion”,

Marcel Rösner, CEO Archimedes New Ventures GmbH, Dominik Witt, COO Phania GmbH

15.40-16.10

Combining machine learning and knowledge-based approaches in B2B product consulting

A use case discussion

Marcel Rösner & Dominik Witt

PHAINA

Where we come from

BÖLLHOFF

PHAINA

Finding and defining the problem of digital product advice

Developing the software solution and defining the business model

Scaling the idea as an independent startup

Do you need to explain products to sell them?

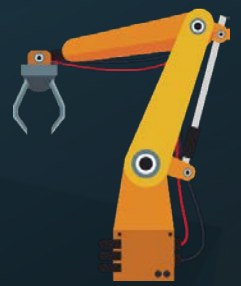
Good advice is expensive, especially from employees

Each employee advises products differently

Do you have consultants in every language?

PHAINA

Do you also have more than 10 questions to advise your products?



PHAINA

Our SaaS solution automates sales

Using artificial intelligence, we develop completely digital purchase advisors in just a few days

PHAINA

Digital advise leads to...

No more false advice

As much advice as you want

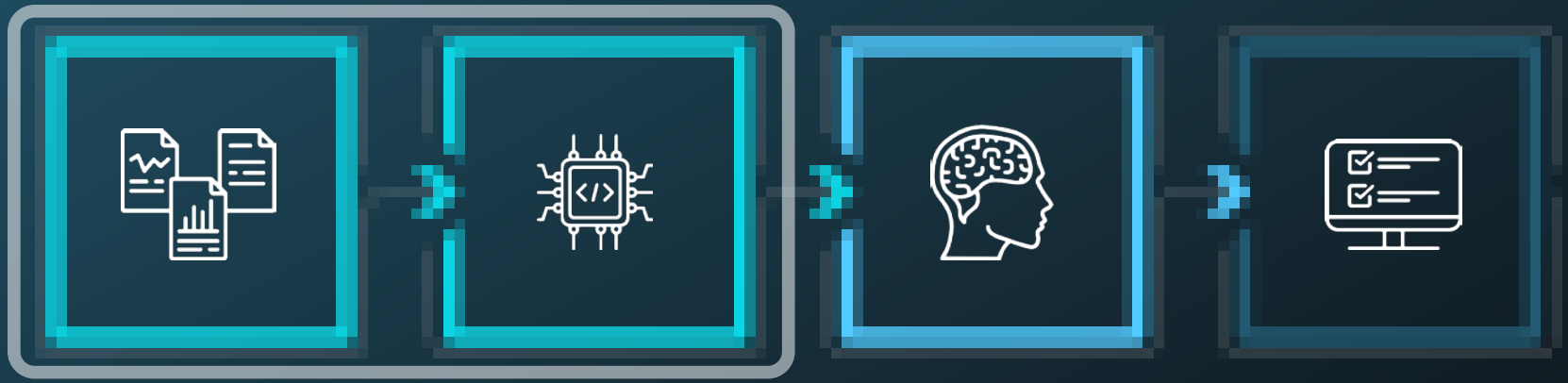
Now you can advise even the smallest customers.

Consult in any language

PHAINA

4 steps to your digital sales

First ready solution!



Upload Products

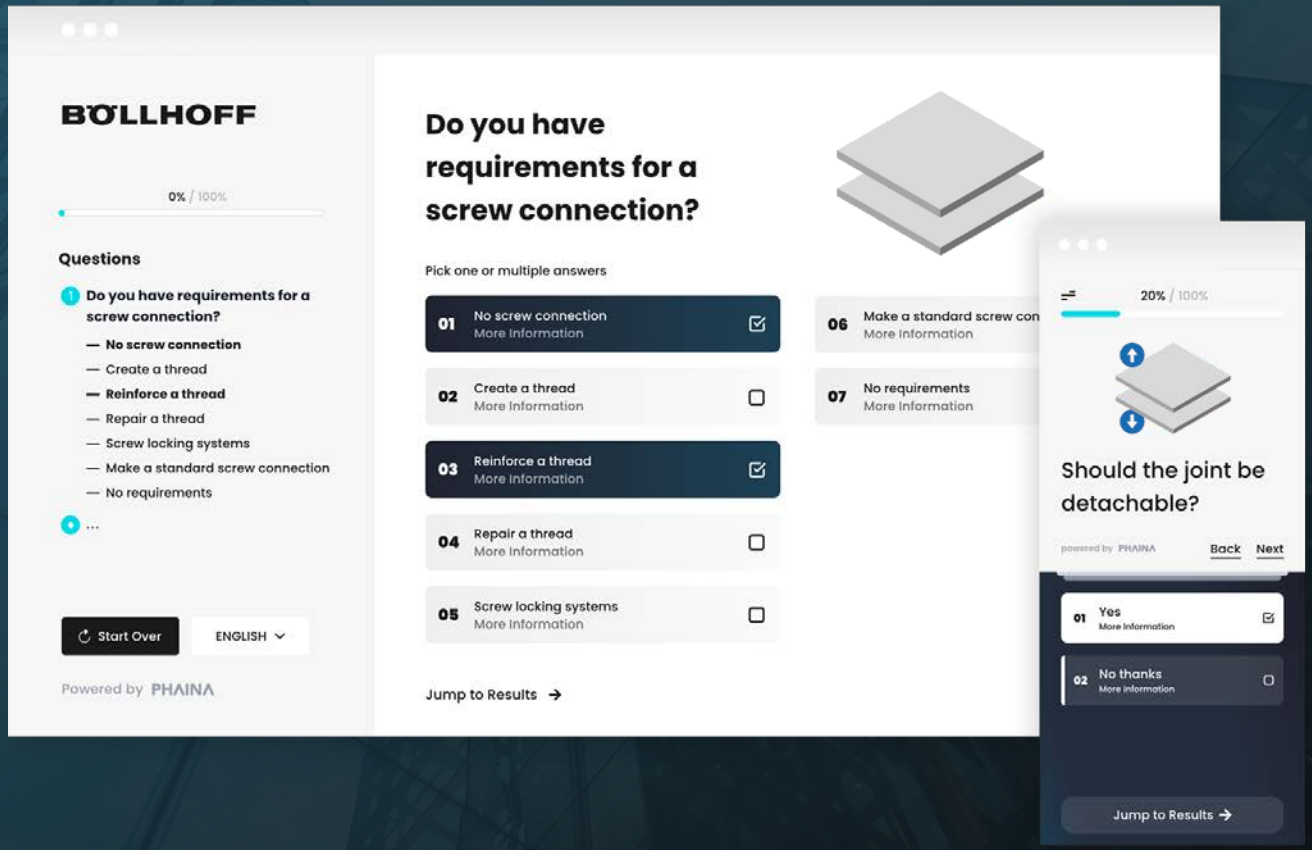
Generate first interview automatically

Optimize with expert knowledge

Generate best interview

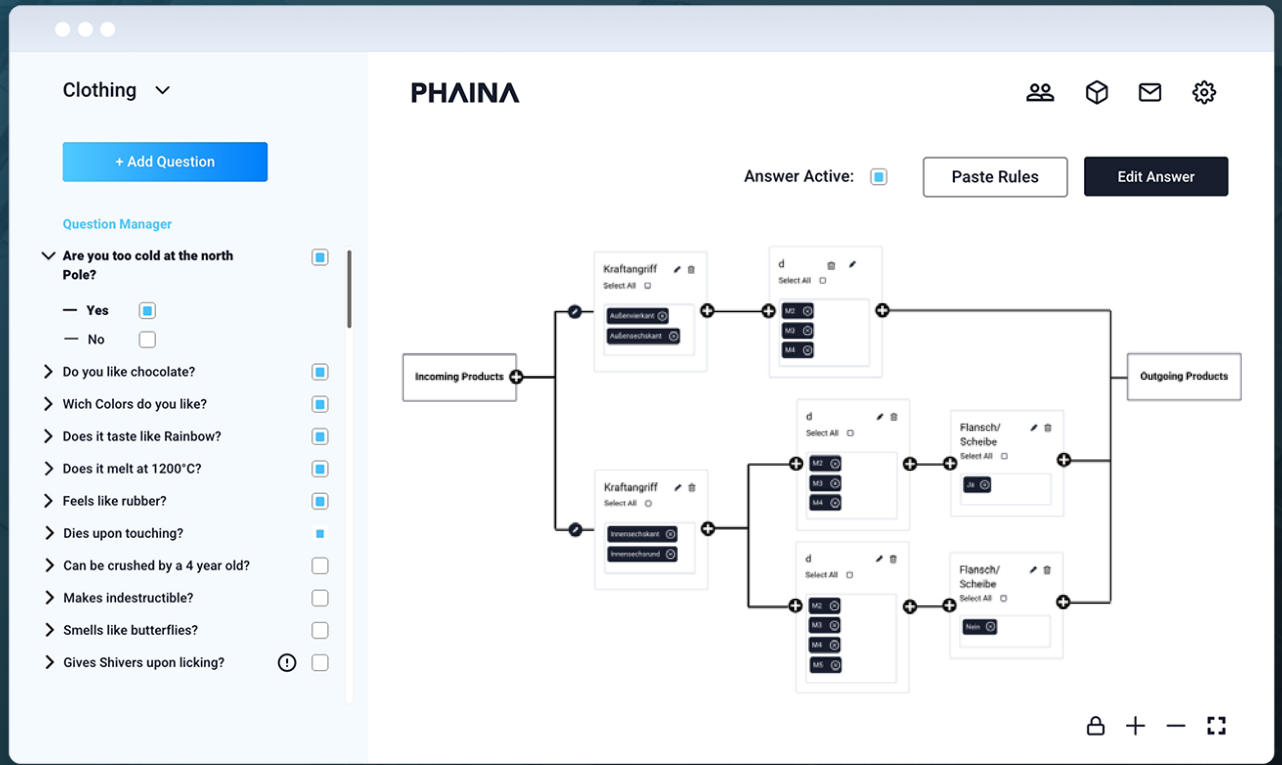
PHAINA

Use case Böllhoff group - Interview frontend



PHAINA

Use case Böllhoff group - expert knowledge



PHAINA

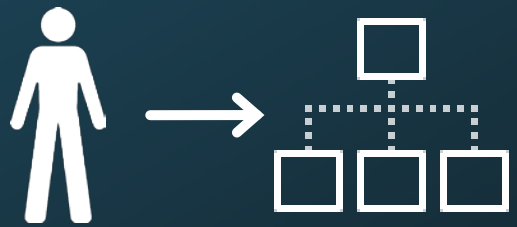
Where is the machine learning?

- Step 1
  - Creating and improving the interview
- Step 2
  - Data driven product management and development

We build it automatically

Other solutions

Decision tree must be created manually

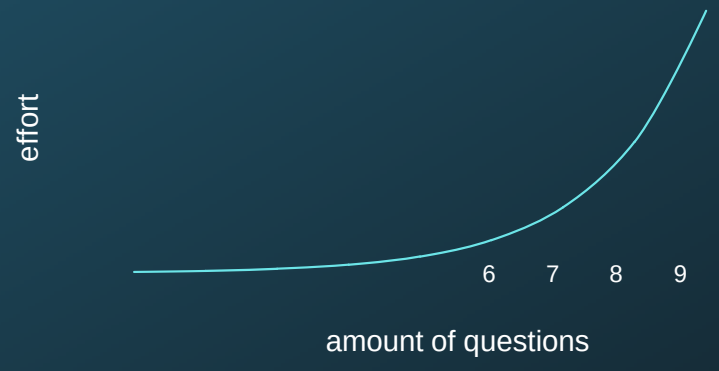


PHAINA

Decision tree is created by AI

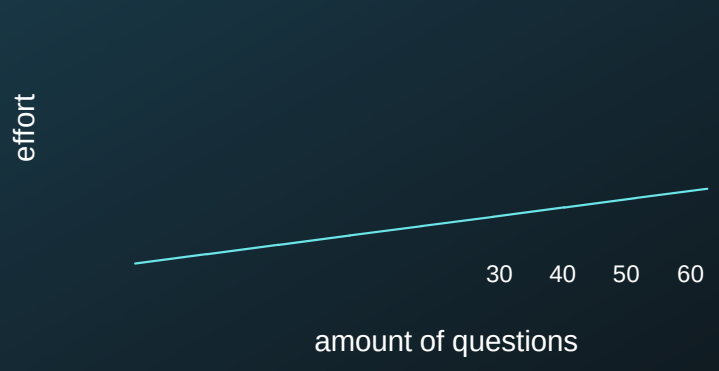
We minimize the manual effort

Other solutions



7 questions produce 2.000 manual paths, 15 questions produce 14.3 million...

PHAINA



7 questions produce 7 manual paths, 15 questions produce 15

Data driven improvement of the interview

Rank	Question	Asked Percentage	Asked amount	Time
1	Do you have requirements for a screw connection?	31%	410	21s
2	Do you like chocolate?	29%	410	21s
3	Does it taste like Rainnbow?	26%	410	21s
4	Does it have a connection?	26%	410	21s
5	Do you like red?	26%	410	21s
6	Do you have requirements for a screw connection?	26%	410	21s
7	Does it taste like Rainnbow?	26%	410	21s

PHAINA

Data driven product management /development

Let the interview data tell you

What are the frequent requirements

What products are recommended how often

What demands cannot be fulfilled

PHAINA

Contact

PHAINA

Thank you for participating!!!

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Applied Sciences