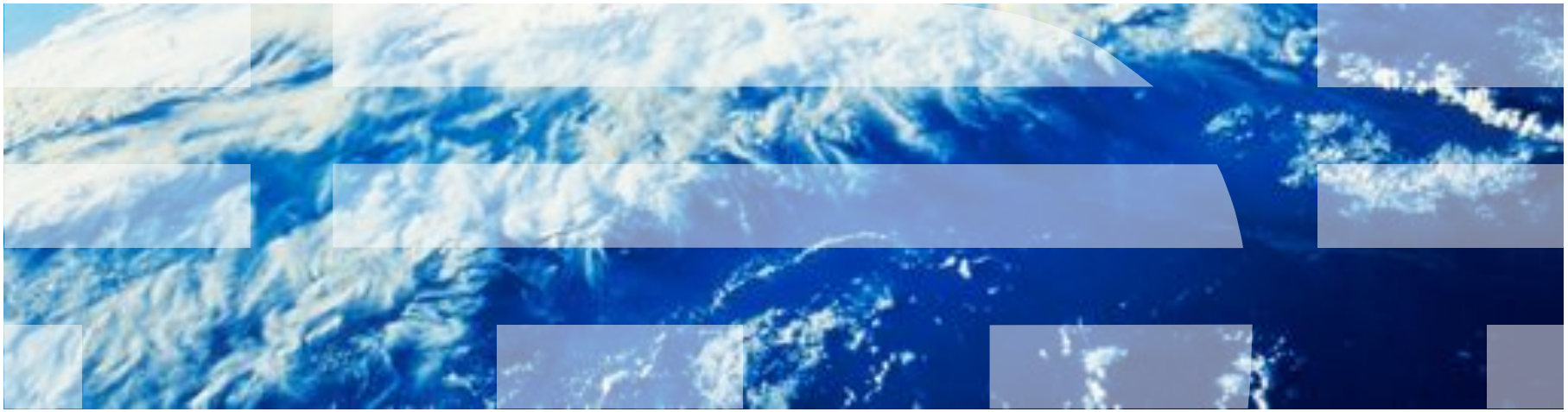
Dirk Wittkopp
Geschäftsführer IBM Deutschland Forschung & Entwicklung GmbH

Und das ist erst der Anfang …

40 Jahre Informatik an der TU BS



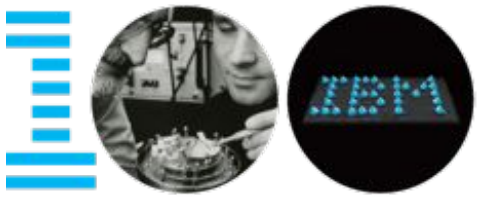
IBM Research & Development

IBM Global R&D Team

- About 6 Billion US $ investment in R&D (2009)
- More than 60.000 Developers, 3.000 Researchers
- More than 80 Labs
- More than 100 acquisitions since the year 2000
- Developing the largest IT product portfolio in the world
- More than 6000 US Patents in 2011 (#1 since 19 years)

IBM Germany R&D GmbH

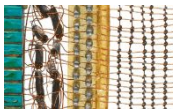
- Largest IBM Development Lab in Europe
- Founded 1953
- 1800 Employees
- HQ in Boeblingen
- Systems, Software, and Services Development



Six Basic Pillars of Information Technology

Sensing

The mechanisms for getting information from people and events into computers.



Memory

The way computers store and access information.

Processing

The core speed and capabilities of computers.

Logic

The software and languages that let computers do work.

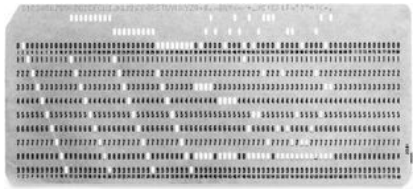
Connecting

The ways computers talk to people and machines.

Architecture

The changing nature of computing and of the way we think about information.

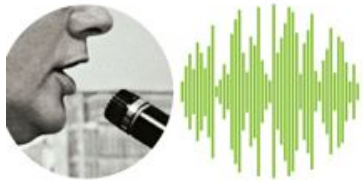
Sensing



IBM 1050

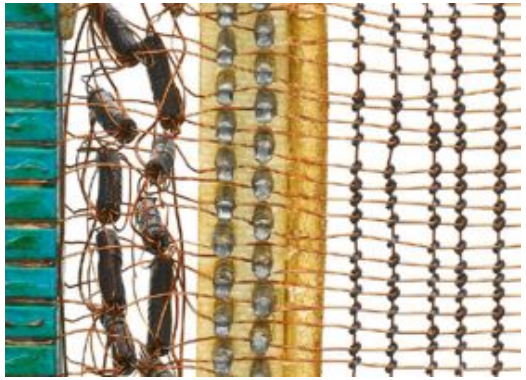
Multi-Modal Sensing and Interaction: Voice, Gestures, Sensors, ...

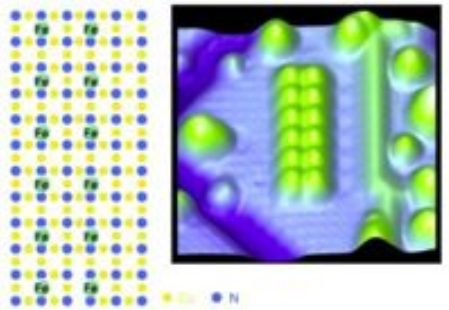
Prototype Mouse by Doug Engelbardt, 1970



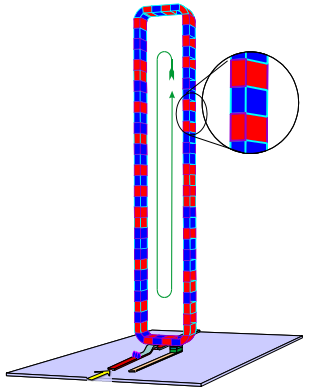
From a few data records and manual input to virtually unlimited information

Memory





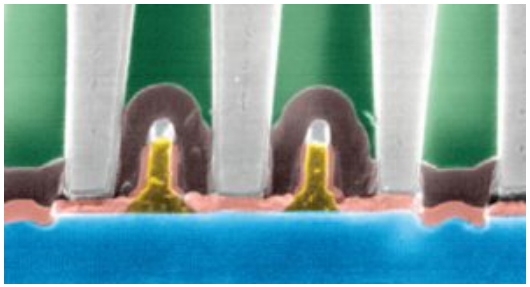
Atomic Scale Magnetic Memory

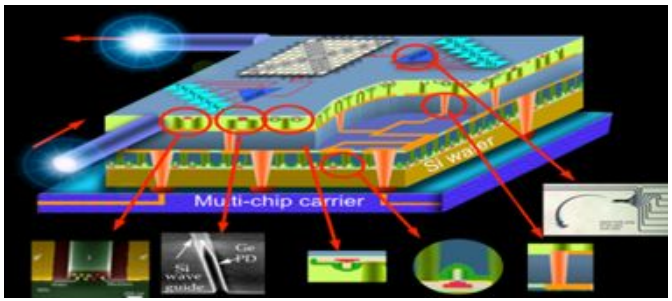


Racetrack Memory

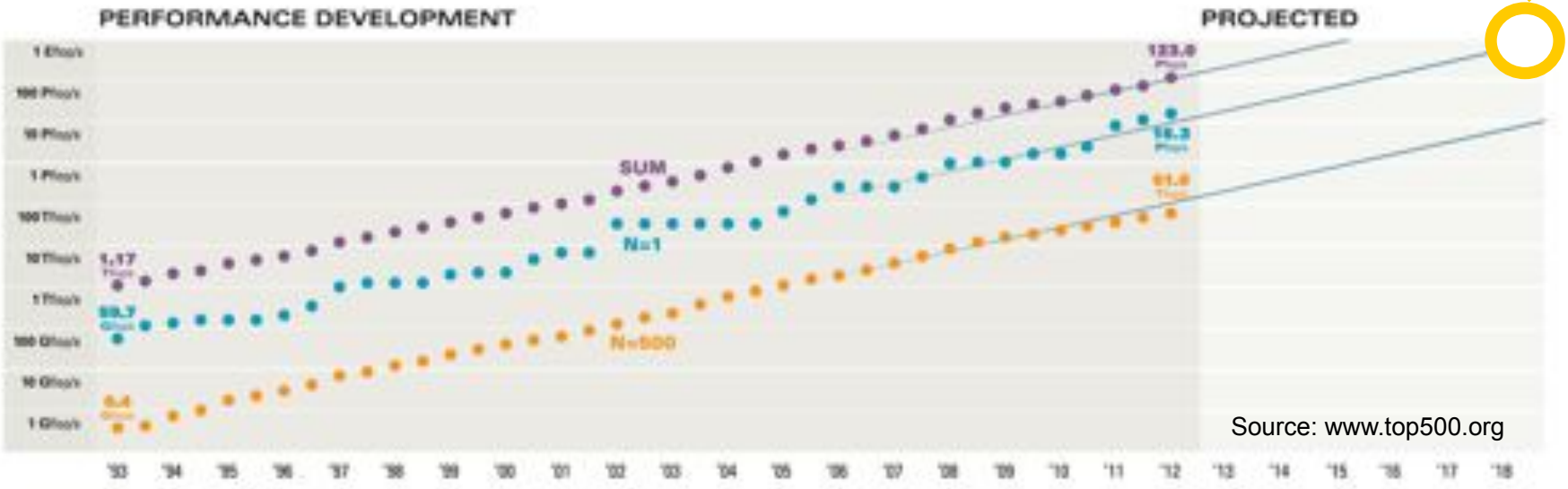
Exponential growth of capacity since decades

Processing



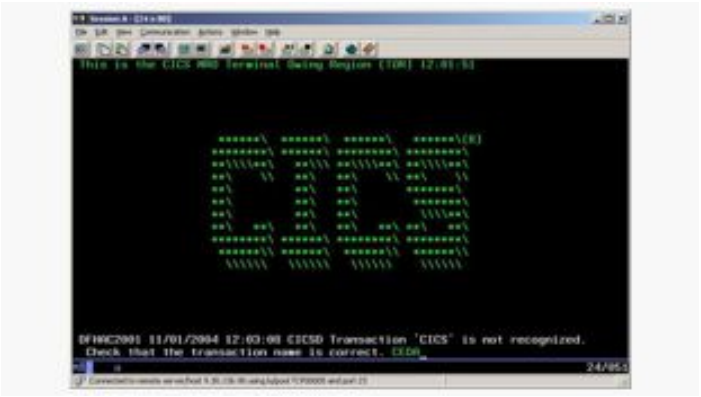


1 Exaflop in 2020



Doubling peak performance every year -> Factor of 1000x in 10 years

Logic



- Application Platforms
- Business Process Management
- Collaboration
- Data & Information Management
- Analytics
- Connectivity & Integration
- Mobile Management
- Development Tools
- Virtualization
- System Management
- Security & Privacy
- ...

Complex integrated Software Solutions

Advanced Analytics

Social Software

Cloud

Increasingly powerful set of software platforms and components

Connecting

Systems

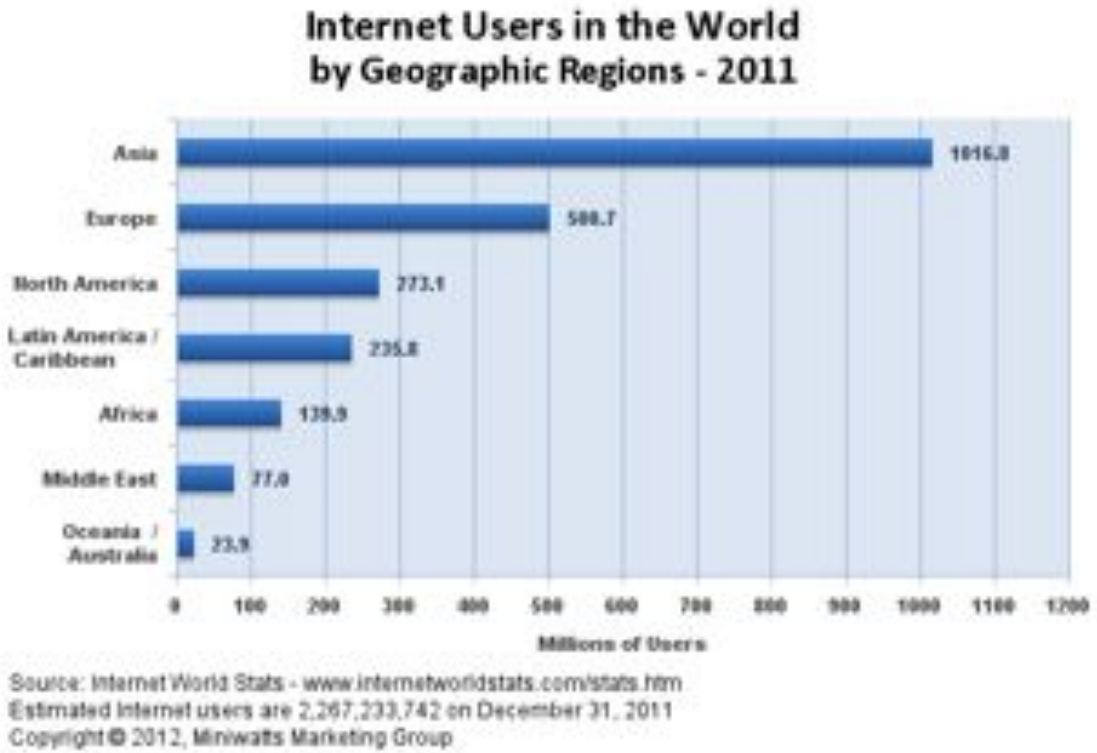
Data Rate
x 1.000

ISDN → **VDSL**

Data Rate
x 30.000

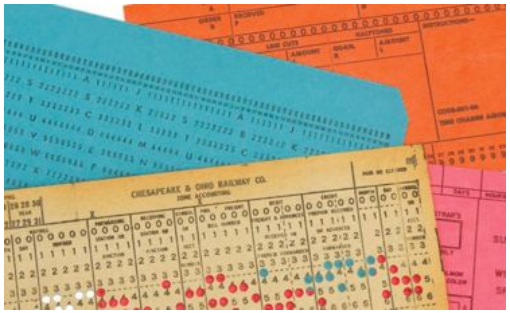
GSM → LTE

People



Everything can be connected. Everybody can be online. Anytime.

Architecture – How we think about Information



Smarter Buildings

Smarter Healthcare

Smarter Public Safety

Smarter Energy

Smarter Cities

Smarter Mobility

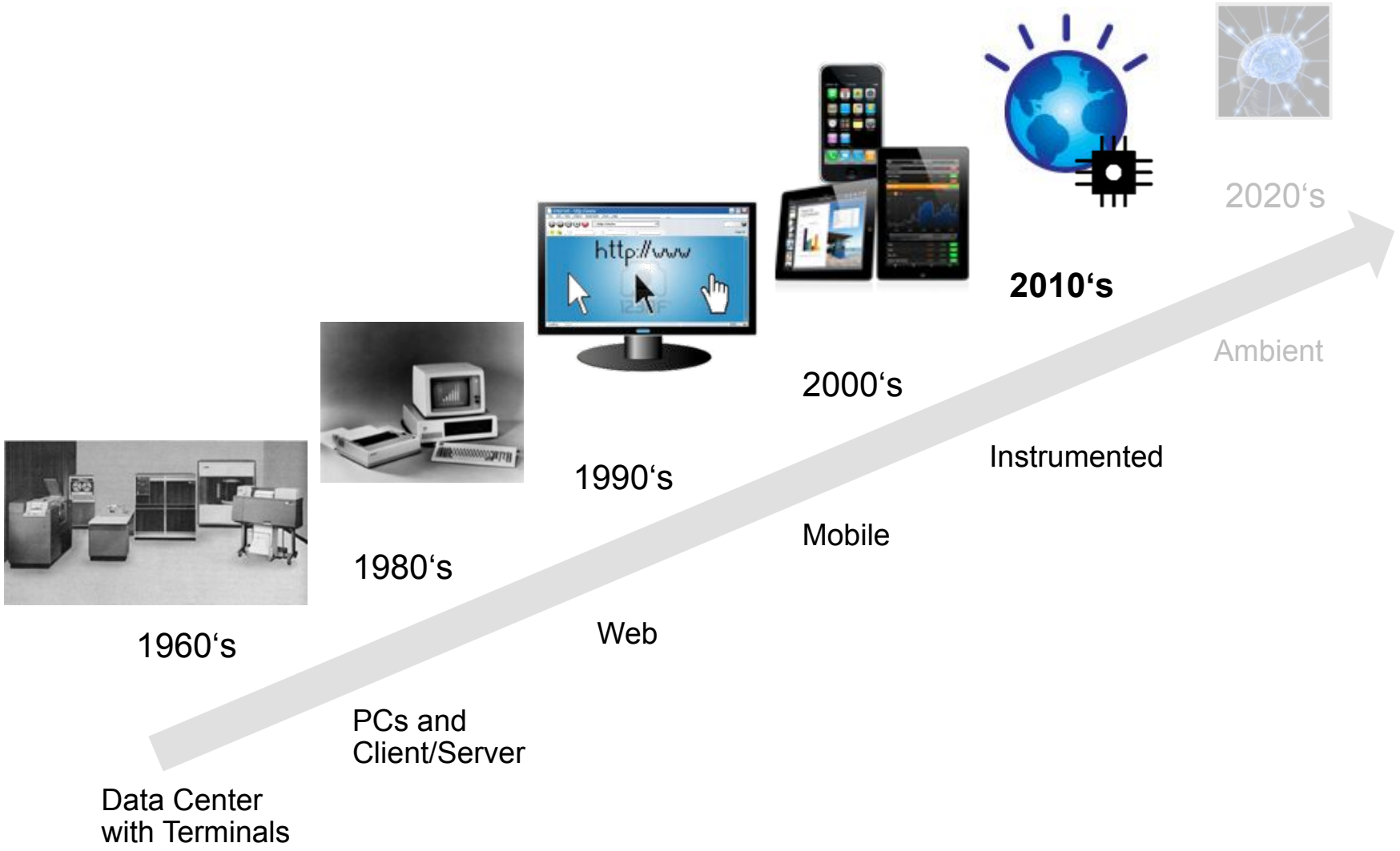
Smarter Water Management

Smarter Food

Smarter Retail

The Smarter Planet is enabled by IT.

The proliferation of Information Technology



We are entering a new era of Information Technology

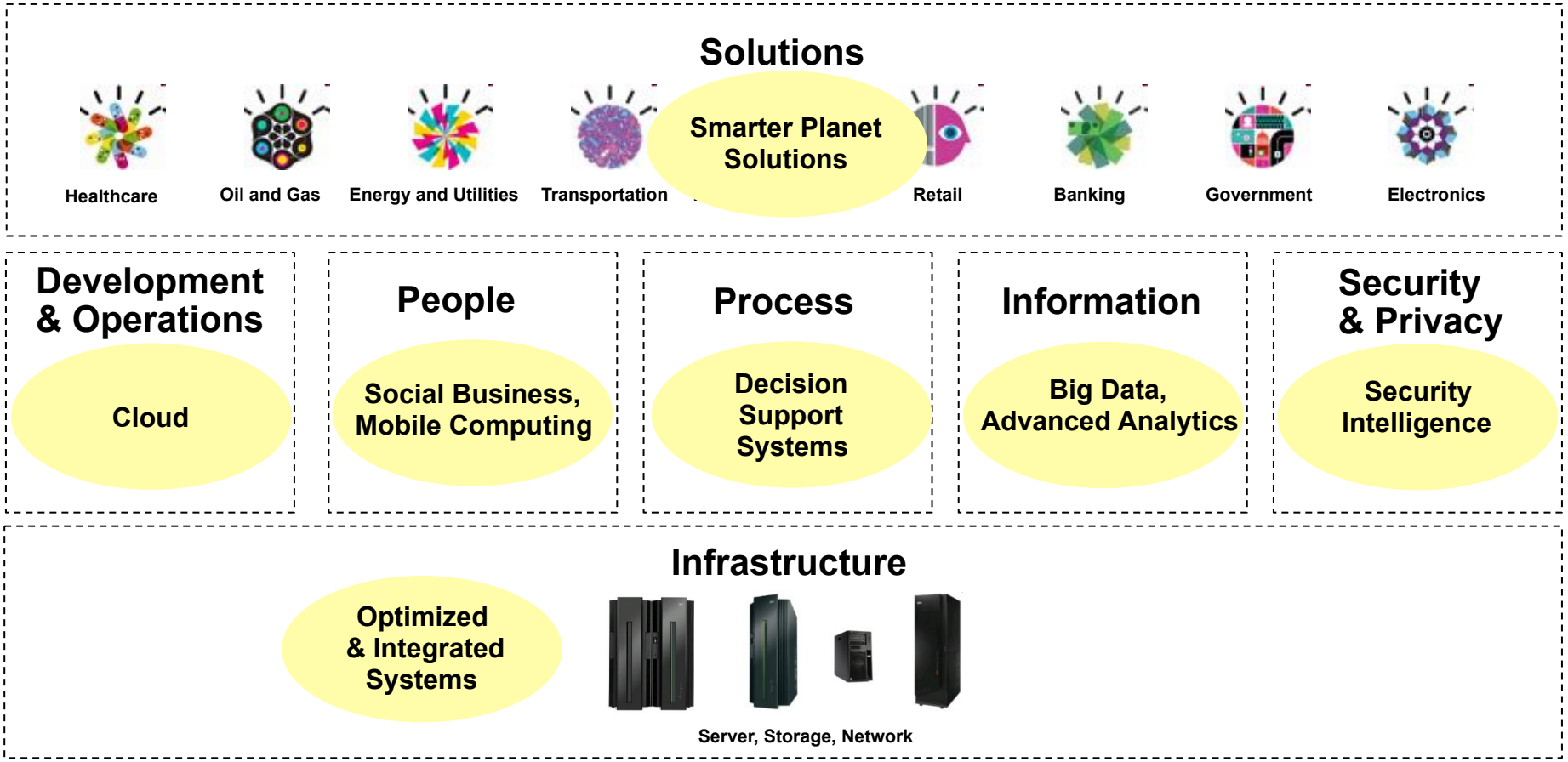
Traditional Process-centric Computing Systems

- Business process automation
- Deterministic applications
- Structured data (Terabytes)
- Search-oriented
- Machine language
- Bottom-line cost improvement
- Long business cycle

Emerging Information- and People-centric Learning Systems

- Real-time, pattern-based action
- Probabilistic applications
- Structured & unstructured data (Zettabytes)
- Discovery-oriented
- Natural language
- Top-line revenue growth
- Reactive for shorter product cycles

Simplified „IT Landscape“



Social Software

Social Networks + **Mobility** + **Social Content & Analytics**

Social networking, amplified by mobile devices, has fundamentally changed how we communicate

The Social Web

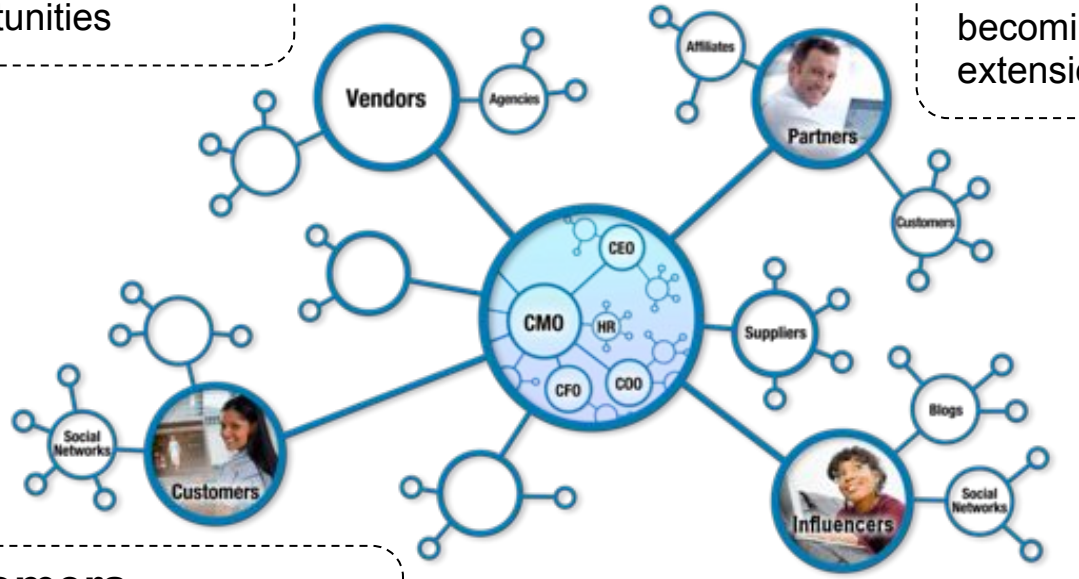
„The digital world is now powered by social operating systems.“

Ben Elowitz, CEO Wetpaint

Social Networking for the Enterprise

Employees
self-forming teams around fast moving opportunities

Partners
becoming on-demand extensions of the enterprise



Customers
leading the conversations that define brands

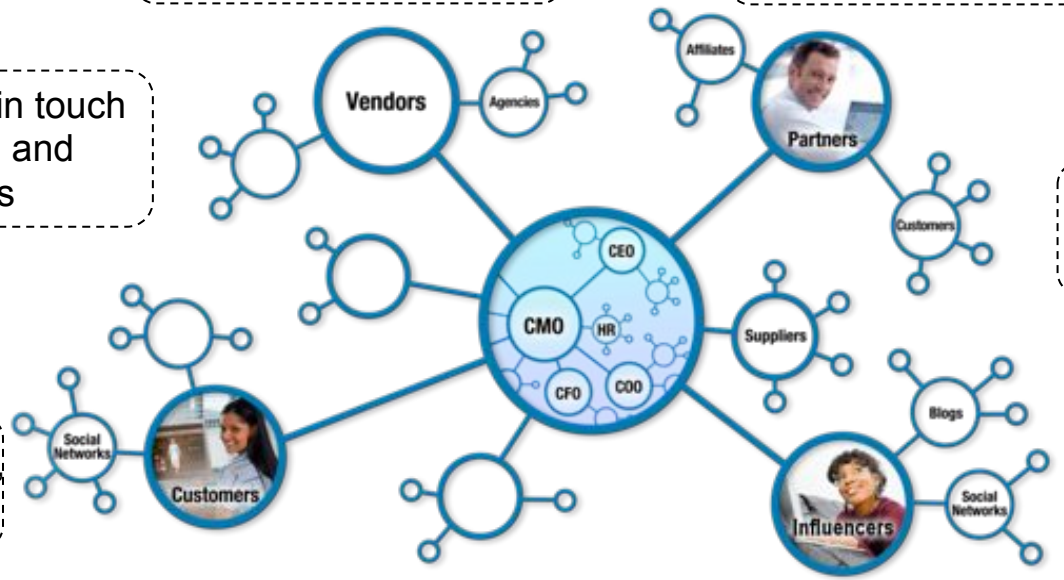
Traditional roles and processes across the business network are evolving, forever changing the way organizations operate

Social Networking for the Enterprise

Leverage what others know and shared

Build and leverage your network

Connect and stay in touch with colleagues and communities



Share your content, info, and expertise

Follow files, pages, forums, blogs, …

Find the right people to help you succeed

In-context instant messaging with experts and teammates

Virtual meetings, real-time brainstorming

Enable People to connect with People, Content, and Communities, resulting in a Social Graph that gathers enterprise knowledge

Foundational capabilities for Future Social Business Software

People Enablement

Incorporate capabilities that **adapt content** for situations and needs, and enhance communication **over many devices, across diverse pools of talent**

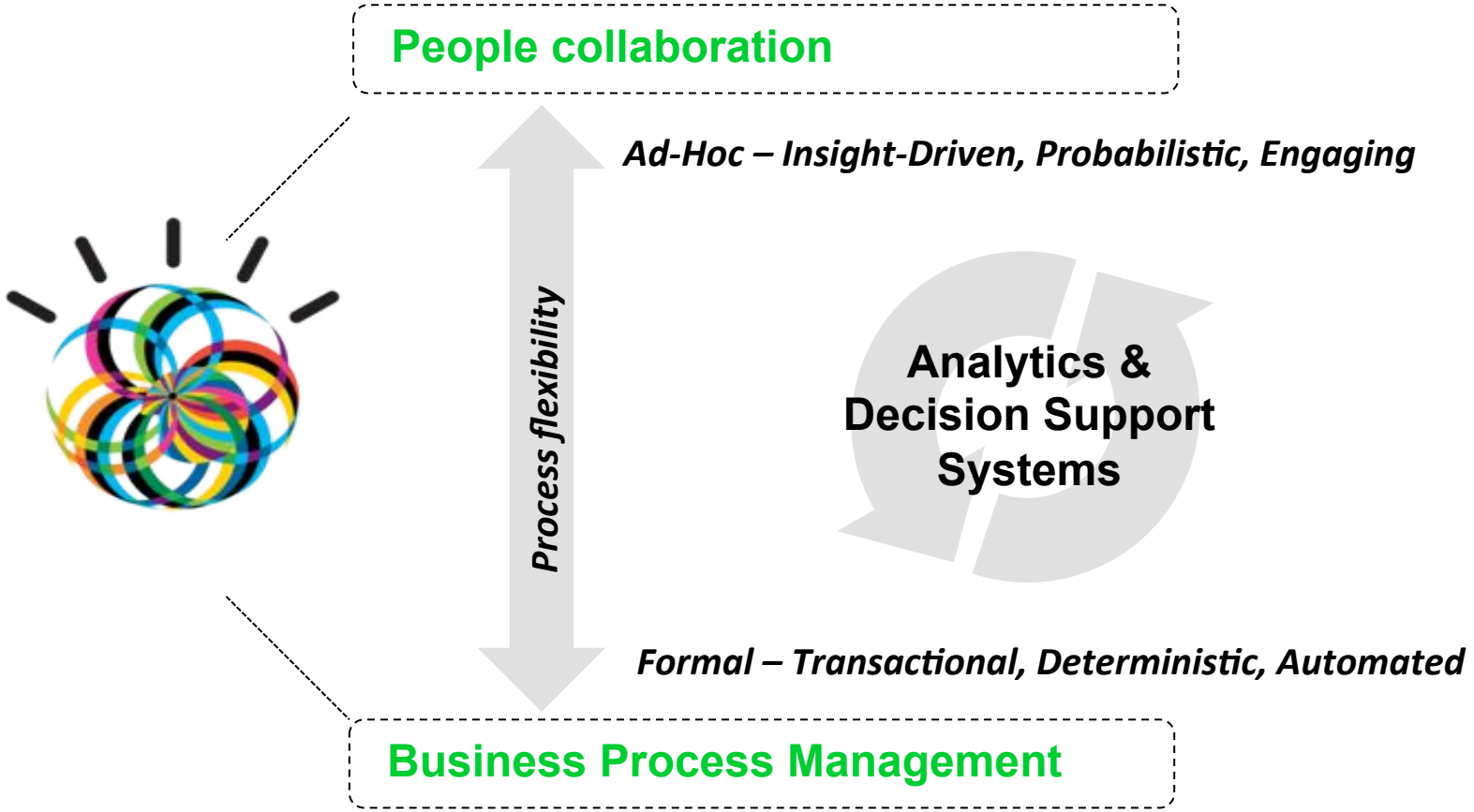
People Content

Develop capabilities to **create a representation** of a person's skills, experiences, preferences, digital reputation… in a **structured and organized way**, so it can be used **for the purpose of running a business**

People Analytics

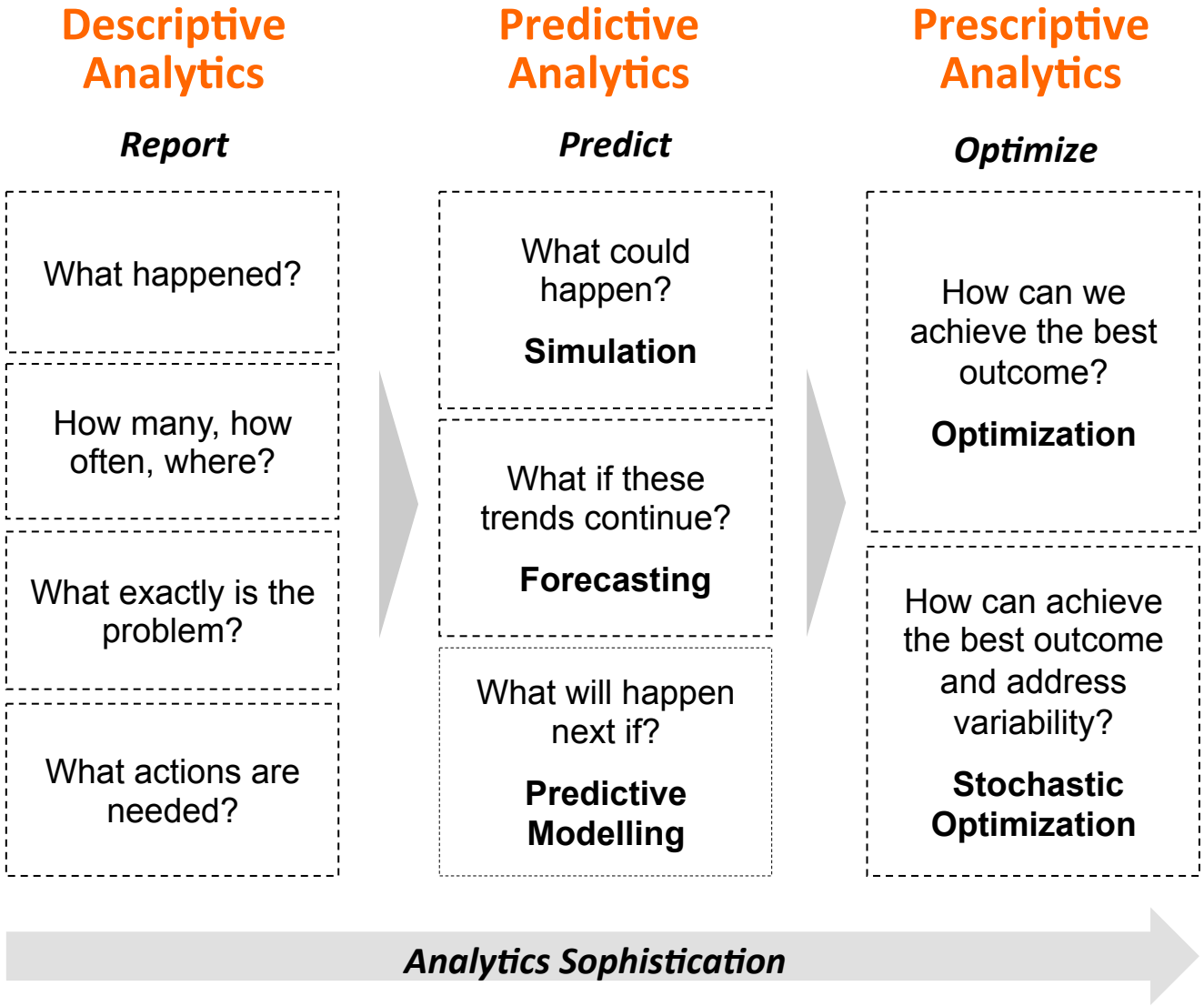
Implement capabilities for people-centric process optimization **within an analytics platform for rapid, on-demand deployment**

Coordination & Decision Support Platform for Complex Business Scenarios are linking Collaboration with BPM

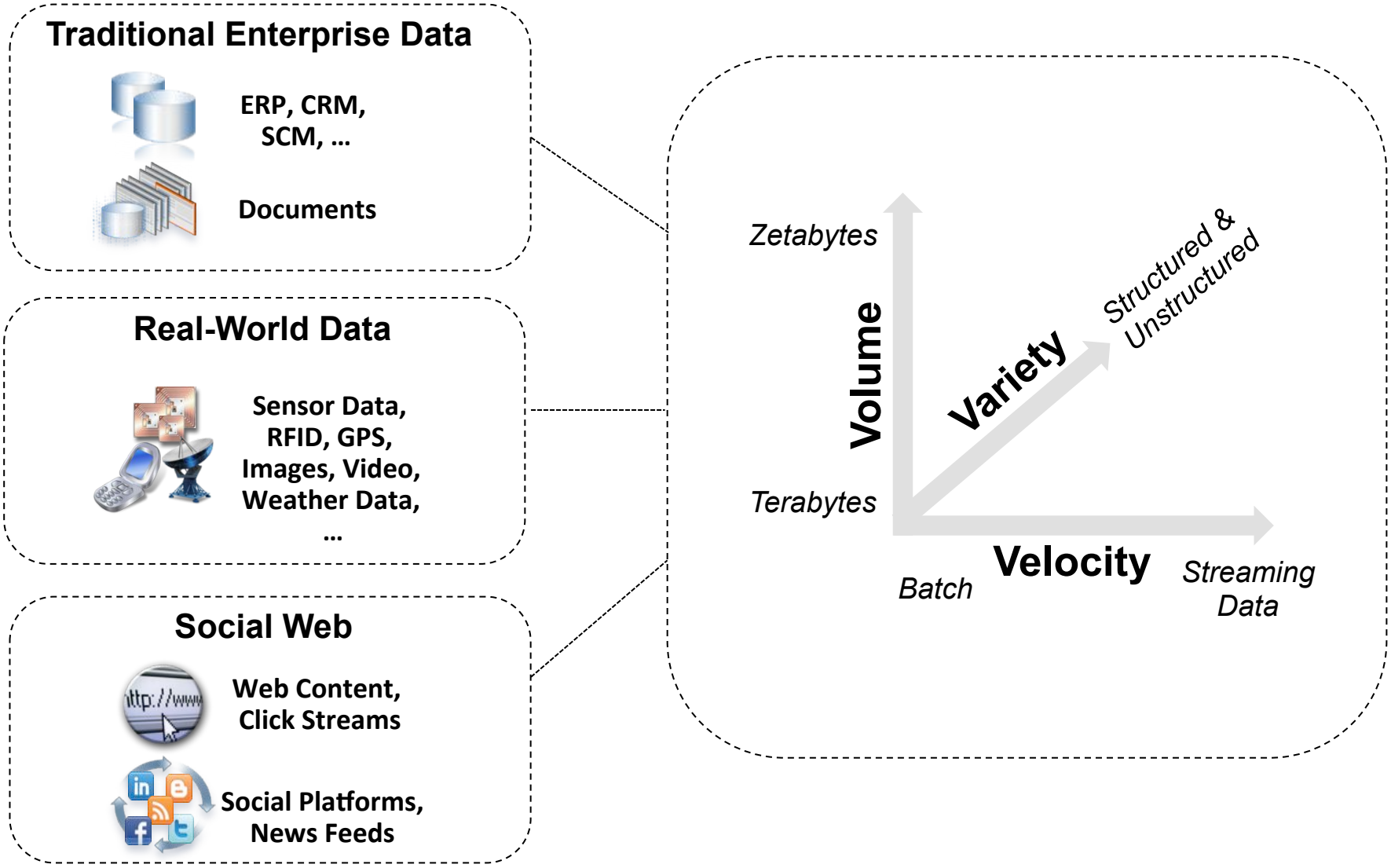


Coordination = Collaboration + Process Management, leveraging Analytics

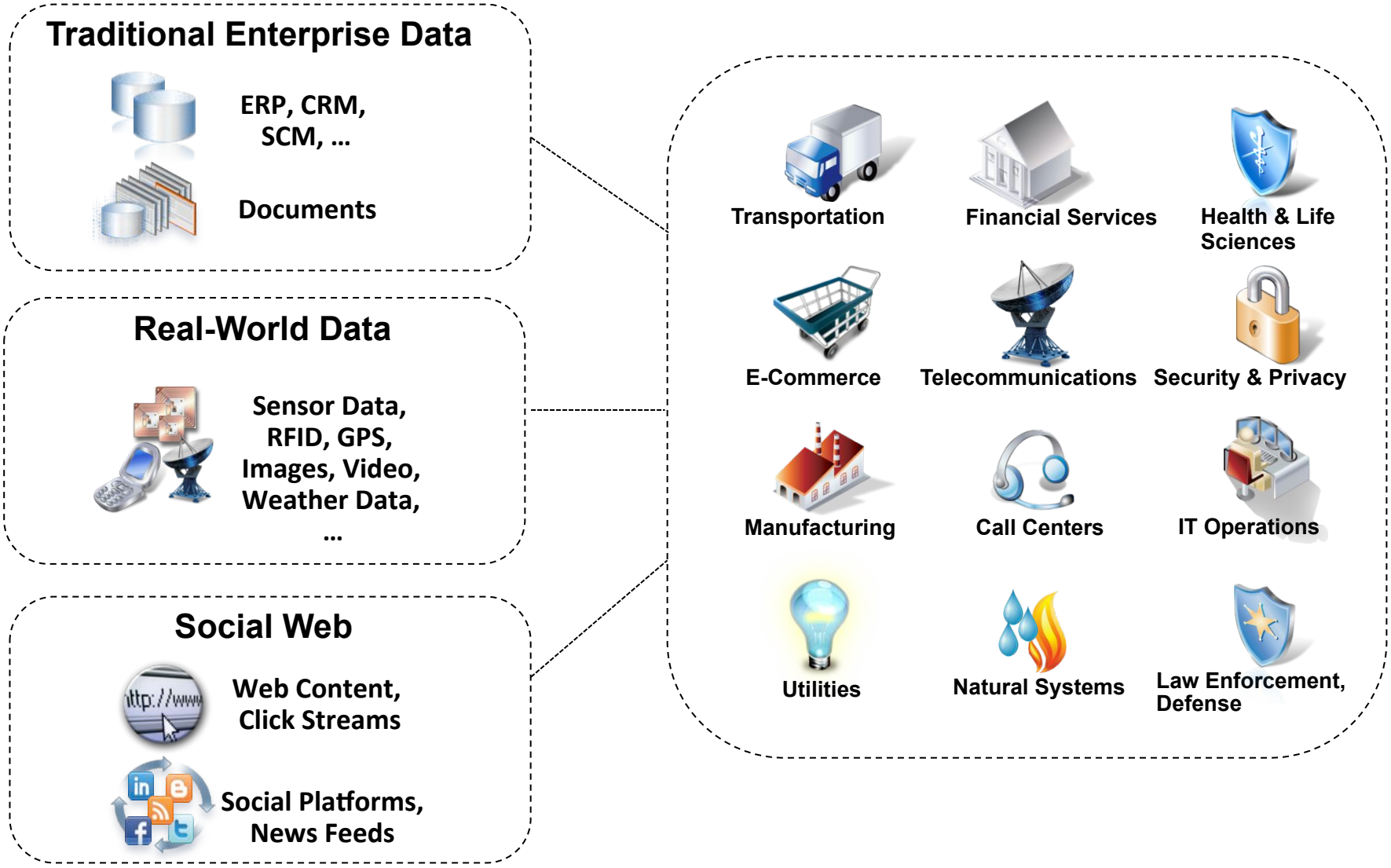
Organizations are applying analytics to improve decision making



“Big Data” creates a new challenge for advanced analytics



Big Data Analytics is relevant to many Smarter Planet Solutions



New technology beyond traditional databases and data warehouses is required

Traditional Enterprise Data

ERP, CRM, SCM, …

Documents

Real-World Data

Sensor Data, RFID, GPS, Images, Video, Weather Data, …

Social Web

Web Content, Click Streams

Social Platforms, News Feeds

Analytics Appliances (In-memory DBs, Accelerators)

IBM Netezza, DB2 Analytics Accelerator

SAP HANA

Distributed Filesystems and Analytics (no-SQL, Hadoop)

IBM InfoSphere BigInsights

Stream-Analytics (No Storage)

IBM InfoSphere Streams

R&D challenges for the Future of Analytics

Traditional Enterprise Data

ERP, CRM, SCM, …

Documents

Real-World Data

Sensor Data, RFID, GPS, Images, Video, Weather Data, …

Social Web

Web Content, Click Streams

Social Platforms, News Feeds

Information Integration

Annotation & Tokenization
(automated or crowd-sourced)

Entity Resolution
(people, locations, things, ...)

Relationship Detection
(rules, matching, ...)

Reasoning Algorithms
(spatial, temporal, paraphrasing...)

Continuous Analysis
(responding to change/ feedback)

Dealing with Uncertainty
(stochastic modeling, multiple sources ...)

Retrieving information for decision support

Traditional Enterprise Data

ERP, CRM, SCM, …

Documents

Real-World Data

Sensor Data, RFID, GPS, Images, Video, Weather Data, …

Social Web

Web Content, Click Streams

Social Platforms, News Feeds

SQL, XQuery

Keyword Search

Structured Data
precise, explicit, narrow

Unstructured Data
often imprecise, rich in context, broad

Natural Language

IBM Watson

Grand Challenge: IBM Deep Blue 1997

- Logic-based
- Finite playing field and number of possible moves and countermoves

  = structured data
- Subject to mathematical probability

On February 14, 2011, IBM Watson made history . . .

Jeopardy! – a grand challenge for a computing system:

- broad range of subject matter: such as history, literature, politics, arts, entertainment, and science
- requires analyzing subtle meaning, irony, riddles, and other complexities
- speed of accurate responses (max. 3s)
- reliable confidence in answer required to decide about buzzing

IBM Watson for Jeopardy!

- 90 IBM p750 servers with 2880 cores
- 16 TB RAM, 20 TB disk
- 80 Teraflops
- Linux
- Content Analytics, Big Data Platform, UIMA

IBM Watson brings together a set of transformational technologies to drive optimized outcomes

Understands natural language and human speech

Breaks down the communication barrier between humans and computers

Generates & evaluates hypothesis for better outcomes

Offers various probabilities rather than attempting a single „right“ answer

IBM Watson

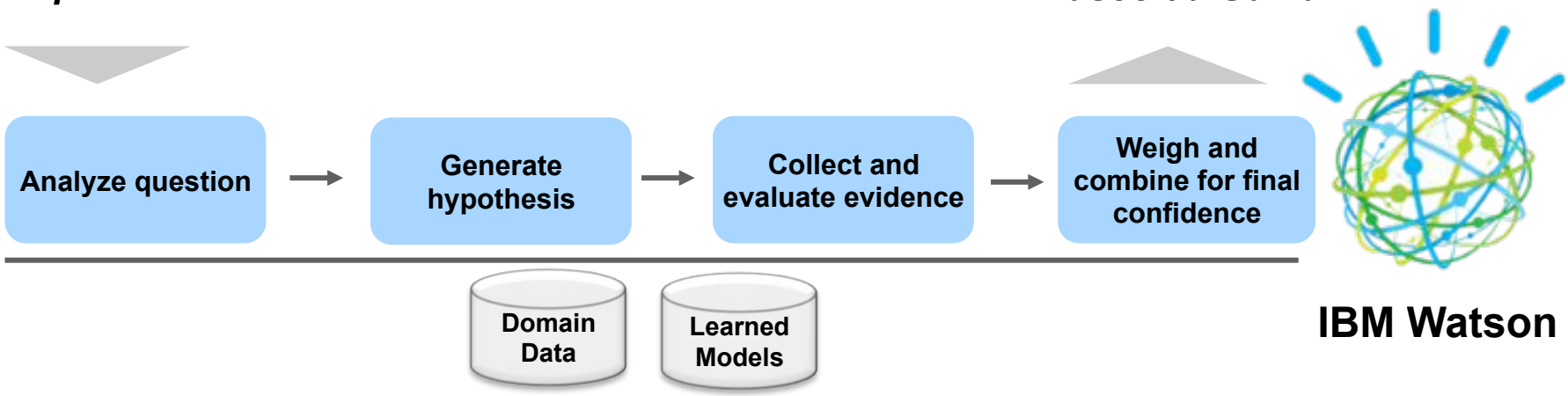
Adapts and learns from user selections and responses

Builds knowledge iteratively over time, in much the same way that humans learn

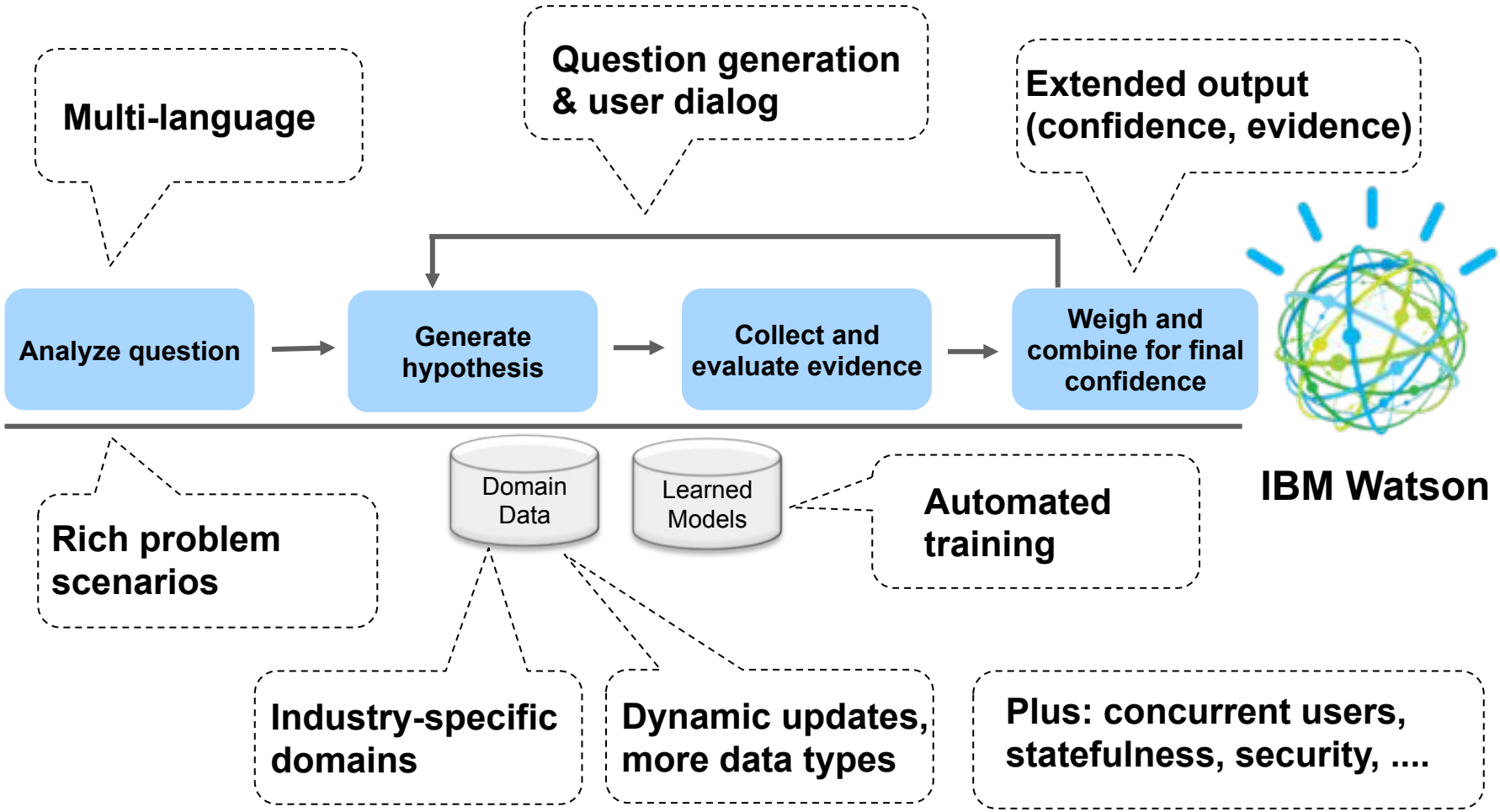
How does Watson work?

In May 1898 Portugal celebrated the 400th anniversary of this explorer's arrival in India.

Vasco da Gama



Moving beyond Jeopardy!



Putting Watson to Work

Now

IBM Watson for Healthcare

Now

IBM Watson for Financial Services

Future

IBM Watson for Contact Center

Future

IBM Watson for Industries

IBM Watson

IBM Watson Platform

Learning Systems Roadmap

Keyword Search

Delivers lists based on keywords & human filters

Watson

Static Learning Systems

- Static data,
- Training by experts
- Limited Domain

Dynamic Learning Systems

- Dynamic Data,
- Multiple Domains,
- Deeper Reasoning,
- Crowd-Sourcing,
- Leverage HW Acceleration

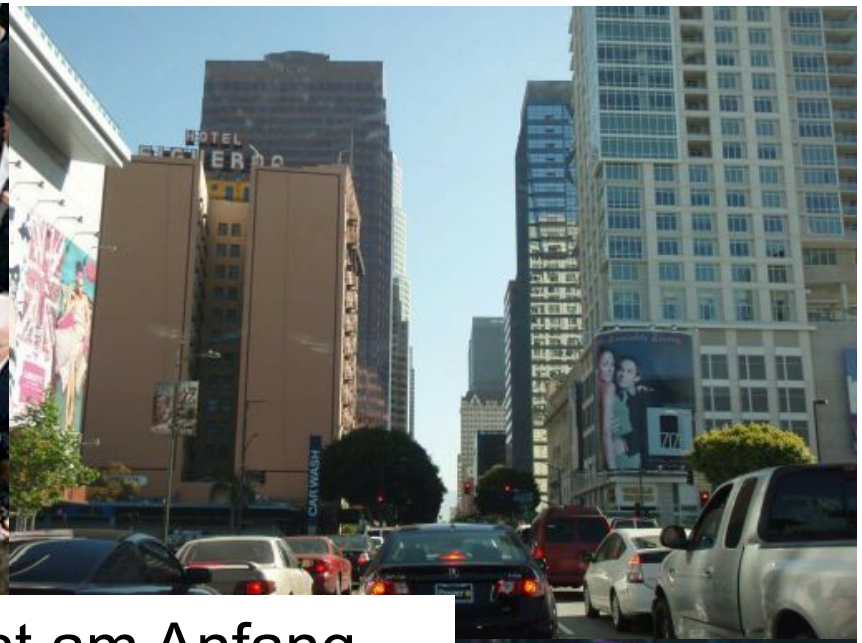
Autonomous Learning Systems

- Understanding of natural language, images and other sensory information.
- Hypothesis and question generation across arbitrary domains;
- meta-heuristic to automate algorithm choices

Biological Inspiration: Cognitive Process Understanding

1985 **Today** **Future**

Greater Autonomy



Wir sind erst am Anfang ...

Persönliche Erfahrungen

1978 - 1985	1986 - 1989	1990 - 1995	1996	1997 - 1999	2000 - 2005	2006 - 2009	2010 - 2012

Studium der Informatik an der TU Braunschweig

Technische Universität Braunschweig

Cooles Studium ... Aber was macht ein Informatiker eigentlich genau in einem Unternehmen?

Praktika, Praktika, ...

Industrie-Kooperationen

Firmen-Besuche

...

Persönliche Erfahrungen

1978 - 1985	1986 - 1989	1990 - 1995	1996	1997 - 1999	2000 - 2005	2006 - 2009	2010 - 2012

IBM

Software-
Qualitätssicherung

Unglaublich, was alles schief gehen kann.
Keine Kompromisse bei Qualität akzeptieren.

Project Management,
Quality Management,
Customer Satisfaction

Persönliche Erfahrungen

1978 - 1985	1986 - 1989	1990 - 1995	1996	1997 - 1999	2000 - 2005	2006 - 2009	2010 - 2012

Teamleiter/Manager
Banken-Software-
Entwicklung

Hätte ich nicht Soziologie oder Psychologie im Nebenfach studieren sollen?

Und ... jetzt ist Qualität wirklich wichtig.

Noch mehr Team-Arbeit,

Soft-Skill-Kurse

Persönliche Erfahrungen

1978 - 1985	1986 - 1989	1990 - 1995	1996	1997 - 1999	2000 - 2005	2006 - 2009	2010 - 2012

Auslandsabordnung zu „Payment Systems“ London. Einsatz in Asien und Europa.

Die Welt ist groß und bunt.

Kurse zu „Cultural Awareness“,
Auslands-Kooperationen,
Austausch-Programme

Persönliche Erfahrungen

1978 - 1985	1986 - 1989	1990 - 1995	1996	1997 - 1999	2000 - 2005	2006 - 2009	2010 - 2012

Leiter Smart Card Software Entwicklung.

Ohne Industrie-Standards kann sich kein Markt entwickeln.

Marktreife ist nicht nur eine Frage der Technik.

IT Security ist ein hartes Geschäft.

In Embedded Systems können Fehler richtig teuer werden.

Kurse zu „Business Value“ und „Business Development,

IT Security als Pflichtfach

IBM

Persönliche Erfahrungen

1978 - 1985	1986 - 1989	1990 - 1995	1996	1997 - 1999	2000 - 2005	2006 - 2009	2010 - 2012

Hauptabteilungsleiter Portal-Software-Entwicklung

Ein hochmotiviertes Team mit einem ehrgeizigen Projekt und ausreichend Freiheitsgraden kann Wunder bewirken.

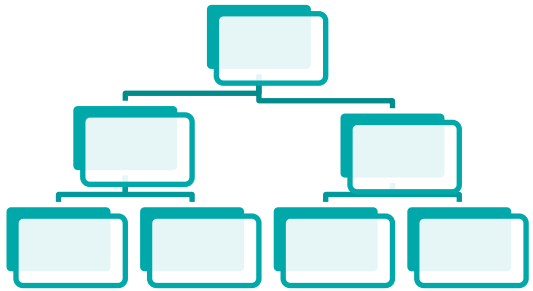
Nur wer ausreichend weit voraus denkt, bleibt im Markt.

„Startups“ unterstützen.

Produkte und Geschäft von Beginn an internationalisieren.

Persönliche Erfahrungen

1978 - 1985	1986 - 1989	1990 - 1995	1996	1997 - 1999	2000 - 2005	2006 - 2009	2010 - 2012



Bereichsleiter IBM
Lotus und WebSphere
Software Entwicklung

Management-Aufgaben ändern sich grundlegend, wenn man nicht mehr alle Team-Mitglieder kennen kann.

Kurse zu Strategie-Planung und Organisations-Management.

Persönliche Erfahrungen

1978 - 1985	1986 - 1989	1990 - 1995	1996	1997 - 1999	2000 - 2005	2006 - 2009	2010 - 2012

Geschäftsführer IBM Deutschland Forschung & Entwicklung GmbH

Neben Kunden und Mitarbeitern sind Geschäftspartner, Universitäten, Politik und Gesellschaft essentiell für nachhaltigen Erfolg.

Gesellschaftliches Engagement fördern.

Firmen und Unis vernetzen.

Dirk Wittkopp

Vice President
Geschäftsführer
IBM Deutschland Forschung & Entwicklung GmbH
wittkopp@de.ibm.com