Precision Medicine

Digital Transformation of Healthcare

Dr. Clemens Suter-Crazzolara, SAP SE
June, 2016

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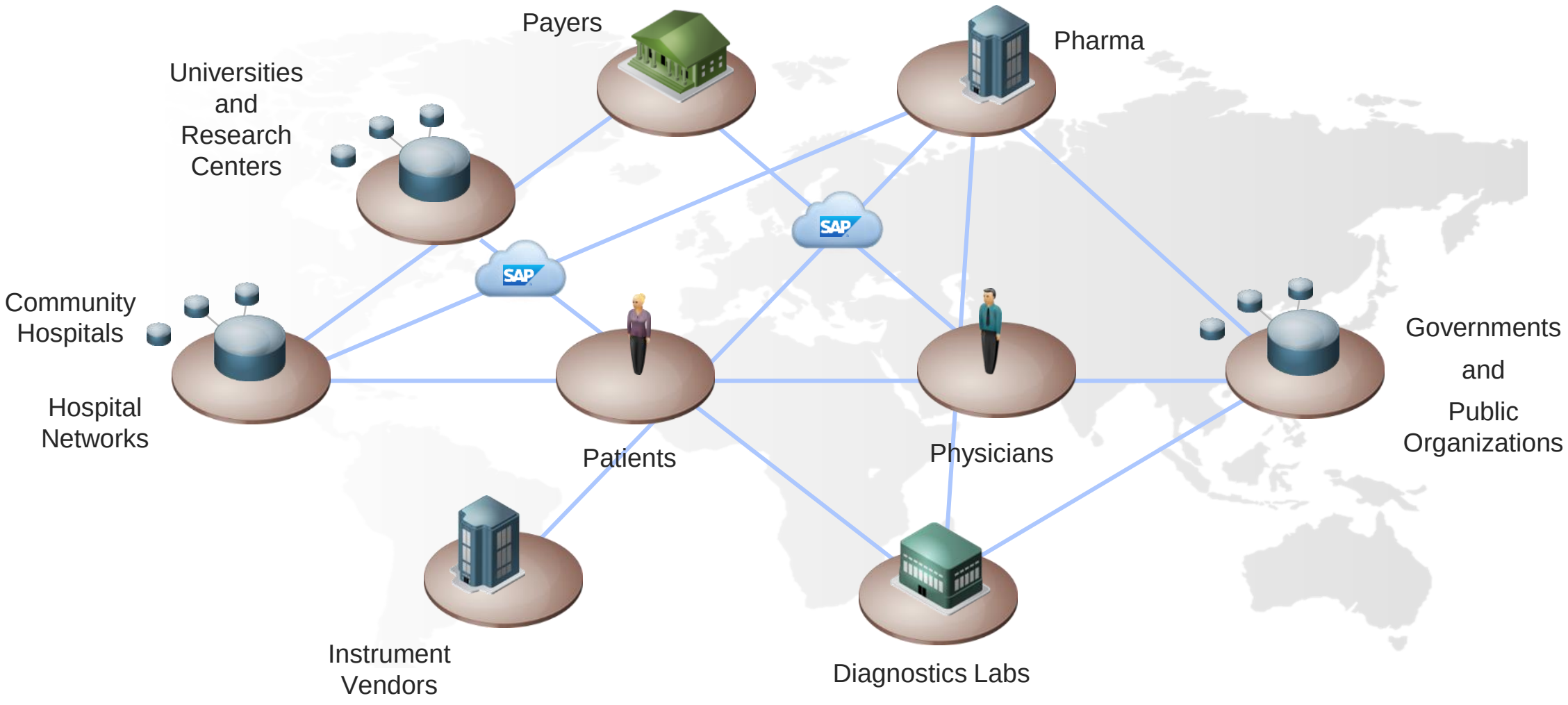
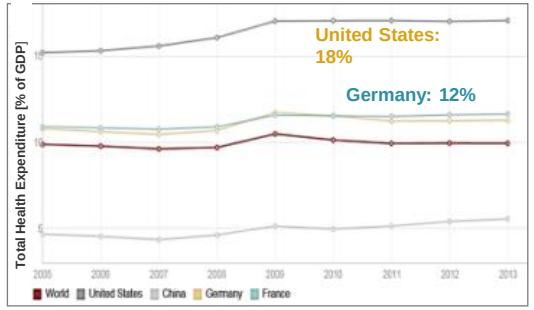
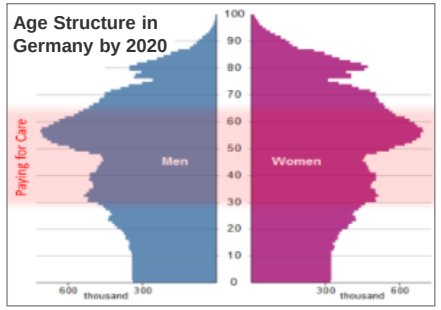
The Challenge of the 21st Century: Data in Silos

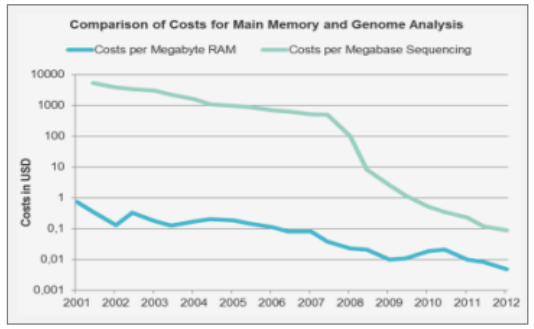
The SAP Connected Health network

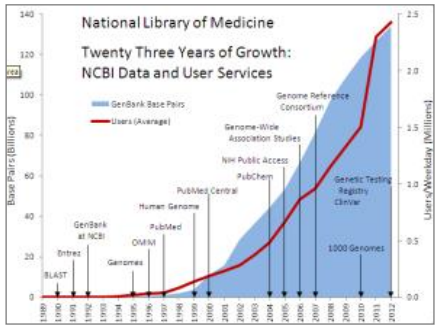


Drivers

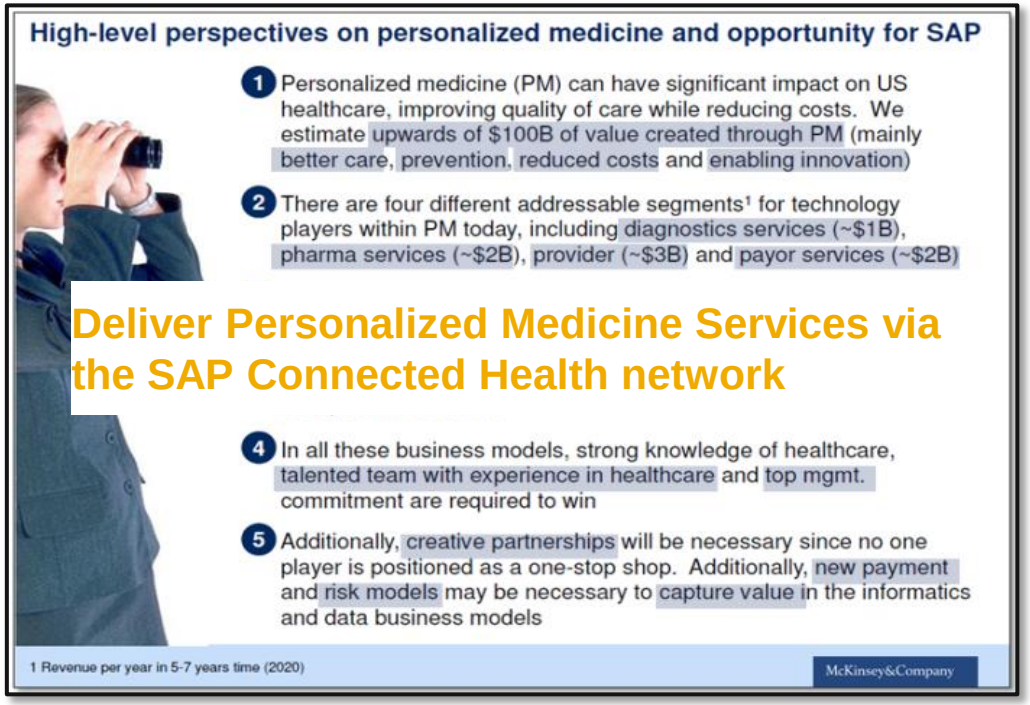




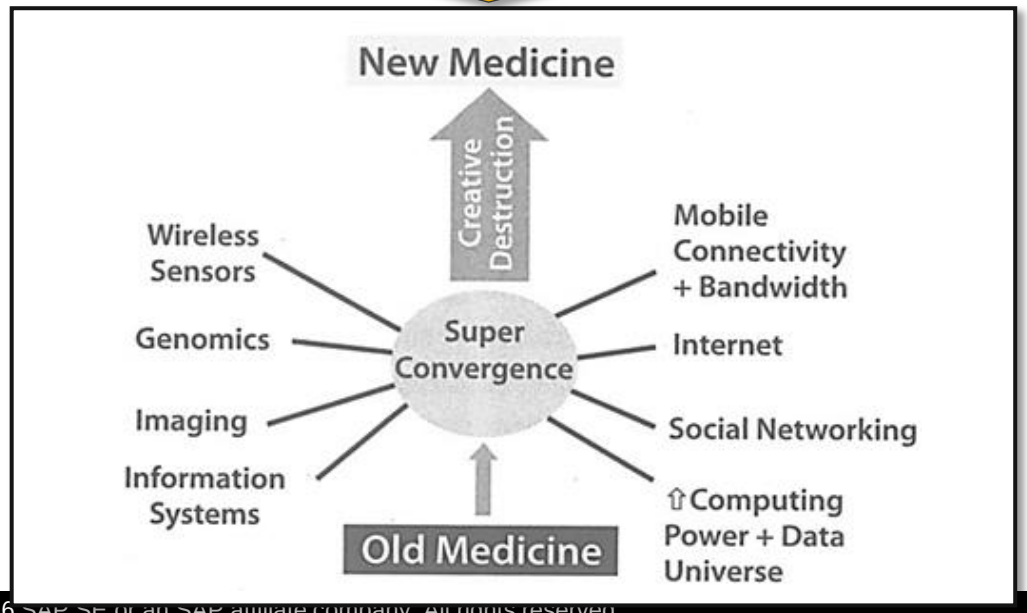




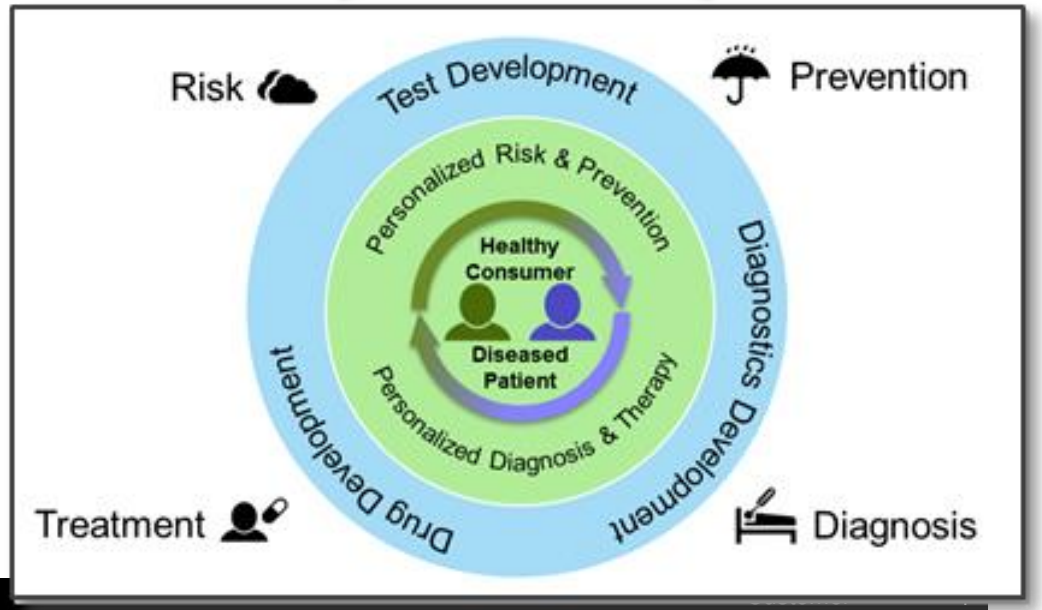
Opportunity



Trend Convergence

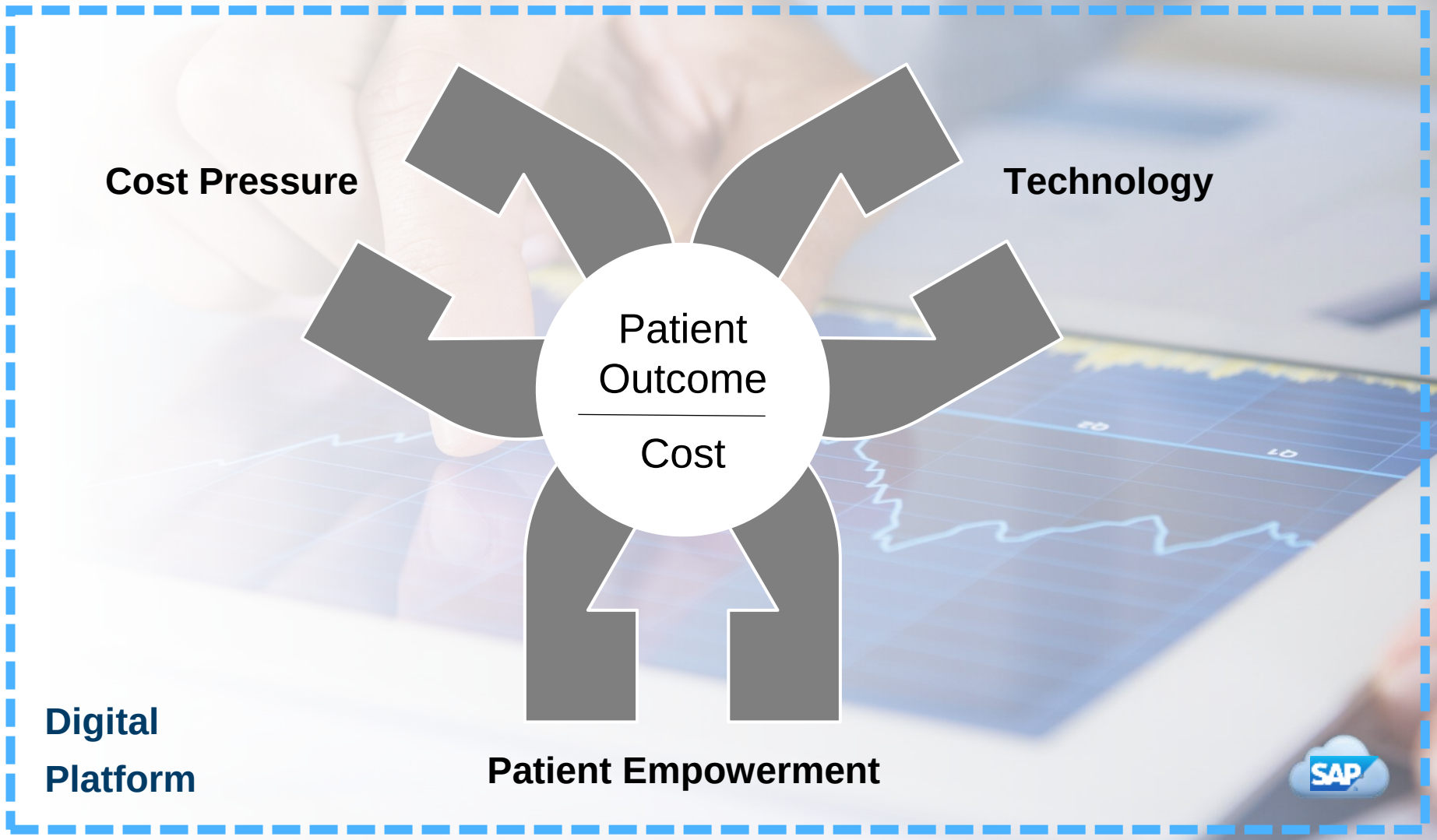


New Paradigm



Precision Medicine

Matchless market forces drive the creation of the digital platform



Managing Big Data better could help the U.S. save $300 – 450B annually[1]

(2-3% of GDP)

Globally, it could save $1,300 – 1,900B annually[2]

(2-3% of GDP)

1. http://www.fiercehealthit.com/story/big-data-use-could-save-450-billion-healthcare-costs/2013-04-05
2. http://data.worldbank.org/indicator/NY.GDP.MKTP.CD

The challenge: Make smart data out of Big Data

Human genome and biological data ~800 MB per full genome >15 PB in databases of leading institutes

Cancer patient records
160,000 at the National Center for Tumor Diseases in Heidelberg

PubMed biomedical articles >25 million

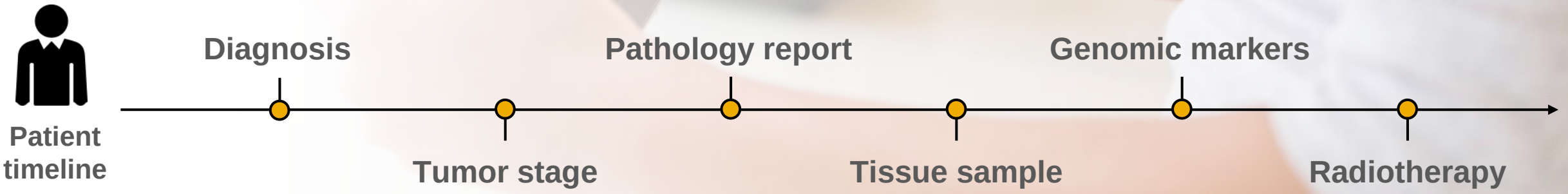
Clinical information management systems; Often more than 50 GB

Medical imaging data
Scan of a single organ in 1 second creates 10 GB of raw data

Human proteome 160 million data points (2.4 GB) per sample; 7.6 TB raw proteome data on ProteomicsDB.org

Prescription data
1.5 billion records from 10,000 doctors and 10 million patients (100 GB)

Clinical trials >30,000 recruiting on ClinicalTrials.gov



SAP Connected Health platform

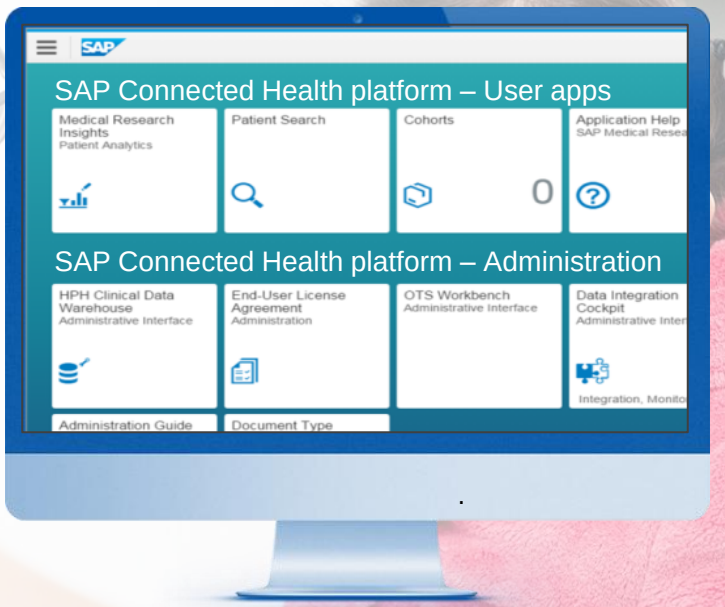
The digital platform

Deeper insights

by connecting data silos of structured and unstructured, clinical, lab, omics, image and other data

Full control

over the platform, the applications and content, and how data is integrated and processed



Faster innovation

and hypothesis building and testing through real-time, advanced analysis → with SAP HANA in-memory computing

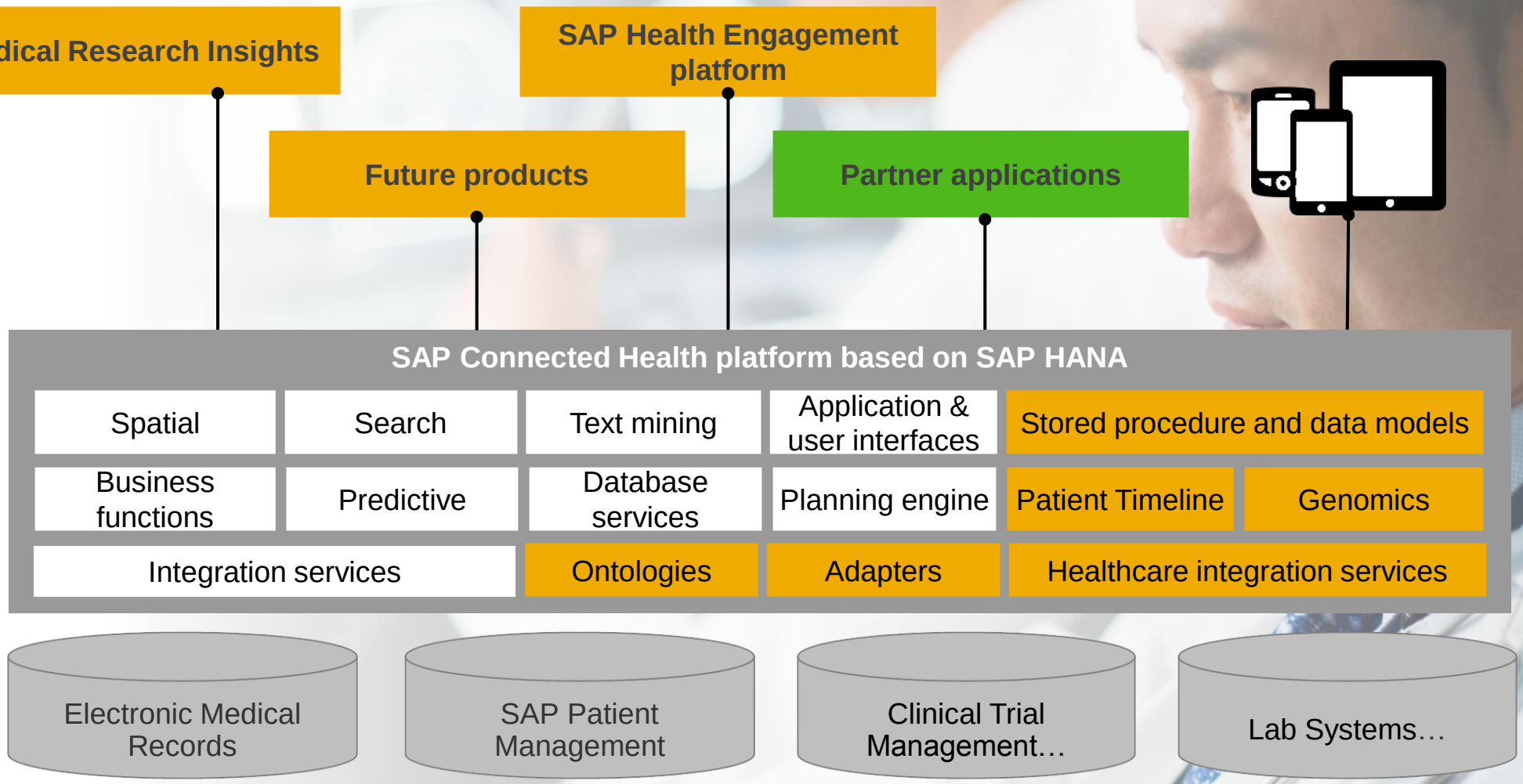
Simpler collaboration

with peers; securely and data privacy compliant

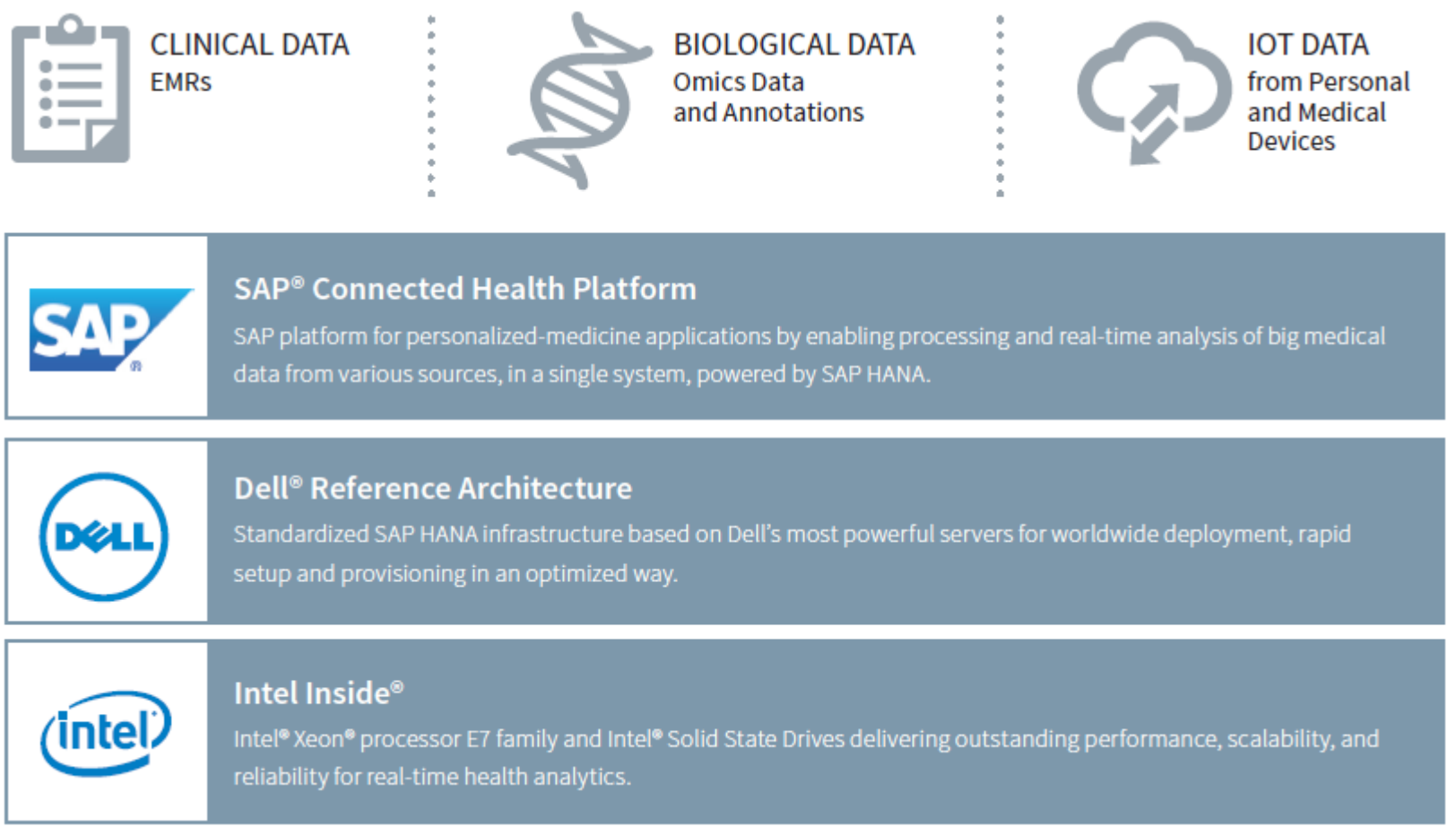
Extend

the platform without limits: with content, mobile apps, applications, through predefined extensible data models and out-of-the-box adaptors

SAP Connected Health platform



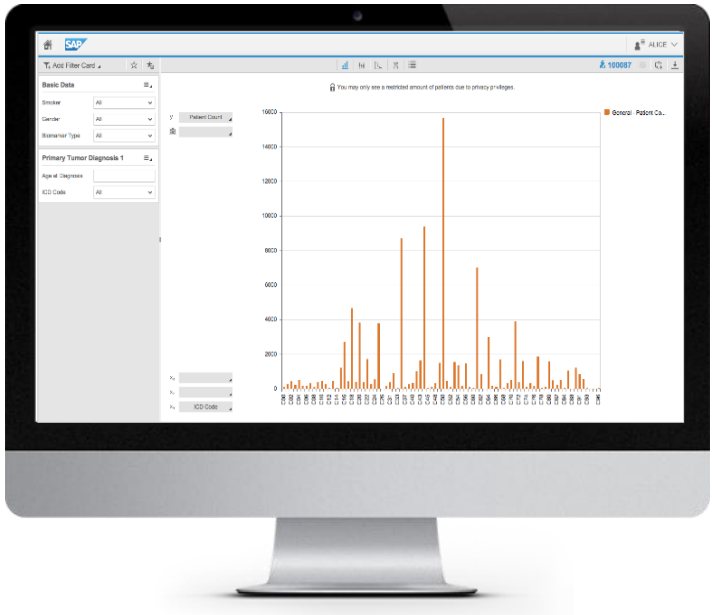
SAP Connected Health platform powered by Dell and Intel



SAP HANA – Enabler in Memory Computing

Innovation	Benefit	Application
Multi-core architecture	Massively parallel execution	High throughput sequencing analysis
6 TB DRAM servers	Large Data Sets in-memory	Genomics, proteomics and patient data
Compression (5-20x)	Large data sets in-memory	Genomics, proteomics and patient data
Combined Column and Row Store	Column = Fast Queries	Adhoc queries using clinical data
Partitioning: In-Database computing	Analyze large data sets Complex computations	Genome alignment Proteomics and Imaging data
No aggregate tables	Flexible modeling No data duplication	Data Model for combined clinical and omics data
Text Analytics	Use of unstructured data	Physician's letters Scientific Literature

Overview of SAP Medical Research Insights



Slice, dice, and dive deep into research and clinical data

Access and analyze diverse medical data

- **Analysis of Big Data**
  Structured and unstructured data, including genomics, proteomics, and other omics data, in real time through user-friendly interface
- **Real-world data analysis**
  Capture and explore longitudinal patient data with real-world evidence.
- **Ad hoc reporting**
  Harmonization of data from many sources and representation with easy visualization
- **Secure platform to understand, predict, and decide**
  Analyze data and run scenarios for hypotheses building and validation, shaping (pre)clinical studies and delivery of new drugs, devices, and care.

NCT: Gaining Medical Insights and Enhancing Care for Cancer Patients with SAP HANA®

NCT NATIONALES CENTRUM FÜR TUMORERKRANKUNGEN HEIDELBERG
getragen von: Deutsches Krebsforschungszentrum, Universitätsklinikum Heidelberg, Thoraxklinik-Heidelberg, Deutsche Krebshilfe

Organization
National Center for Tumor Diseases (NCT) Heidelberg, part of the German Cancer Research Center and the Heidelberg University Hospital

Location
Heidelberg, Germany

Industry
Higher education and research

Products and Services
Patient care; cancer research and prevention

Web Site
www.nct-heidelberg.de

Objectives

- Start treatment of cancer patients by establishing a protocol on day one that is tailored to their specific genetic profile
- Generate ideas for future trials based on analysis of patient attributes, including genetic variations and mutations
- Extract biomarker data from patient evaluation letters from physicians

Why SAP

- The SAP HANA® platform enables consolidation of and real-time access to various structured data sources, such as tumor documentation, medical records, and clinical trials, and unstructured data sources, such as physician evaluation letters, treatment guidelines, trial reports, and medical publications
- Fast, ad hoc reporting of treatment histories by patient attributes and survival rates from a central data warehouse

Benefits

- Real-time identification of cancer types to enable the grouping of patients by relevant characteristics
- Insight into treatment response and outcome probability by diagnoses
- Detailed view of previous treatment activities, including, for example, diagnosis, chemotherapy, surgery, and home visits
- Real-time visibility into current and upcoming clinical trials to match patients for participation based on profile data and treatment needs

"The project showed we could integrate various data sources, extract relevant information, and present it to physicians in a way that enables surprising new insights. In the future, we would like to use SAP HANA at every diagnostic and therapeutic step, because every cancer is different and can vary immensely from one patient to the next."

Prof. Dr. Christof von Kalle, Head, National Center for Tumor Diseases (NCT) Heidelberg

Faster diagnosis
More than 10,000 new patients seen each year since 2011

Greater visibility
Detailed view of patient history extracted from both structured and unstructured data sources

High data volume
150,000 data sets in combination with 3.6 million data points successfully analyzed during a proof-of-concept test

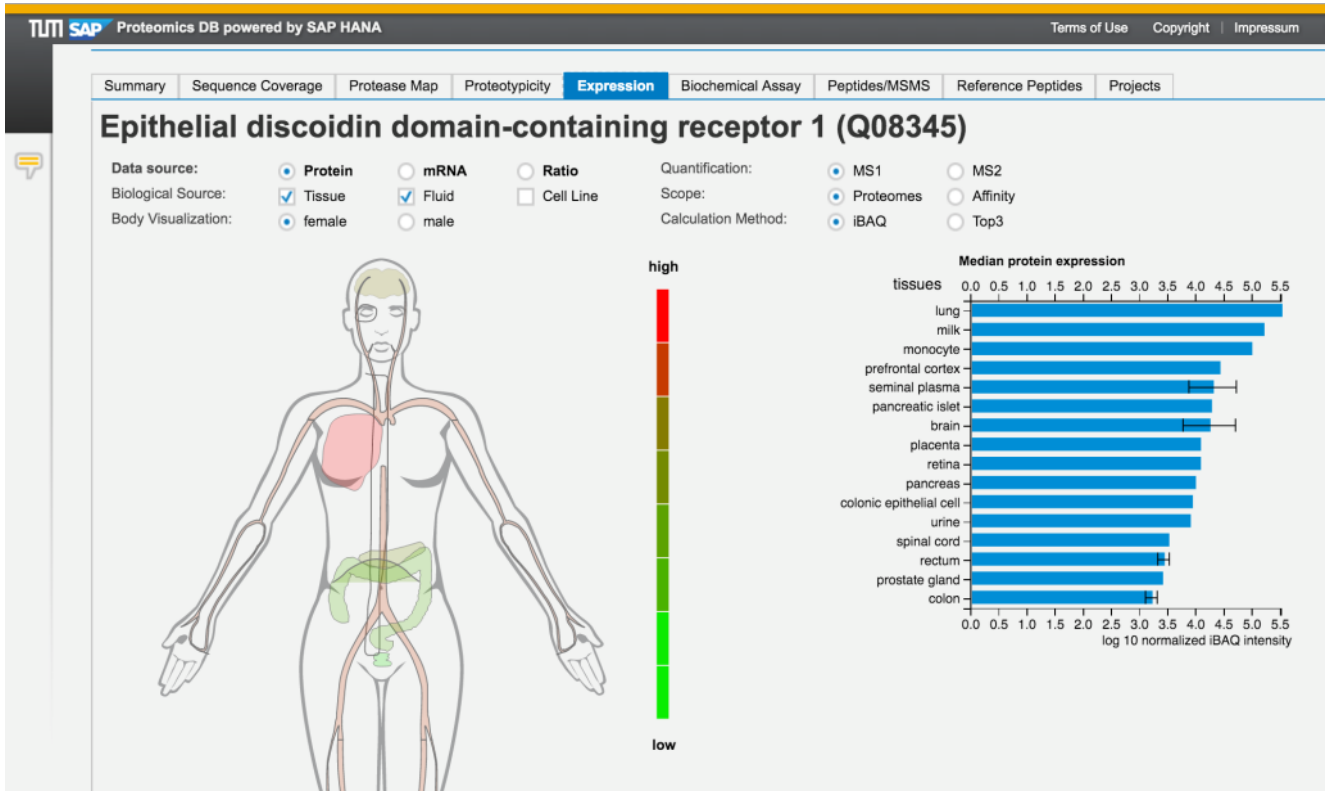
Faster matching
Quickly match patients for participation in the right clinical studies

Proteomics DB

https://www.proteomicsdb.org

Browsing and analyze proteome data

- Offers a complete map of human proteins (proteome) to improve the understanding of physiological processes
- A public, free-of-charge platform powered by SAP HANA managing terra-bytes of human proteomics data
- Published in **Nature** May 2014 (selected as cover story)
- Collaboration with TU München, JPT, Cellzome
- 2015 release added experimental planning, drug potency analysis, experiment planning



Running Live

is the way forward

SAP Personalized Medicine Forum
July 6–7, 2016
Bonn, Germany
Registration page

clemens.suter-crazzolara@sap.com
Tel:+4916090819863

“Wege entstehen dadurch, dass man sie geht” Franz Kafka