Digital Healthcare als Werkzeug
für die nahtlose Integrierte Versorgung

FH-Prof. DI Dr. Stefan Sauermann FH Technikum Wien

11. Symposium Integrierte Versorgung 2017

„Primärversorgung – Wegbereiter für den integrierten Versorgungsansatz"

8.11.2017

University of Applied Sciences (UAS) Technikum Wien – Hoechstaedtplatz and ENERGYbase

Austria's Largest Purely Technical UAS

- 2016 | 13 Bachelor and 18 Master Study Programs, 5 Short Cycle Study Programs
- 2013 | Moved into the new building at Hoechstaedtplatz
- 2011 | Start of construction of the new building at Hoechstaedtplatz,
- 2008 | Moved into the second location at ENERGYbase
- 2004/05 | Degree programs switched to bachelor's/master's system
- 2003 | Opening of the headquarters at Hoechstaedtplatz
- 2000 | Became Vienna's first university of applied sciences
- 1994 | Founded at the initiative of FEEI – Association of the Austrian Electrical and Electronics Industries and respected industrial enterprises

Organization

- Institution | University of Applied Sciences Technikum Wien
  - ~ 4,000 students, about 9,000 alumni
  - 31 degree programs: organization of the courses of study, development and advancement of the curricula
  - 15 departments: technical know-how and expertise in the areas of instruction and research
  - 4 study centers
  - Steering and decision-making comittee: University of Applied Sciences Council
- Operator | University of Applied Sciences Technikum Wien Association
  - Overall financial and legal responsibility

Academics

- ## 13 bachelor's degree programs

  - Biomedical Engineering
  - Business Informatics
  - Computer Science
  - Electronic Engineering
  - Electronics and Business
  - Information and Communication Systems and Services
  - International Business and Engineering

  - Mechanical Engineering
  - Mechatronics/Robotics
  - Smart Homes and Assistive Technologies
  - Sports Equipment Technology
  - Transport and Environment
  - Urban Renewable Energy Technologies

Academics

- **18 master's degree programs**
  - Biomedical Engineering Sciences
  - Embedded Systems
  - Environmental Management and Ecotoxicology
  - Game Engineering and Simulation
  - Healthcare and Rehabilitation Technology
  - Industrial Electronics
  - Information Management and IT Security
  - Information Systems Management

  - Innovation and Technology Management
  - Intelligent Transport Systems
  - International Business and Engineering
  - Mechanical Engineering
  - Mechatronics/Robotics
  - Renewable Urban Energy Systems
  - Software Engineering
  - Sports Equipment Technology
  - Telecommunications and Internet Technologies
  - Tissue Engineering and Regenerative Medicine

Research & Development

- **Five main areas of research**
  - Embedded Systems and Cyber-Physical Systems
  - Tissue Engineering and Molecular Life Science Technologies
  - Secure Services, eHealth & Mobility
  - Renewable Urban Energy Systems
  - Automation & Robotics

- **Funded R&D projects | contract R&D projects**

- **Among the top 5 in the UAS sector in terms of research & development**
  - At the moment 3 major FHplus structural development projects (Embedded Systems, Tissue Engineering, eHealth) at the moment
  - Currently about 40 funded research projects
  - Appr. 9 innovation checks every year

- **Josef Ressel Center for Verification of Embedded Computing Systems**

International

- 2003/04 Austria's first university of applied sciences to switch to bachelor's/master's system

- Degree programs in English
  - 2 bachelor's degree programs in English
  - 4 master's degree programs in English
  - Joint (double/multiple) degree programs in cooperation with institutions in Sweden, Ukraine and the Czech Republic

- More than 75 partner institutions in 36 countries worldwide

- 16% students from abroad

- Incomings | Outgoings | Internships abroad

Partners

- Network partner of the FEEI – Association of the Austrian Electrical and Electronics Industries and respected industrial enterprises

- Partnerships with national and international companies from business and industry
  - Partners include ABB, AIT, Alcatel-Lucent, Atos, Anecon, Beko, BRZ, bwin, Capgemini, Casinos Austria, Frequentis, Infineon, Kapsch, Knorr-Bremse, Post, Raiffeisen Bank International, Rubicon, Styria, Siemens, Signon, TechTalk, TTTech, Unisys, Wien Energie, ZKW

- Partner institutions in 36 countries around the world

- Partnerships with academic institutions

- Partnerships with schools

Lifelong Learning

- ## Career parallel degree programs

  - 4 career parallel bachelor's degree programs
  - 2 bachelor's degree programs available as distance study degree programs
  - 13 career parallel master's degree programs

- ## Technikum Wien Academy

  - Emphasis on course offerings in the fields of technology, business and personal development
  - Practice-oriented course offerings that can also be tailored to individual needs upon request

Who am I?

www.technikum-wien.at

- Electronics Engineer
- 15 yrs Med. University of Vienna, research
- Biosignal work
- Then standards, medical informatics
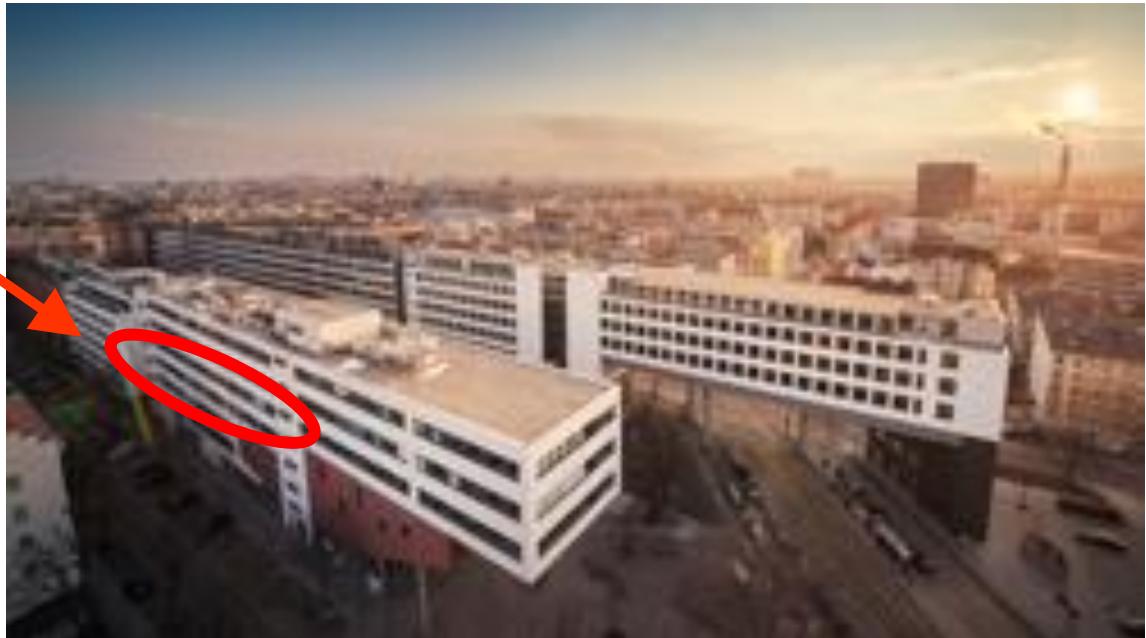
- Program director Biomedical Engineering Sciences (Master)
- Key Research eHealth, Department of Biomedical Engineering
- founding member IHE AT, member HL7, ONK 238, ISO, CEN, ASSTeH, ProRec AT, ..

Agenda

- **Digital: Wozu?**
  - Herausforderungen, Hoffnungen, Visionen

- **Stand der Dinge**
  - Technik, IT, Erfahrungen

- **Nächste Schritte**
  - Gemeinsam Richtung flächendeckende Umsetzung

The age pyramid

EUROPE: 1950

Male | Female

| 100+ |
| 95-99 |
| 90-94 |
| 85-89 |
| 80-84 |
| 75-79 |
| 70-74 |
| 65-69 |
| 60-64 |
| 55-59 |
| 50-54 |
| 45-49 |
| 40-44 |
| 35-39 |
| 30-34 |
| 25-29 |
| 20-24 |
| 15-19 |
| 10-14 |
| 5-9 |
| 0-4 |

29.27   19.51   9.76   0.00   0.00   9.76   19.51   29.27
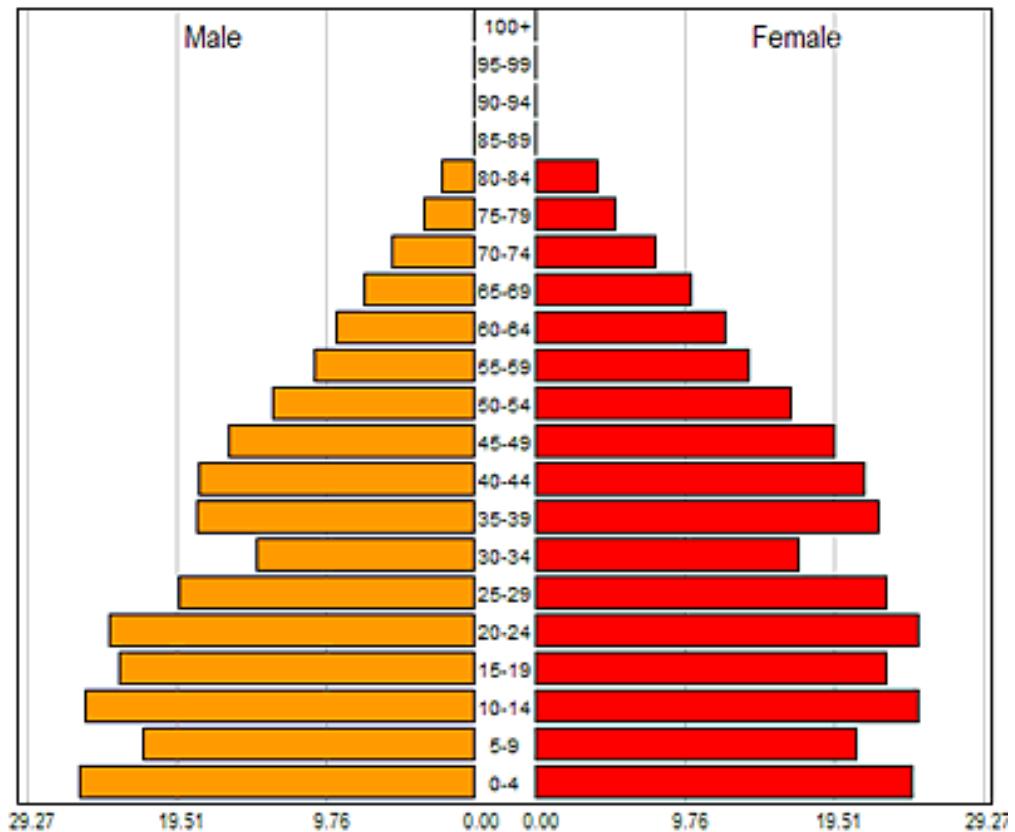
Proportion: Elderly (Age 60+)
Year: 1950
T:12.1% M:4.9% F:7.2%

Proportion: Working-age Population (Age 20-59)
Year: 1950
T:53.3% M:24.2% F:29.1%

Proportion: Children (Age 0-19)
Year: 1950
T:34.6% M:17.5% F:17.1%
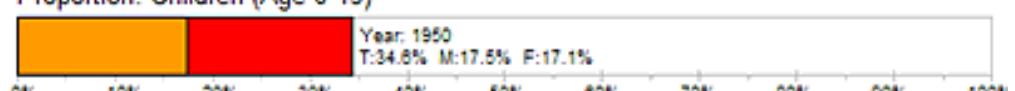
Evolution of „them out there"

**The Economist 2003**

One billion adults overweight world wide
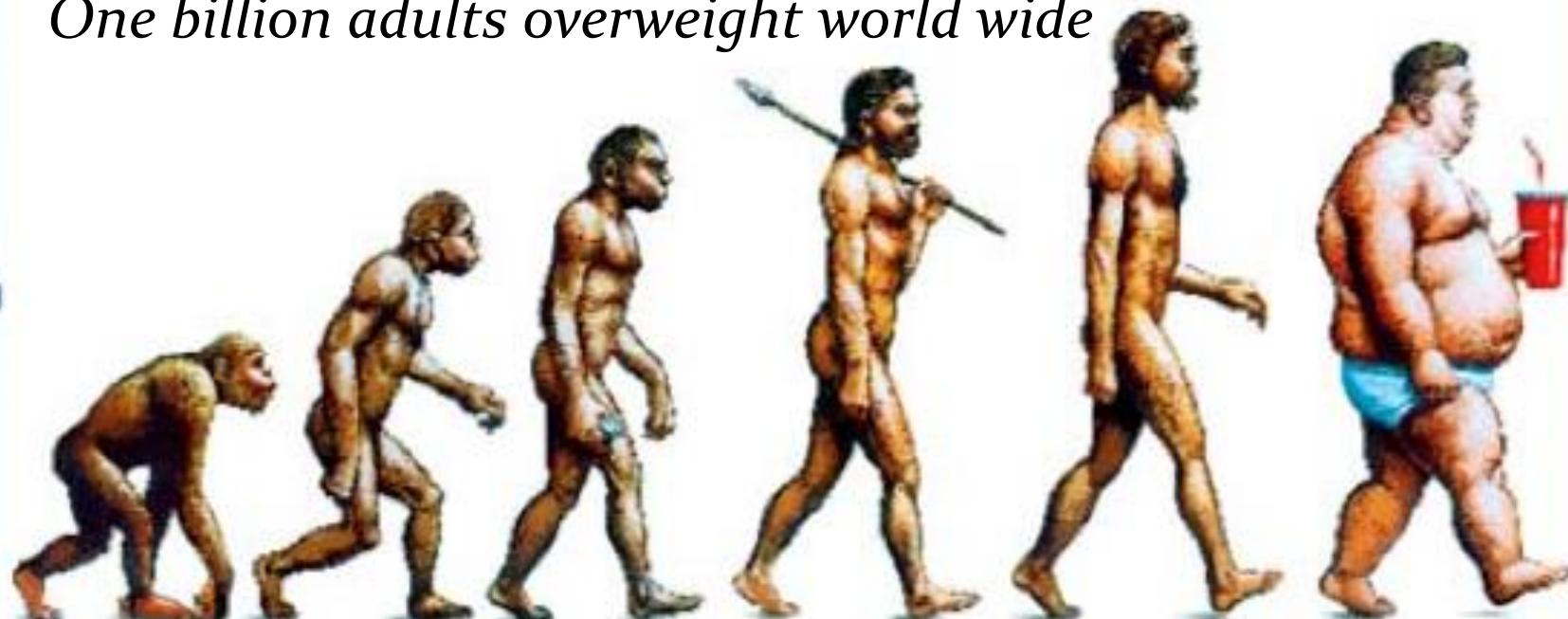
5-6 Million Years   30-40 Years

„Good old days" vs „now"
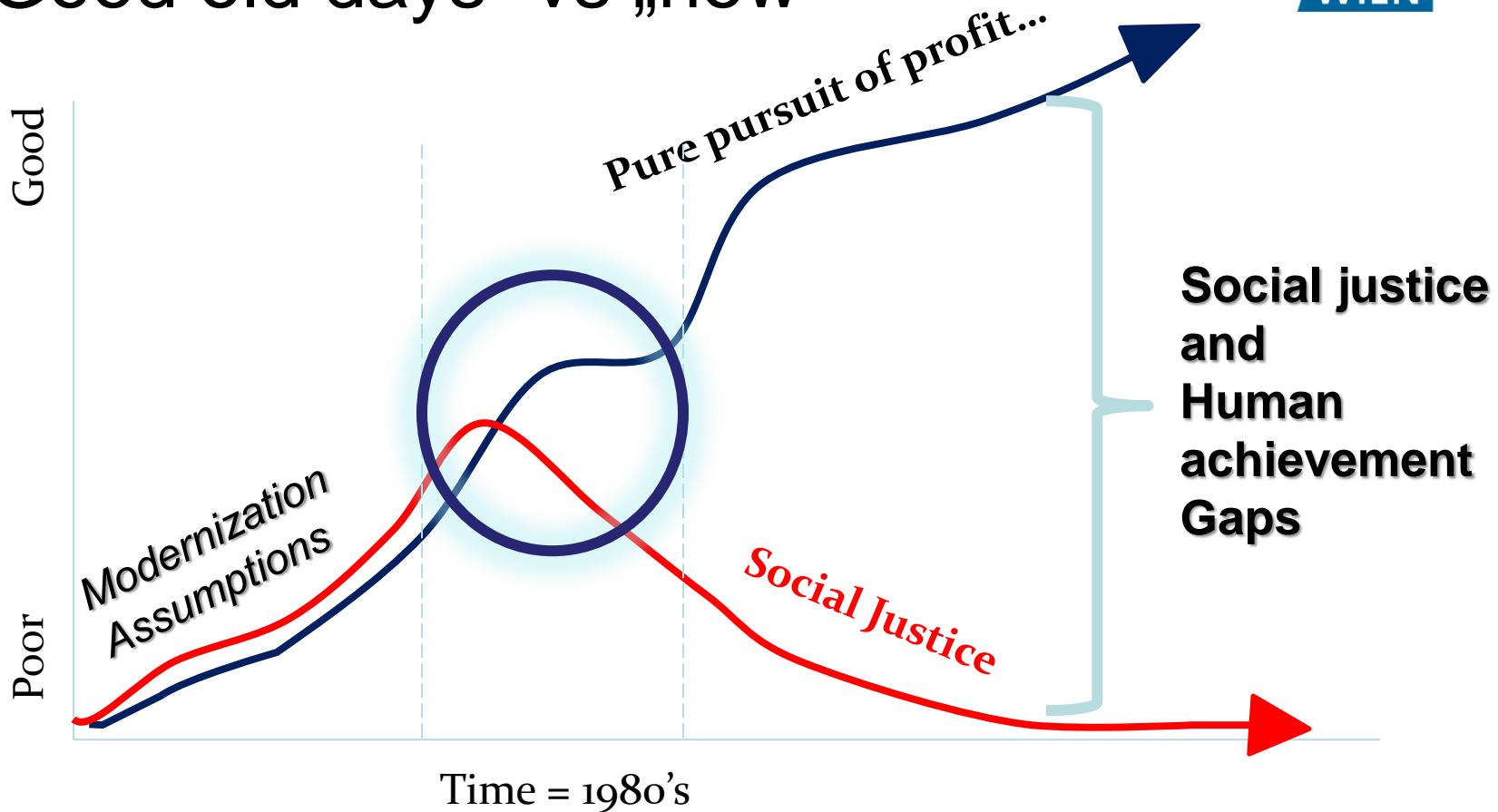
Pure pursuit of profit…

Good

Poor

Modernization Assumptions

Social Justice

Social justice and Human achievement Gaps

Time = 1980's

■ Source: Piniewski, B.; Codagnone, C. & Osimo, D.: Nudging lifestyles for better health outcomes: crowdsourced data and persuasive technologies for behavioural change European Commission, Joint Research Centre, Institute for Prospective Technological Studies, 2011, 1-78.
http://ftp.jrc.es/EURdoc/JRC64206.pdf
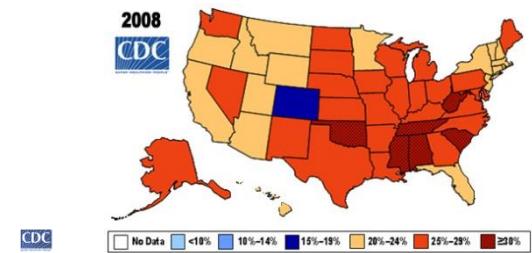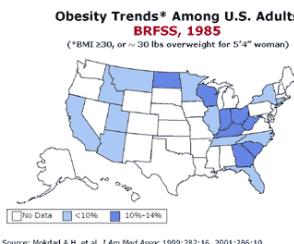
Diabetes incidence
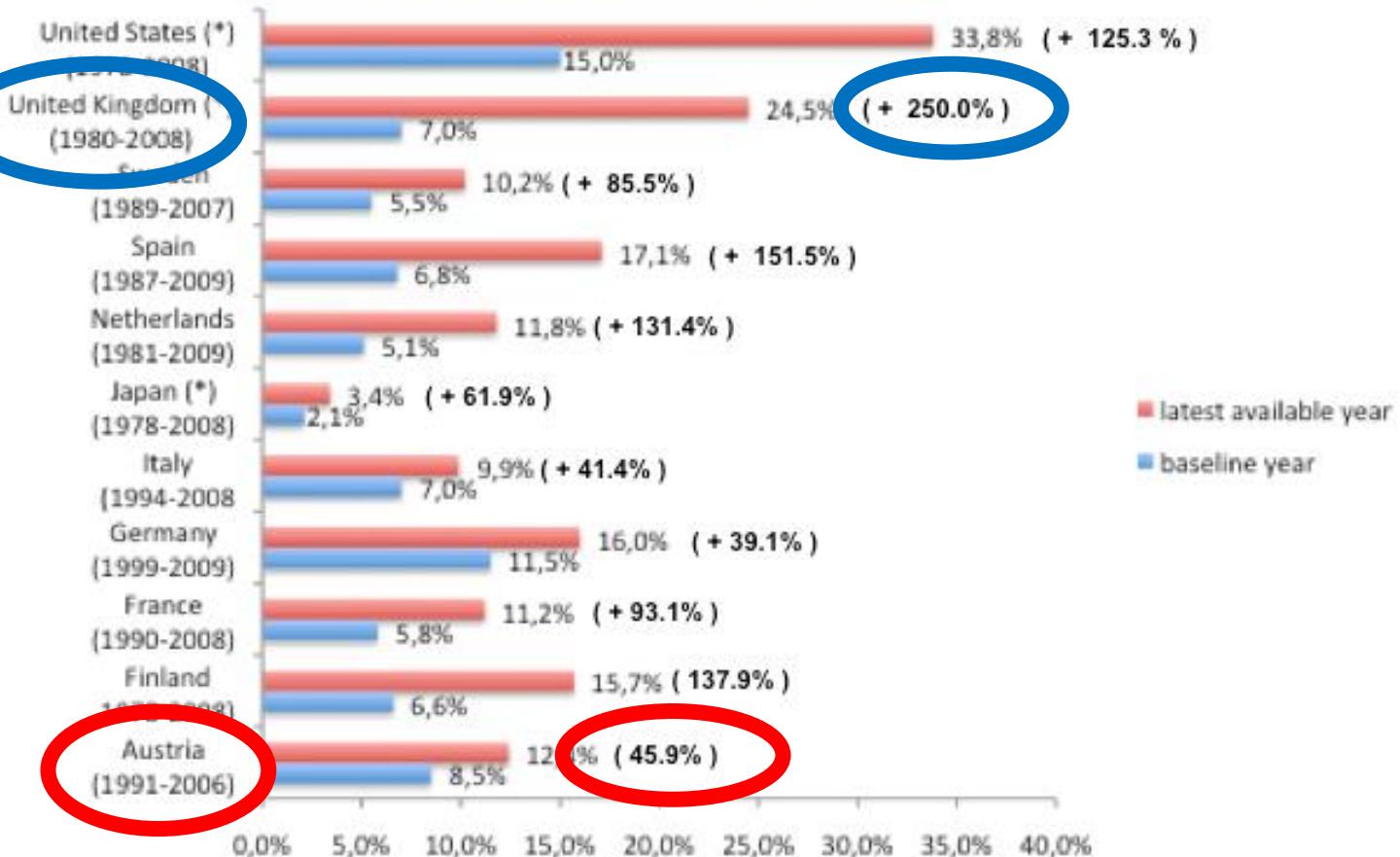
(*) data comes from measurement, all other are self-reported

- Source: OECD Health Data 2010. Cited after: Piniewski, B.; Codagnone, C. & Osimo, D.: Nudging lifestyles for better health outcomes: crowdsourced data and persuasive technologies for behavioural change European Commission, Joint Research Centre, Institute for Prospective Technological Studies, 2011, 1-78. http://ftp.jrc.es/EURdoc/JRC64206.pdf

Life as it is

60-80% *Preventable*

Death

■ Crowd Achievable Health
■ Crowd Actual Health Outcomes

Source: Piniewski, B.; Codagnone, C. & Osimo, D.: Nudging lifestyles for better health outcomes: crowdsourced data and persuasive technologies for behavioural change European Commission, Joint Research Centre, Institute for Prospective Technological Studies, 2011, 1-78. http://ftp.jrc.es/EURdoc/JRC64206.pdf

You only notice when …

Source: Piniewski, B.; Codagnone, C. & Osimo, D.: Nudging lifestyles for better health outcomes: crowdsourced data and persuasive technologies for behavioural change European Commission, Joint Research Centre, Institute for Prospective Technological Studies, 2011, 1-78. http://ftp.jrc.es/EURdoc/JRC64206.pdf

Steer to the top

Source: Piniewski, B.; Codagnone, C. & Osimo, D.: Nudging lifestyles for better health outcomes: crowdsourced data and persuasive technologies for behavioural change European Commission, Joint Research Centre, Institute for Prospective Technological Studies, 2011, 1-78. http://ftp.jrc.es/EURdoc/JRC64206.pdf
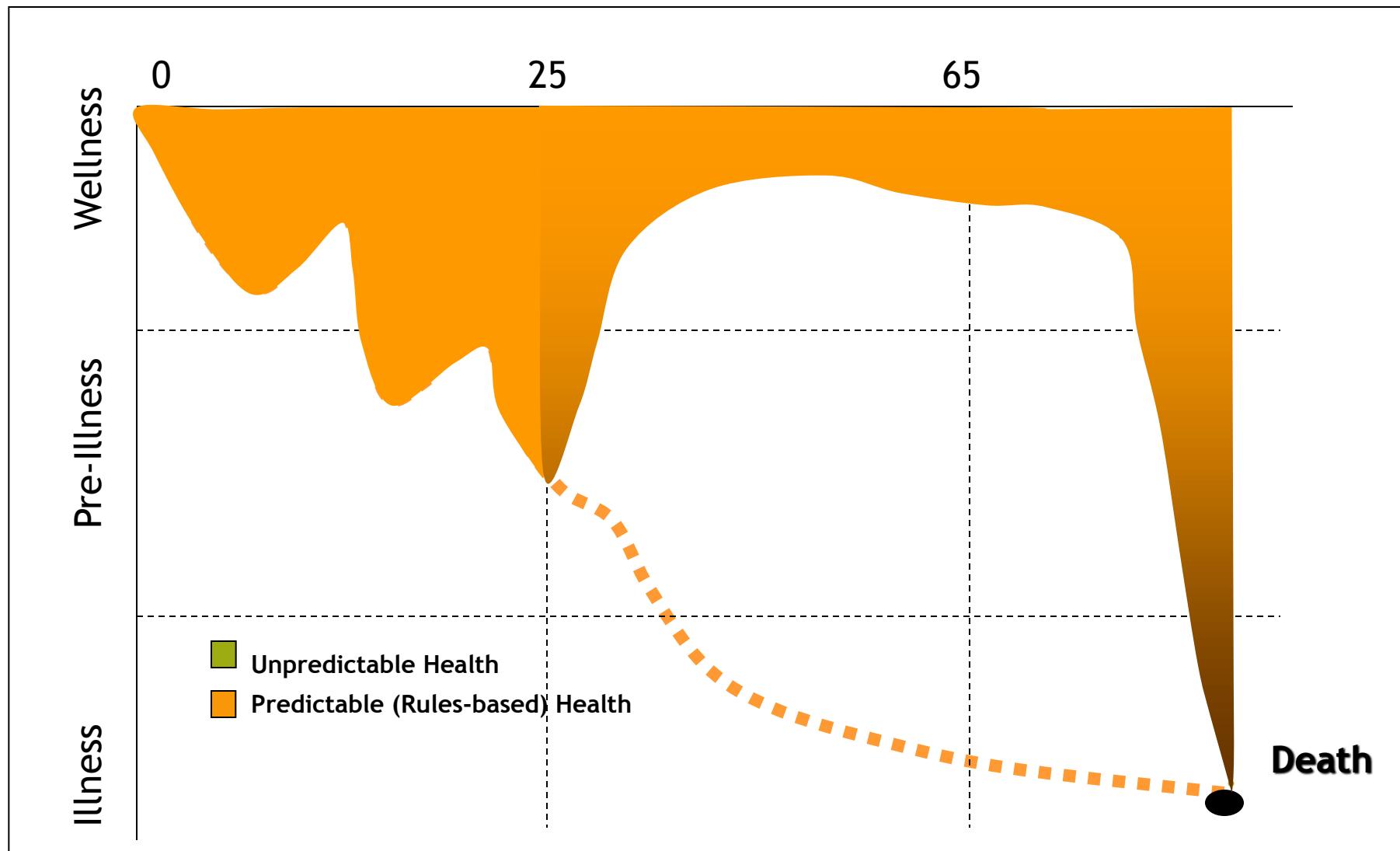
Bio-Feedback: A Solution

- Enable numeric sensing

- Directly feed to the individual "in the driver's seat"

- They will consciously change their behavior and react to sensor data

- Needed: Compliance management:

Definitions (abridged) from Tania M. Slawecki: How to Distinguish Legitimate Biofeedback / Neurofeedback Devices. January 2009 Report. Penn State University, Materials Research Laboratory, PA, USA. Available online: http://www.aapb.org/tl_files/AAPB/biofeedback/Legitimate%20Biofeedback%20January%202009.pdf

Rewards are better than punishment
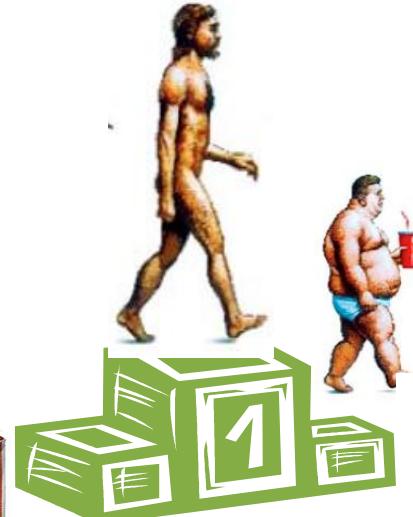
16,749,781
like this

77,801
talking about this

Juan Antonio Perez, Bernice Gaughan, Svetoslav Georgiev and 14,117 others like this.

View all 957 comments   1,552 shares

4,6 von 5

8 Beurteilungen

Stand der Dinge, Erfahrungen

- Medizingeräte, Apps, …
  - Alles da??

- GDA Software
  - Technik, IT, Erfahrungen vorhanden!

- Integrierte Systeme
  - PatientInnen
  - GDAs
  - …
  - Ein weites Feld für Motivierte

University of Applied Sciences
TECHNIKUM
WIEN

Die Kapsel besteht aus miniaturisierten Bauteilen, von denen einige auch in Digitalkameras eingesetzt werden

1 Optische Kuppel
2 Linsenhalter
3 Linse
4 LED
5 Kamera-Chip
6 Batterie
7 Prozessor
8 Antenne

Genetic profiling
- – Identification of genetic predispositions

Prognosis and treatment
- – Prediction of response to treatment
- – Tailoring treatment to tissue subtype
- Diagnostics – early detection of disease
  - – Serum protein biomarkers
- Identification of novel drug targets
- Application to multi-factor diseases

Agilent Technologies

(McConkey)

„Smart Pills Initiatives", Nanobiosensors

(Novartis, Proteus, Imaging, etc.) Public Health Services

Education and Training of Stakeholders

An increasing number of NFC enabled sensors

Spirometer

Smart Blisters

Glucometer

Blood Pressure Meter

ECG Event Recorder

Pedometer

KeepInTouch Telemonitoring

Body Weight Scales

Dohr A et al. **The Internet of Things for Ambient Assisted Living.** *Proceedings of the 7th International Conference on Information Technology : New Generations ITNG 2010, April 12-14, 2010, pp 804-809*

Decision making in medicine
a hospital, a medical device company, …
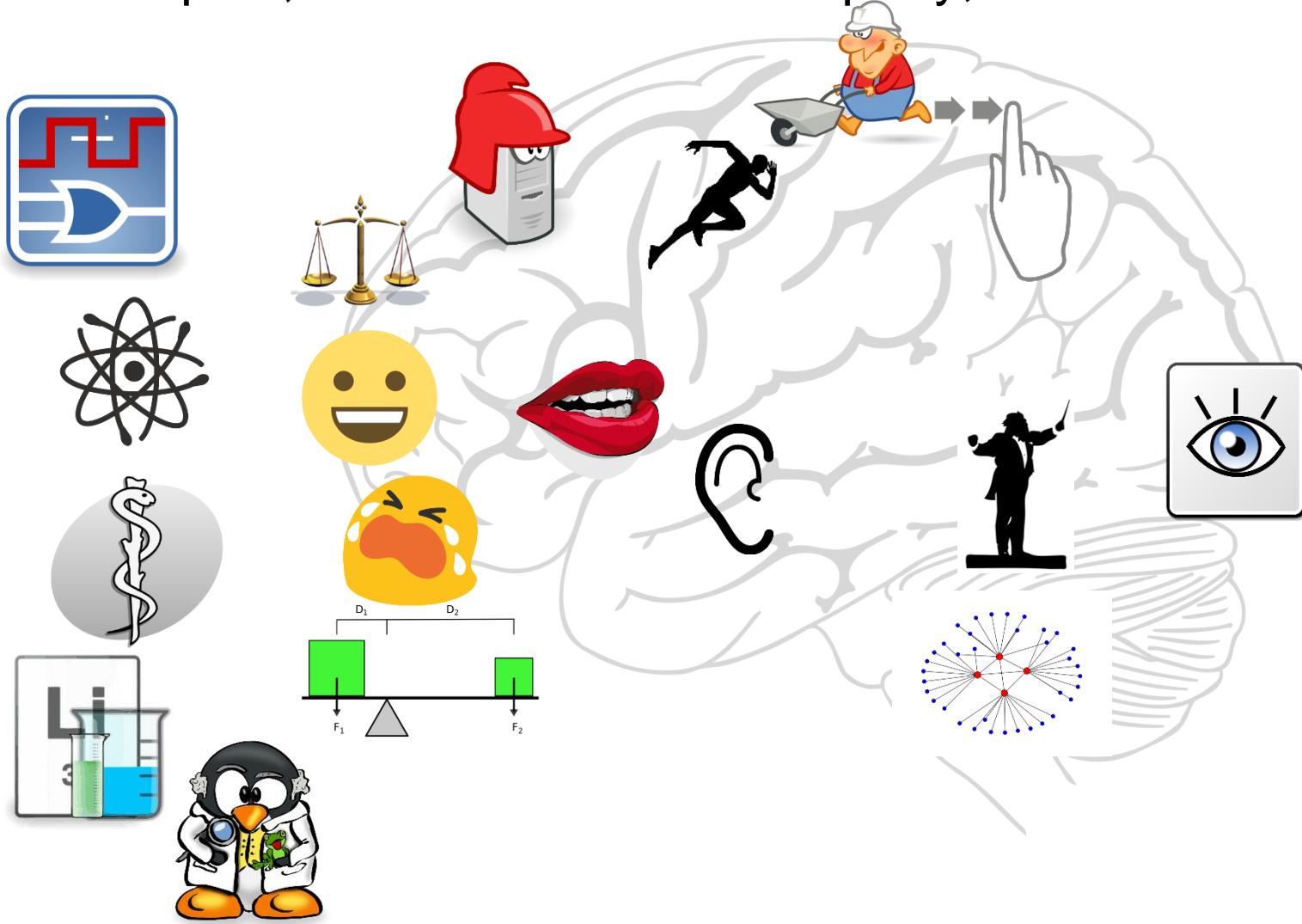
Again, for the engineers
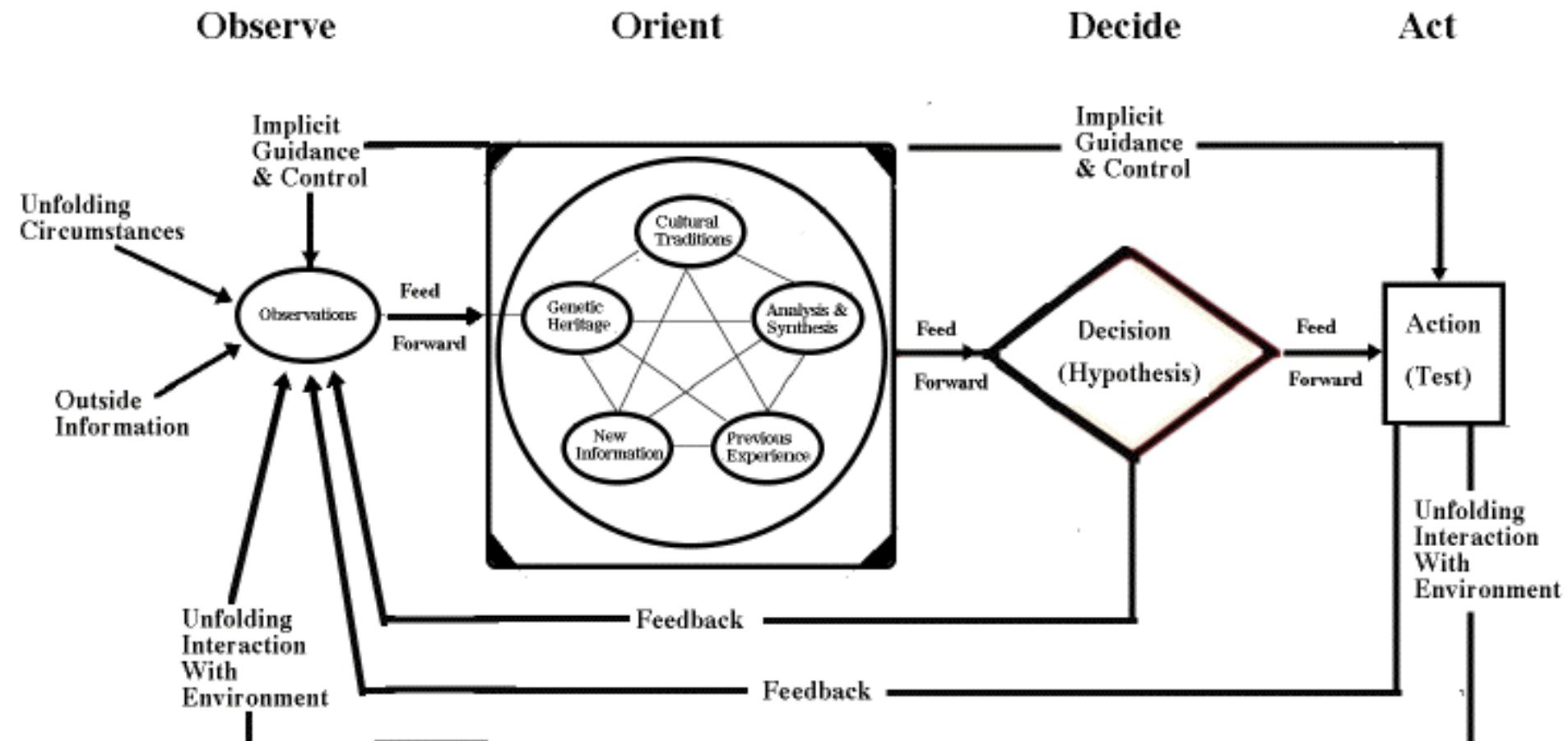
John Boyd's OODA Loop

See image sources and references at https://mahara-mr.technikum-wien.at/group/mbe/learning-knowledge-map

„Digital" provides benefit, if it unloads the brain: Transform the information! Preprocessing!
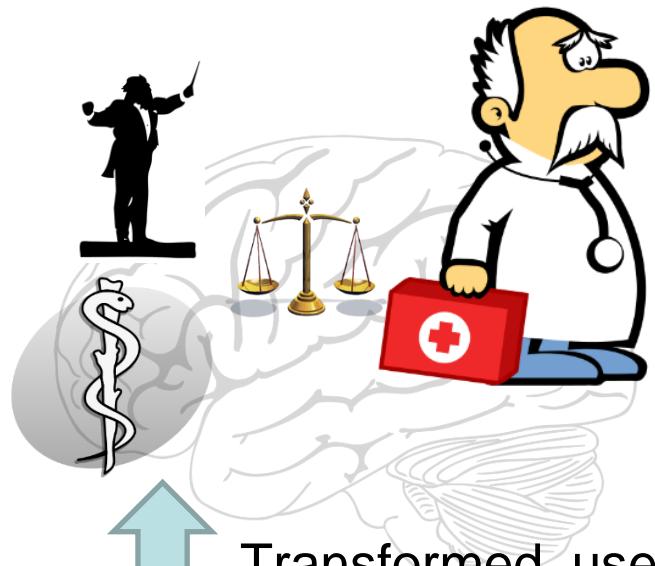

We provide better decisions with less effort

Transformed, useful packets reach our brain
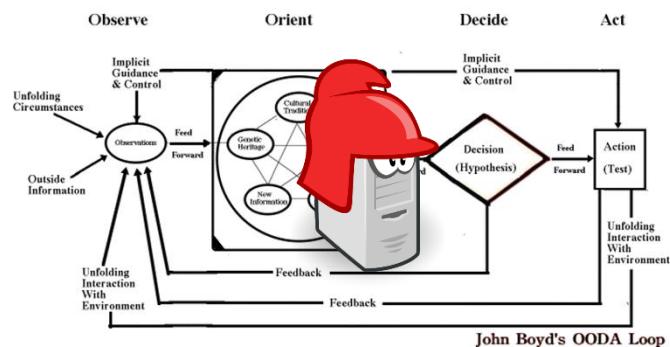
Raw information flows in

See image sources and references at https://mahara-mr.technikum-wien.at/group/mbe/learning-knowledge-map
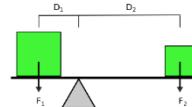
First telemonitoring implementations in Austria planned as national coherent service

- Diabetes Mellitus Type II
- Heart failure
- Implant follow up

- COPD next candidate

- Using a committed IT architecture, including selected medical devices, apps, software, …
- Providing quality, safety, security, interoperability, …
- Support patients with multimorbidities

- See https://www.bmgf.gv.at/home/Gesundheit/E-Health_Elga/Telemedizin/

Infrastrukturen - historisch

- **Die Erfindung**

- **Erste Anwendungen**
  - Juhuu es geht!

- **Verteilte Geschäftsmodelle**
  - Weil einer allein es nicht schafft

- **Integrierte Systeme**
  - Lokale Inseln bilden sich, es ist klart, wer was liefert

- **Einheitliche Infrastrukturen**
  - Wenn sich die Inseln vernetzen wollen – ein möglicher Weg
  - e-Card, ELGA, … **IT Architekturen, IT Infrastrukturen**

The Theory of Kondratieff Waves

- Prosperity

- Recession

- Depression

- Improvement

- Source: Analysen und Trends: Der 6. Kondratieff – Wohlstand in langen Wellen. Januar 2010. Allianz Global Investors, Kapitalanlagegesellschaft mbH, Frankfurt am Main.
 https://www.allianz.com/v_1339501931000/media/press/document/kondratieff.pdf

Technology and economy come in waves

steam engine
cotton

railway
steel

electrical
engineering
chemistry

petrochemicals
automobiles

information
technology

P R D E

1. Kondratiev   2. Kondratiev   3. Kondratiev   4. Kondratiev   5. Kon...

1800   1850   1900   1950   1990
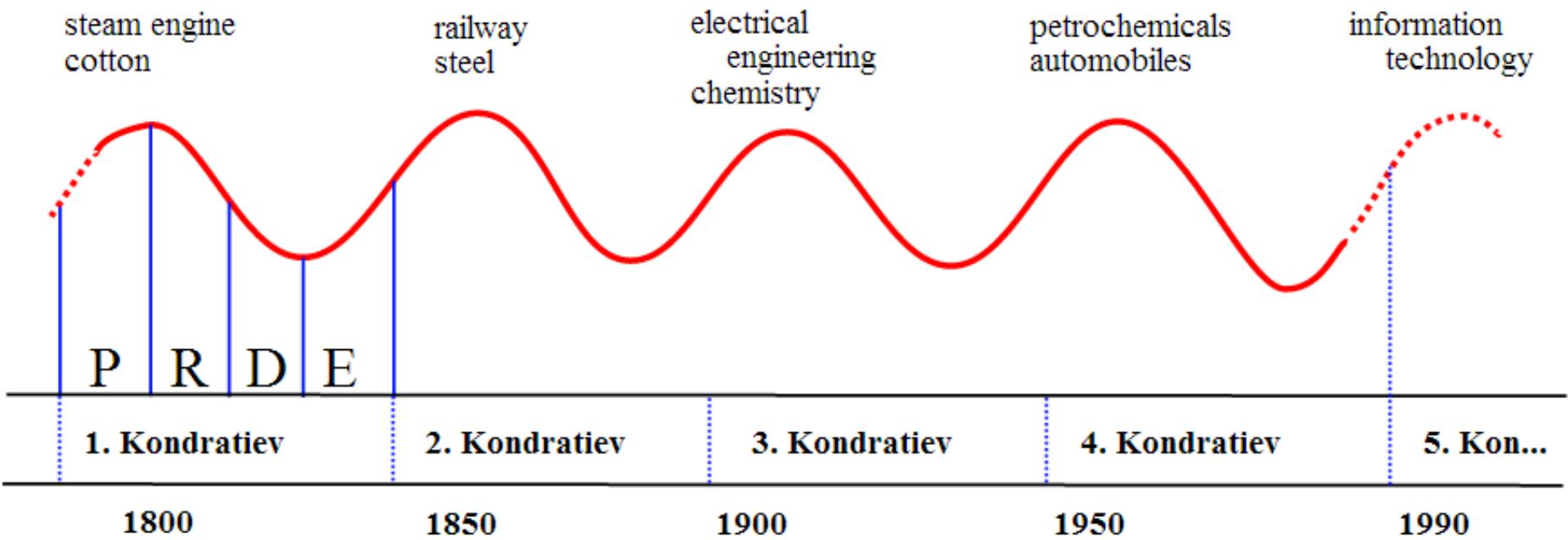
P: prosperity
R: recession
D: depression
E: improvement

- Image: Rursus / Wikimedia: A rough schematic drawing showing the "World Economy" over time according to the Kondratiev theory. License CC BY-SA 3.0.

Continua Architecture
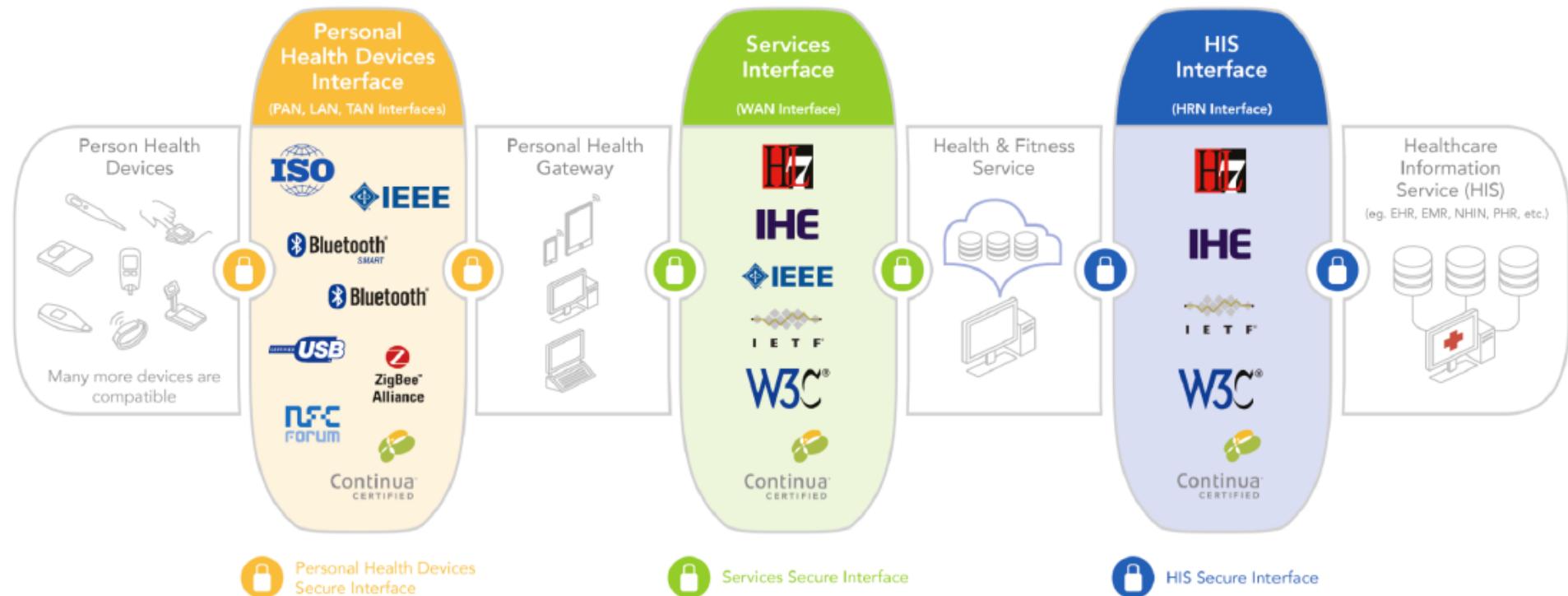
Continua High Level Architecture. Source: Personal Connected Health Alliance (PCHA) White Paper - Fundamentals of Data Exchange, September 2015. Available online:https://cw.continuaalliance.org/document/dl/13473

Austrian IT Architecture Draft for telemonitoring
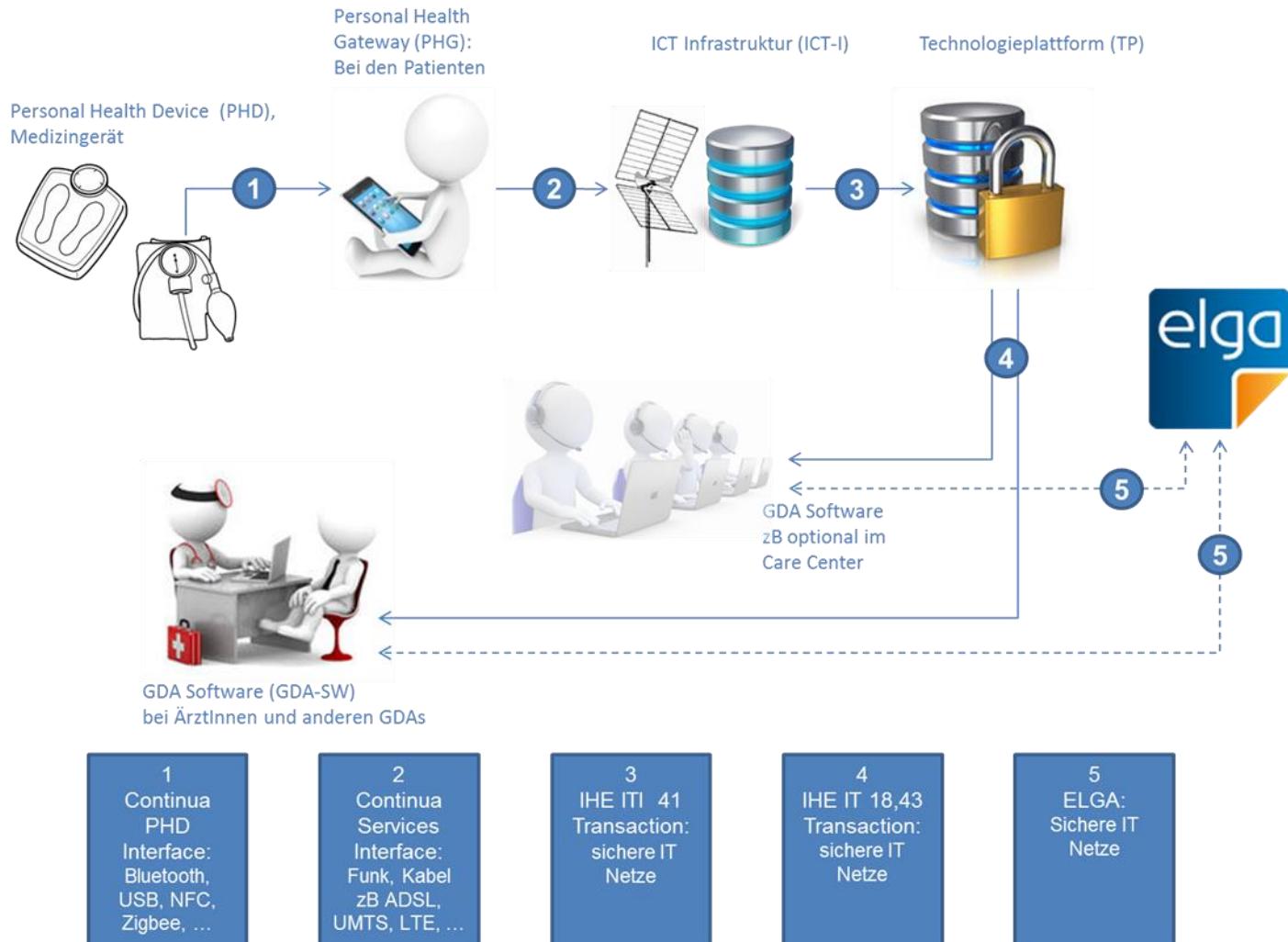
Image: Stefan Sauermann, Irina Weik: eHealth Applications in Austria: Telemonitoring. DGTelemed: 7. Nationaler Fachkongress Telemedizin, 3-4. November 2016, Berlin, Germany. Online: https://mahara-mr.technikum-wien.at/artefact/file/download.php?file=2289

Organisatorische Rollen
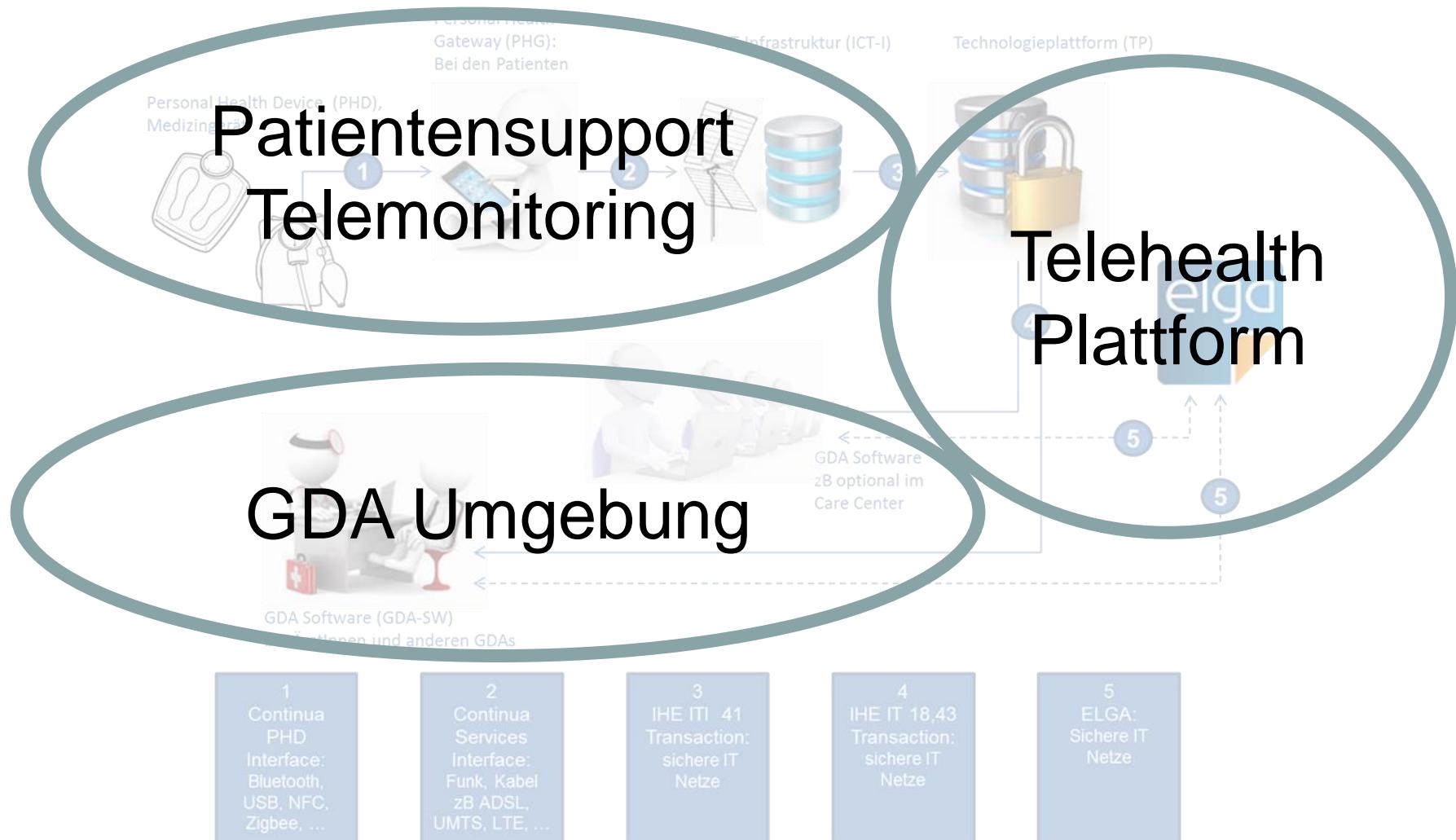
Patientensupport Telemonitoring

Telehealth Plattform

GDA Umgebung

Aufgabenverteilung

Das könnte auch ihr Spital sein!!

- Patientensupport Telemonitoring
  - unterstützt PatientInnen bei der Meßwerterfassung, Einschulungen
  - Führt Medizin-Geräte-Management, laufende Wartung durch
  - Garantiert Qualität der Meßwerte, Einhaltung der medizinischen, vertraglichen, rechtlichen, ... Rahmenbedingungen
  - Stellt korrekte Zuordnung der Meßwerte zu PatientInnen-IDs sicher

- GDA Umgebung
  - Stellt Meßwerte dar und unterstützt die Interpretation
  - Ermöglicht telemedizinische Patientenbetreuung
  - Bietet Decision Support
 - Unterstützt Workflows

- Telehealthplattform
  - Sammelt sämtliche personenbezogenen Vitalparameter Meßwerte
  - Ermöglicht Rückmeldungen von GDAs an die PatientInnen
  - Untertützt sämtliche Disease Management Programme, organisations- und herstellerübergreifend
  - Stellt Datenschutz und Datensicherheit sicher

Austrian IT Architecture Draft Interfaces

Image: Stefan Sauermann, Irina Weik: eHealth Applications in Austria: Telemonitoring. DGTelemed: 7. Nationaler Fachkongress Telemedizin, 3-4. November 2016, Berlin, Germany. Online: https://mahara-mr.technikum-wien.at/artefact/file/download.php?file=2289
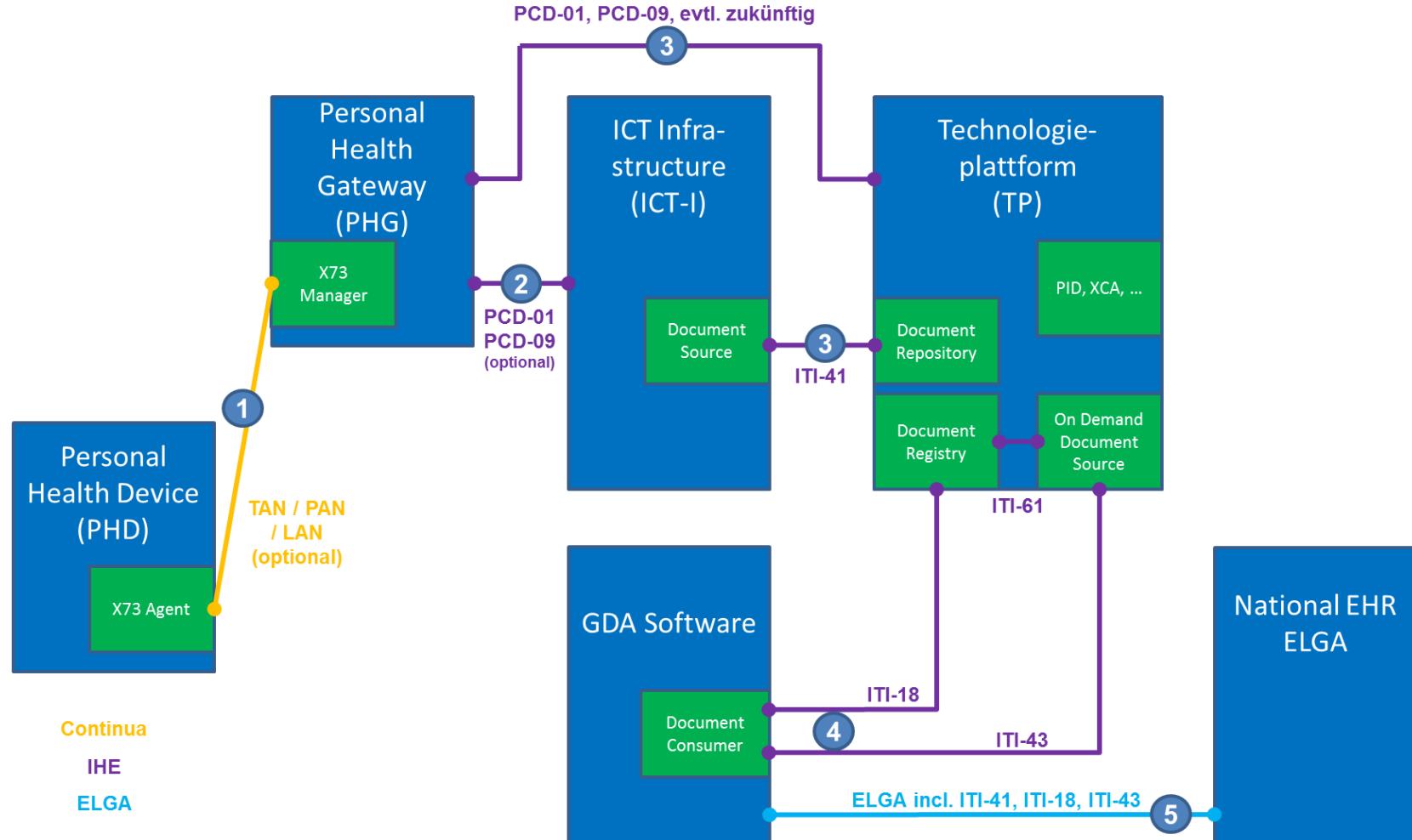
Austrian IT Architecture Draft
Common elements to ELGA

Image: Stefan Sauermann, Irina Weik: eHealth Applications in Austria: Telemonitoring. DGTelemed: 7. Nationaler Fachkongress Telemedizin, 3-4. November 2016, Berlin, Germany. Online: https://mahara-mr.technikum-wien.at/artefact/file/download.php?file=2289
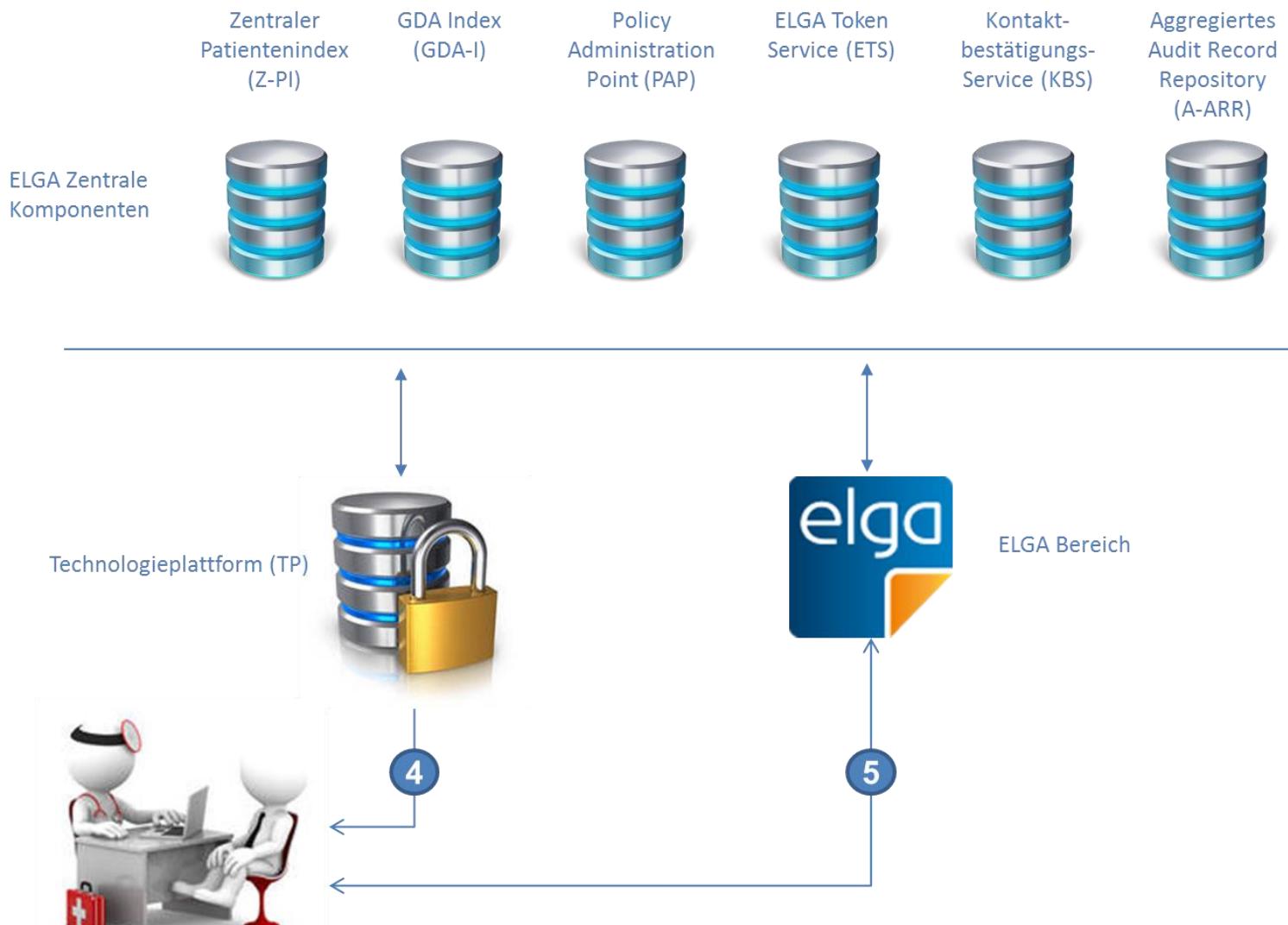
Transport, logistics

- Goods, packed

- Put in containers

- Shipped via train, ship, truck

- Into storage

- and out again

- As you ordered!!

By Fotokannan (Own work) [CC BY-SA 3.0 (http://creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons, https://commons.wikimedia.org/wiki/File%3ACashew_nut_packet.jpg

By Maersk Line (Containers on trucks in the 70s) [CC BY-SA 2.0 (http://creativecommons.org/licenses/by-sa/2.0)], via Wikimedia Commons

Automated Storage and Retrieval System, Defense Visual Information Center by Lance Cheung [Public domain], via Wikimedia Commons.

Free Delivery Logo, by Shanraj4444 (Own work) [CC BY-SA 4.0 (http://creativecommons.org/licenses/by-sa/4.0)], via Wikimedia Commons

Power Grid Infrastructure

From Power Plant to Home
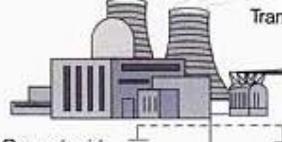
1. Generation
Transformer
Ground grid

2. Transmission

HIGH VOLTAGE
120v
Neutral

Transformer
Ground wire

3. Regional Distribution
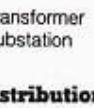
Transformer substation
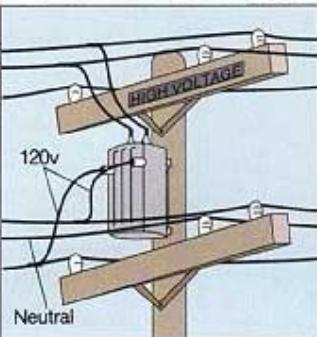
4. Residential Distribution

Ground rod

5. Service Entrance

Circuit breakers
Cables to house circuits
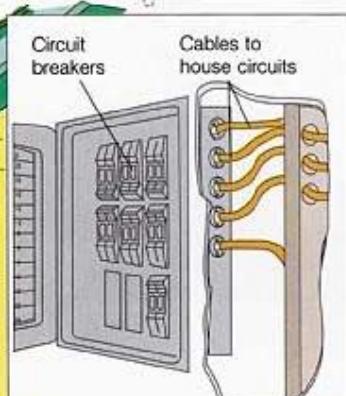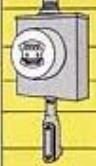
6. Main Service Panel
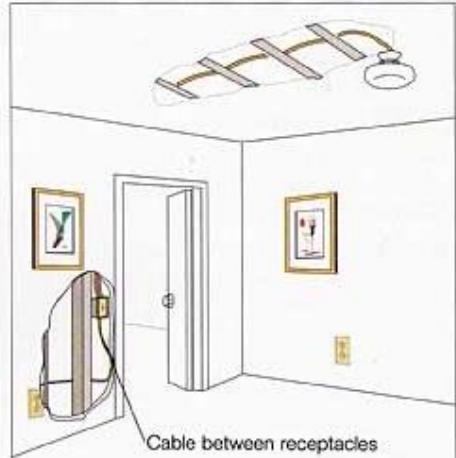
Cable between receptacles

7. Final Usage

Behind the wall you find …

Image source: Do-It-Yourself Resources: Supplies and Tips for Home Improvement and DIY: Basic Wiring Techniques.
http://diy-resources.com/Basic-Wiring-Techniques_orth-0.html

Summarising the implementation status
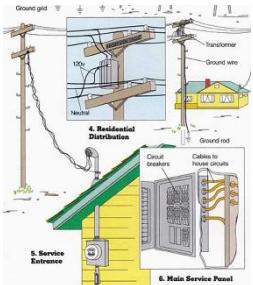
- Agreement among stakeholders and vendors in Austria and internationally:

  - We can collect data from "patient support telemonitoring" on short term
    - In the form of CDA documents with patient ID
    - Including all measured values coded as IEEE 11073
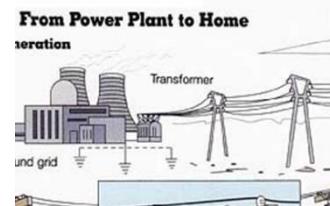
  - We can build the "telehealth platform" on short term
    - Reusing existing EHR / ELGA components
    - Based on IHE XDS, HL7 CDA, Continua Guildelines
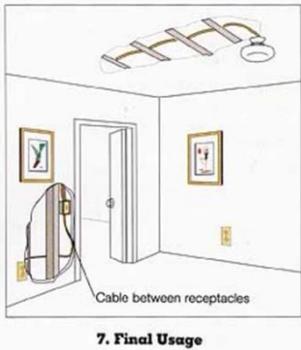
  - Healthcare provider IT environments will be able to connect to the telehealth platform on short term
    - Reusing existing EHR / ELGA interfaces

Nordics

- Denmark
  - Architecture finalised 2013
  - Continua recommended for PHD to AHD, not mandatory

- Norway
  - Architecture underway
  - Continua recommended for PHD to AHD, not mandatory

- Sweden
  - Architecture underway
  - Continua recommended for PHD to AHD, not mandatory

- Dynamic evolution of additional work

Continua Summer Summit (Paris, France): June 24-26, 2015, Opening plenary 2 – Large scale adoption, slideset on large scale adoption. Available online http://www.continuaalliance.org/sites/default/files/Continua_Open_House_LargeScaleAdoption_2015.06.24.pdf

Continua Summer Summit (Paris, France): June 24-26, 2015, Parallel session 2 – Nordic market access workshop. Slideset on nordic market access. Available online
http://www.continuaalliance.org/sites/default/files/Continua_Open_House_NordicMarketAccess_2015.06.24.pdf

Österreich - Beispiele

- Gesundheitsdialog Diabetes
  - VAEB
  - http://www.vaeb.at/portal27/vaebportal/content?contentid=10007.747216

- Herzmobil Tirol
  - Universitätsklinik Innsbruck, Tirol Kliniken, AIT Austrian Institute of Technology
  - https://www.it-press.at/presseaussendung/IKT_20150825_IKT0009/alpbacher-gesundheitsgespraeche-bild
  - https://www.tirol.gv.at/fileadmin/themen/gesellschaft-soziales/soziales/Sonstiges/Pflegesymposium/Integrierte_Betreuung_von_Patienten_mit_Herzinsuffizienz_am_Beispiel_von_HerzMobil_Tirol.pdf

- Therapie Aktiv
  - StGKK
  - http://diabetes.therapie-aktiv.at/portal27/diabetesportal/content?contentid=10007.682095&viewmode=content

- …

Current issues

- Products needed in line with IT architecture
  - Medical devices
  - Hardware, software solutions
  - Conformant to regulatory requirements

- Konsultation Rahmenrichtlinie bis 20.11.2017
  - Kommentare an rahmenrichtlinie@bmgf.gv.at

Weitere Schritte - wohin

- Weitere Abstimmung zu
  - Integrierten Versorgungsprozessen
  - organisatorischen Fragen
  - IT-Integration
  - Datenschutz, Security
  - Medizingeräte Regulatorien
  - PatientInnen, AnwenderInnen, …

- Mit
  - GDA Organisationen in AT und EU
  - mit laufenden Initiativen in Österreich
  - Administrationen
  - mit ELGA+
  - International / EU
  - Herstellern
  - …

Weitere Schritte – Orientierung

- Wo ist der organisatorische Kern
  - Zielsteuerung-Gesundheit ab 2017 ?
    - „Für den Bereich **eHealth** und **Gesundheitstelematik** werden für die Periode ab 2017 die wesentlichen Schwerpunkte der gemeinsamen Politik festgelegt und priorisiert und die dafür notwendigen Finanzmittel sichergestellt."
      - https://www.bmgf.gv.at/home/Gesundheit/Gesundheitsreform/_nbsp_Rechtsgrundlagen_der_Zielsteuerung-Gesundheit_ab_2017
    - Hier besteht auch eine Plattform der "ELGA Systempartner"

- Gern dabei: Interoperabiliätsforum der Standards-Organisationen in Österreich
    - https://hl7.at/home/oesterreichisches-interoperabilitaetsforum/

- Gemeinsam besser als einsam
- Österreich ist zu klein für einen Alleingang
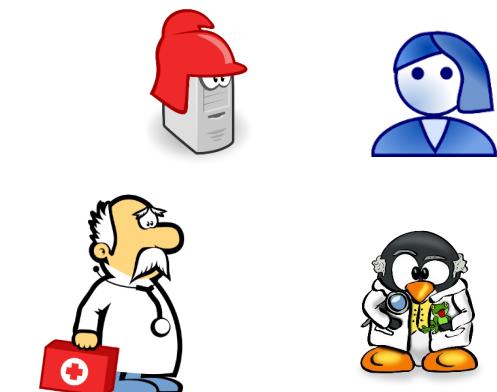
Projekt INNOVATE

Innovation Lab für Medizintechnik und eHealth

Softwarebibliotheken
und **Guidelines** zur
sicheren Integration von
mobilen eHealth
Anwendungen

Developerkits
Interoperabilität
Open Data
Security
Usability & Accessibility

Innovation Lab
Test- und
Demonstrationslabor,
integrative Laborstruktur

Support für User, Wirtschaft, KMUs, …

Kooperation:
Vernetzung von
Daten rund um den
Pollenflug

Kooperation:
Integration von Daten
Aus Medizingeräten

Ziele

INN✚VATE
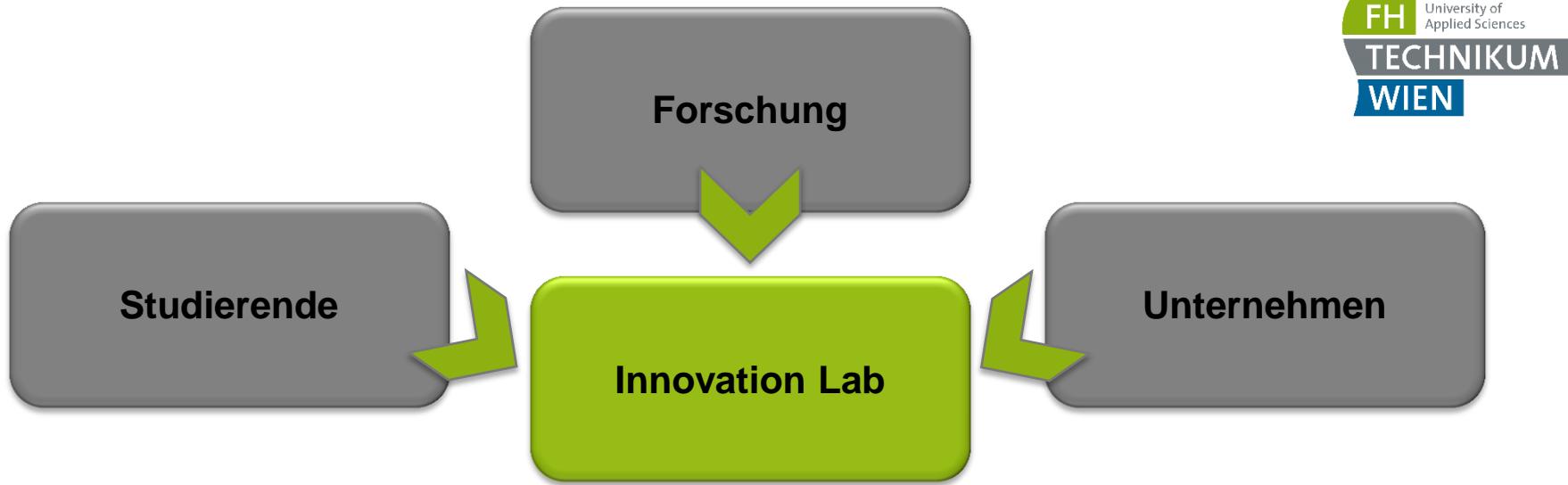
- Bereitstellung technologischer Basis
- Demonstration strukturierter Innovations-Prozesse
- Senkung der Einstiegshürden

Health Connect Project

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Research Team „Secure Services, eHealth & Mobility @ Technikum Wien:

Key Research

Alexander Mense, Stefan Sauermann

Research

Veronika David, Mathias Forjan, Matthias Frohner, Birgit Pohn, Philipp Urbauer

Konferenz 2017: Primärversorgung Wegbereiter für den integrierten Versorgungsansatz

- [23.11.2017, Klinikum Wels-Grieskirchen](#)

- [Details](#), Programm

- [Plenum 1: Die digitale Revolution in Gesundheitseinrichtungen: Wohin geht die Reise für die Gesundheitsförderung?](#)

- Telemonitoring, Rahmenrichtlinie wird Thema sein

Wir freuen uns auf weitere Aktivitäten!

- Radiologie
  - Bestehende Erfahrungen nützen
  - Gemeinsam ausbauen

- Blutdruck, Gewicht, Temperatur etc
  - Scheint machbar – langsam in der Praxis beginnen??!!

- OP, ICU
  - Spezifikationen international in Entwicklung
  - very early adopters können es wagen

- IHE Austria – Arbeitsgruppe Beschaffung
  - http://ihe-austria.at/arbeitsgruppen/

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- Informieren Sie sich beim IHE Day 2017 über die geplante eHealth-Zukunft Österreichs und internationale Referenzprojekte wie eImpfpass, eRezept und Patient Summary.

- 11:00 Uhr, Techgate/Ringstage, Wien
- http://ihe-austria.at/save-the-date-ihe-day-2017-8-november-ring-stage/

- Hier und jetzt ANMELDEN!

- Kennenlernen, gemeinsam beginnen