» Gaining New Medical Insights through Interactive Visual Exploration

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DONAU UNIVERSITÄT KREMS

DEPARTMENT OF INFORMATION AND KNOWLEDGE ENGINEERING

i k e

On behalf of...

DEPARTMENT OF
INFORMATION AND KNOWLEDGE ENGINEERING

Danube University Krems, Austria
Department of Information and Knowledge Engineering

Danube University Krems, Austria

University of Continuing Education

- Postgraduate
- For Executives
- About 3500 Students

Established in 1994

- 2004 – Federal Law:
  - Equated with other Austrian Universities

15 Departments

Applied Research

New Campus opened 2005

Situated in the Wachau (UNESCO World Cultural Heritage area)

80 km west of Vienna


Univ of Maryland College Park
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Google
Pointer 38°59'39.23" N 76°56'52.32" W
Streaming
100%
Eye alt 2.80 km

Research Projects

ieg information engineering group

DEPARTMENT FÜR INFORMATION UND KNOWLEDGE ENGINEERING

DisCō

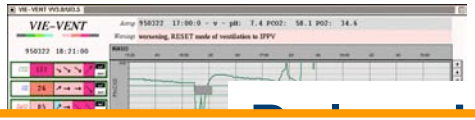
ViCo: Metric for the Complexity of InfoVis

Medical Knowledge-Based Systems

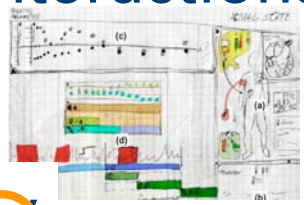
VIE-Nmed

VIE-PNN

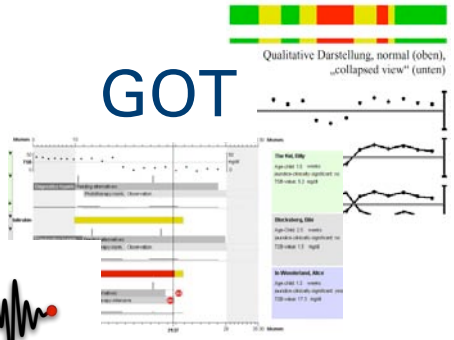
VIE-VENT



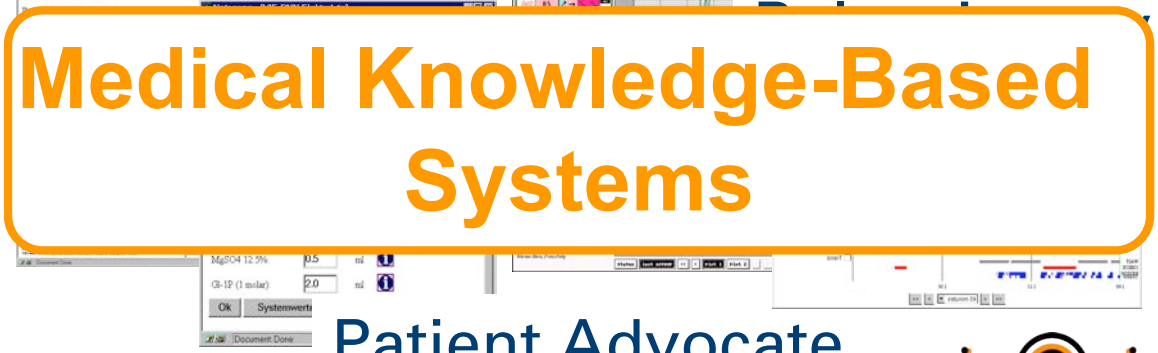
Midgaard Interactions



GOT



TimeViz Visualizing



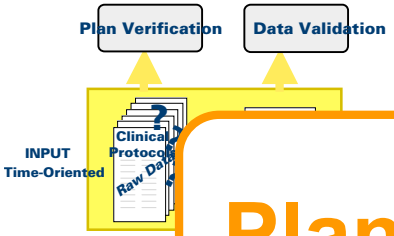
Patient Advocate

in2vis

Visual Analytics & Information Visualization

V & V

Protocure



Asgaard/Asbru

Plan Management

LASSIE

DeltA

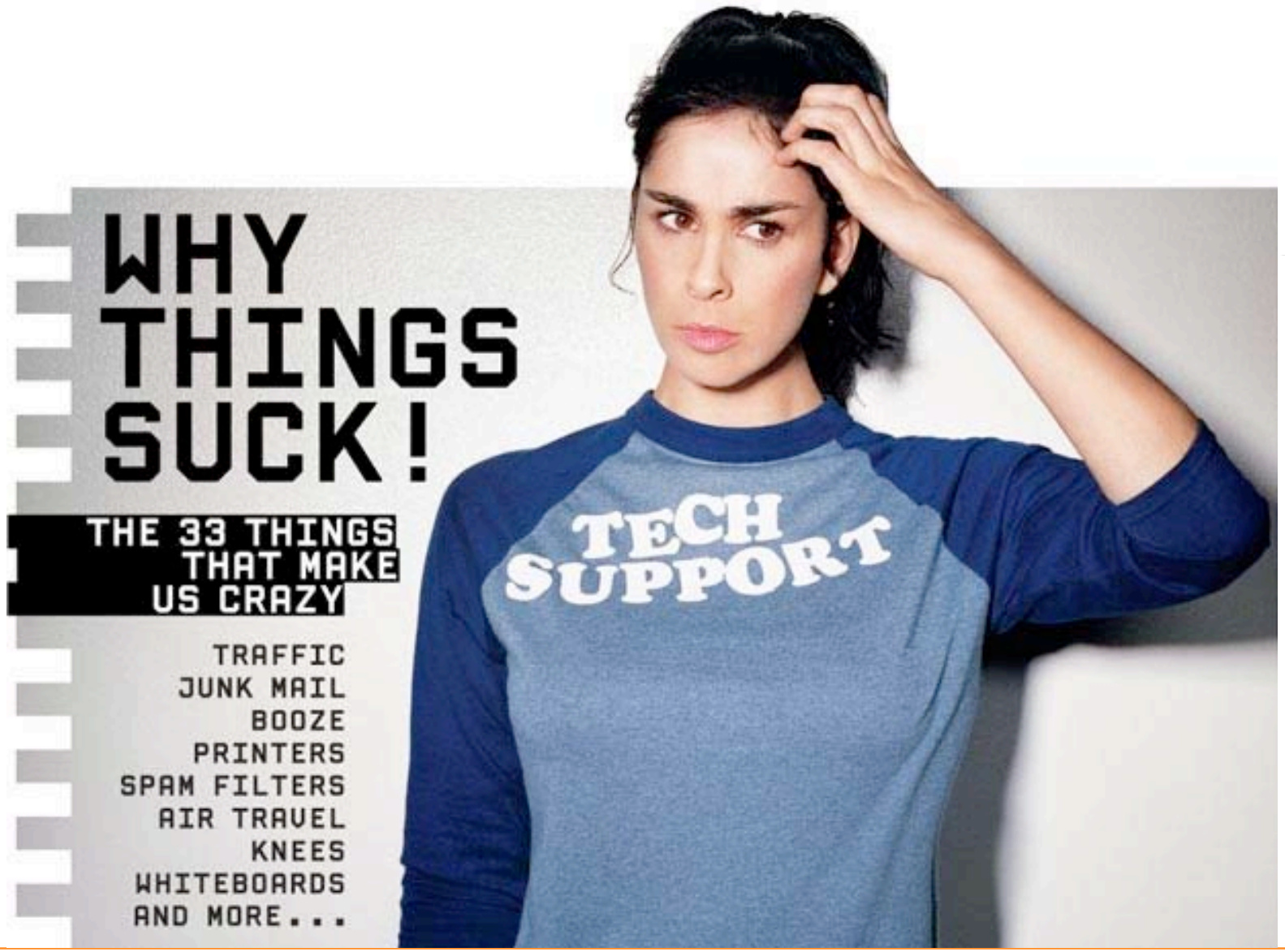
SDUF

Interactive Visual Exploration

Electronic Health Records


Image credits: Paul Bodea, http://www.sxc.hu, Photo #920911

BUT...



[Wired Magazine, February 2008]

Data Explosion

Data Explosion

Data Explosion

„Doctors in developed countries seem to be overwhelmed by the information provided to them and the amount of information is enormous and disorganized.“

[Smith, 1996]

Data Explosion

„Industry studies show that a paper medical record is missing up to 30 percent of the time for an office visit and paper medical records are almost never available for patient care in an emergency room.“

Kaiser Permanente, KP HealthConnect, Retrieved at: May 22, 2008.

Data Explosion

„Physicians in hospitals spend up to a quarter of their work time searching for patient-related information.“

Wolfgang Dorda, Zukunftsforum vom 7.6.3006, Conect Eventmanagement

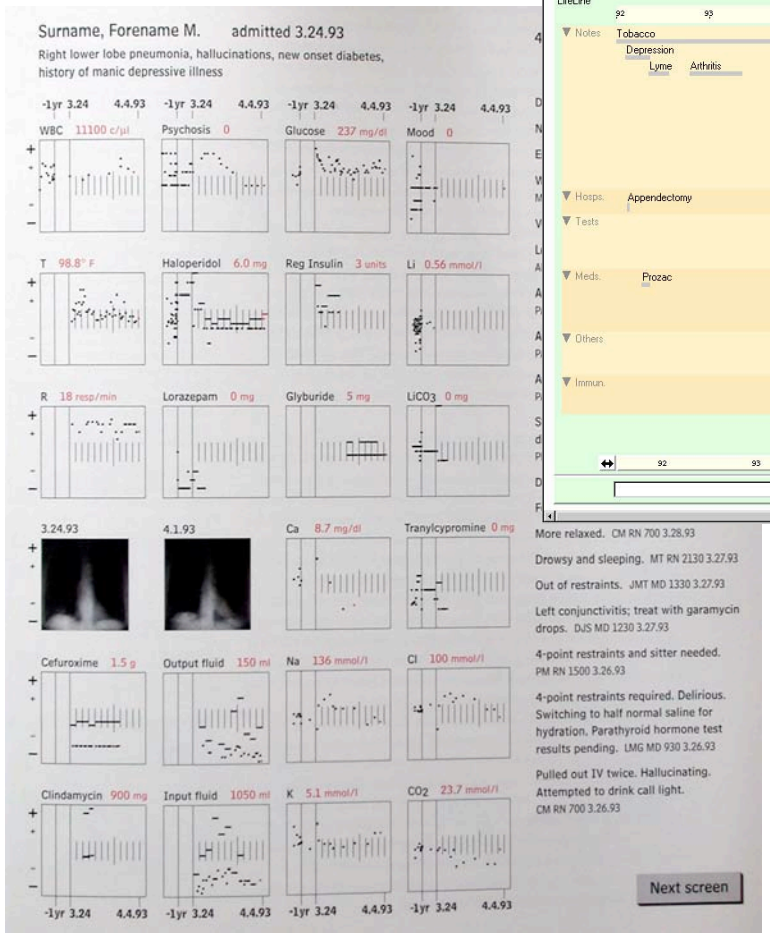
Electronic Health Record

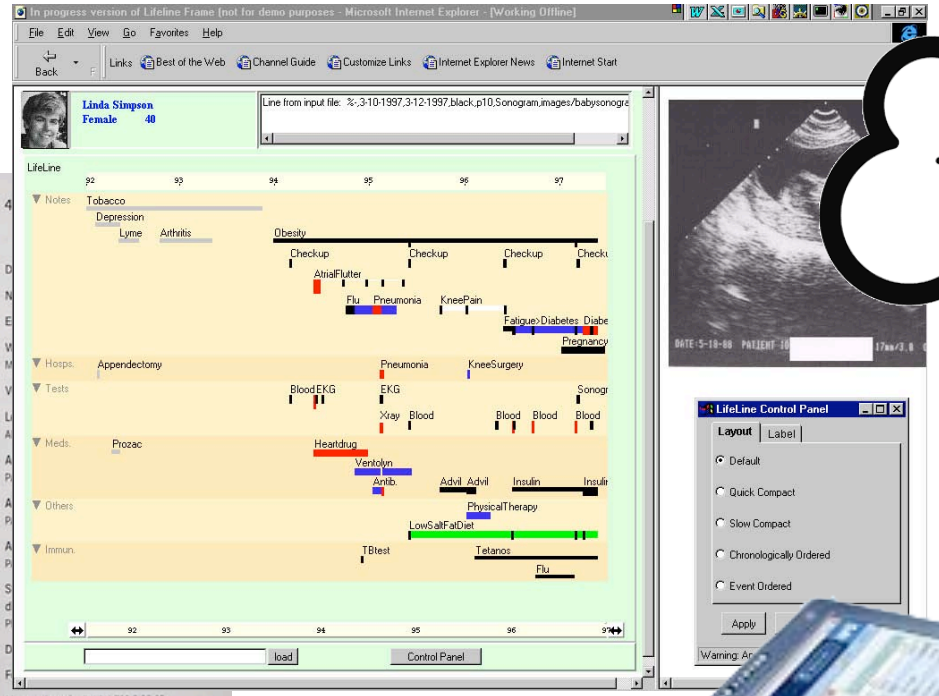
„A repository of electronically maintained information about an individual's lifetime health status and health care, stored such that it can serve the multiple legitimate users of the record.“

Frédéric Loeurng, Glossary - Information Society Technology, 2001.
http://cordis.europa.eu/ist/ka1/administrations/publications/glossary.htm

Data Dumps → Insights

[Powsner & Tufte, 1994]

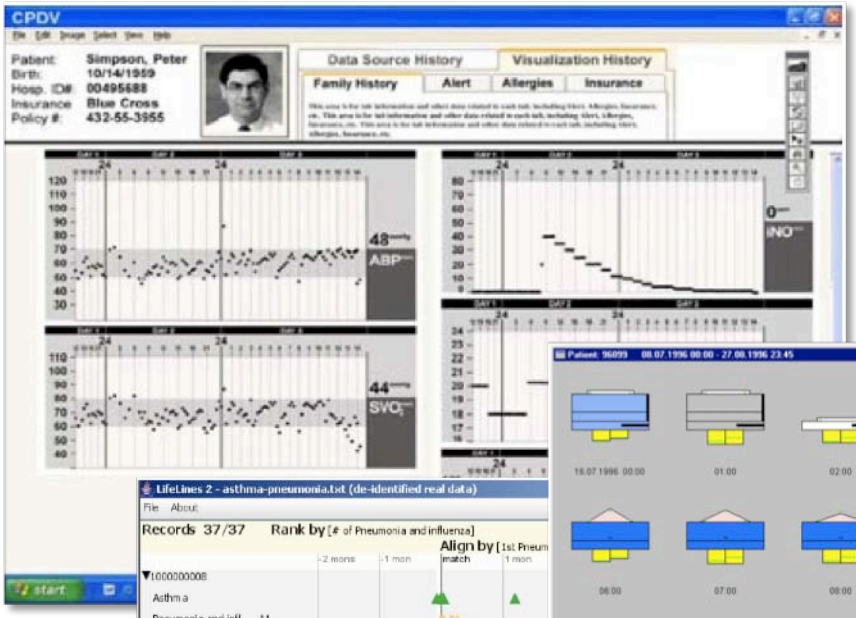


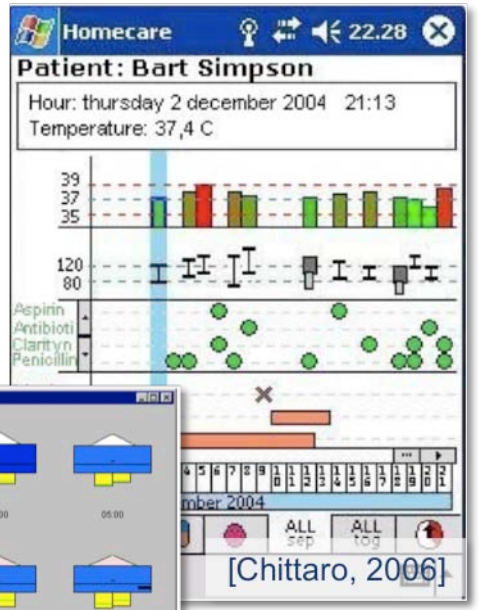


[Plaisant et al., 1998]

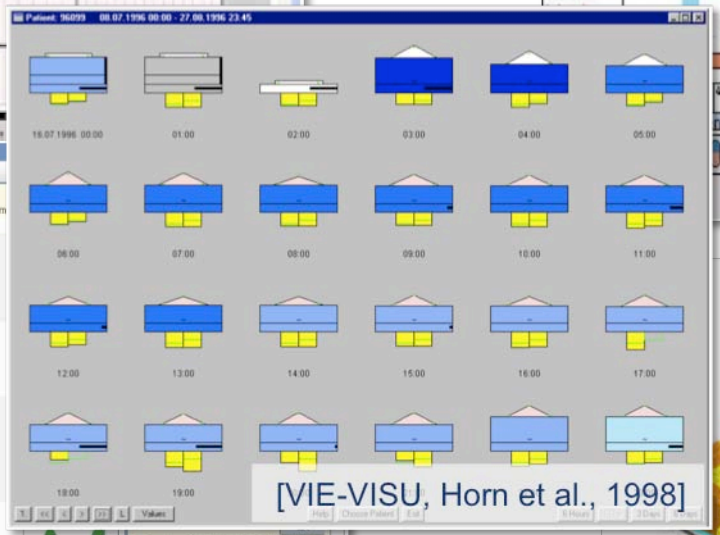
[Lorenzo, 2008]

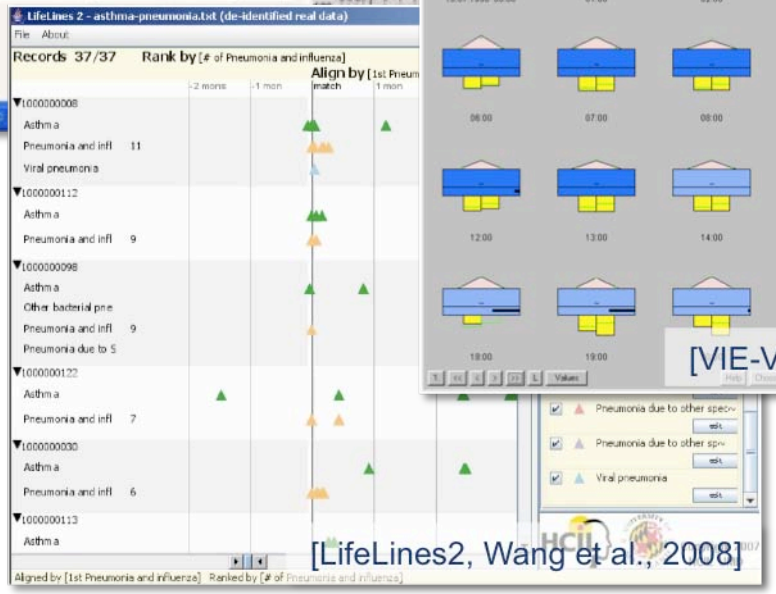
Where are we now?



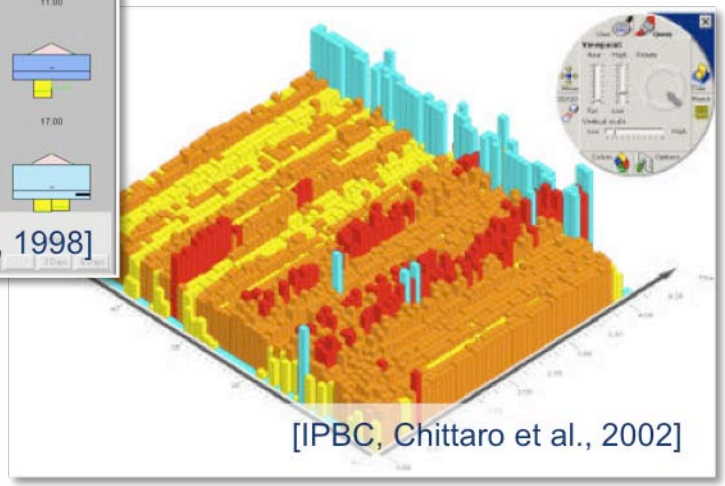


[Chittaro, 2006]

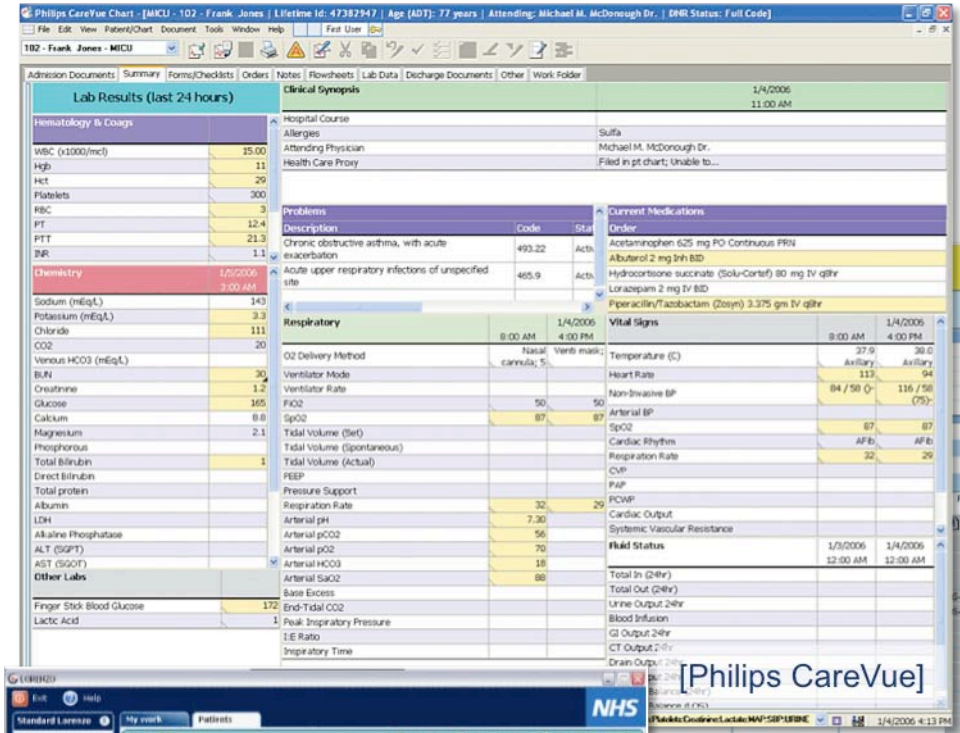

[VIE-VISU, Horn et al., 1998]



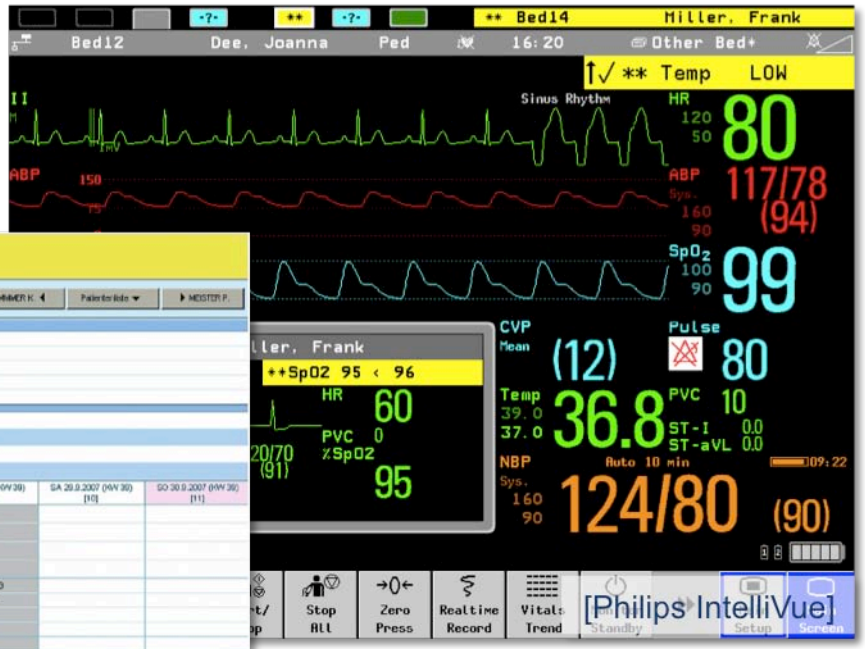
[LifeLines2, Wang et al., 2008]


[IPBC, Chittaro et al., 2002]

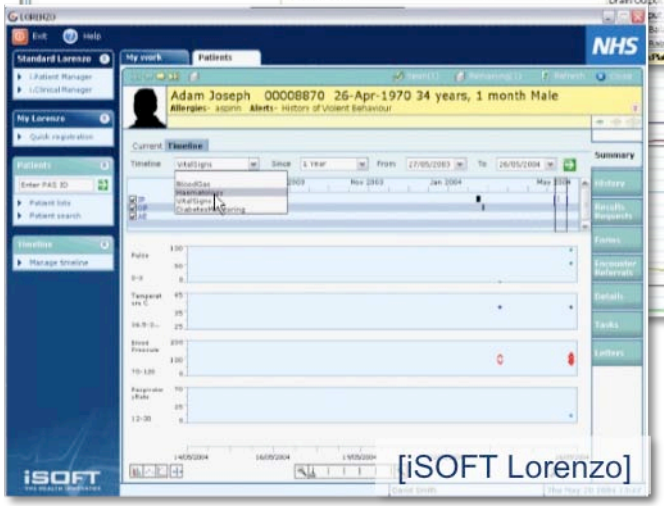
Where are we now?



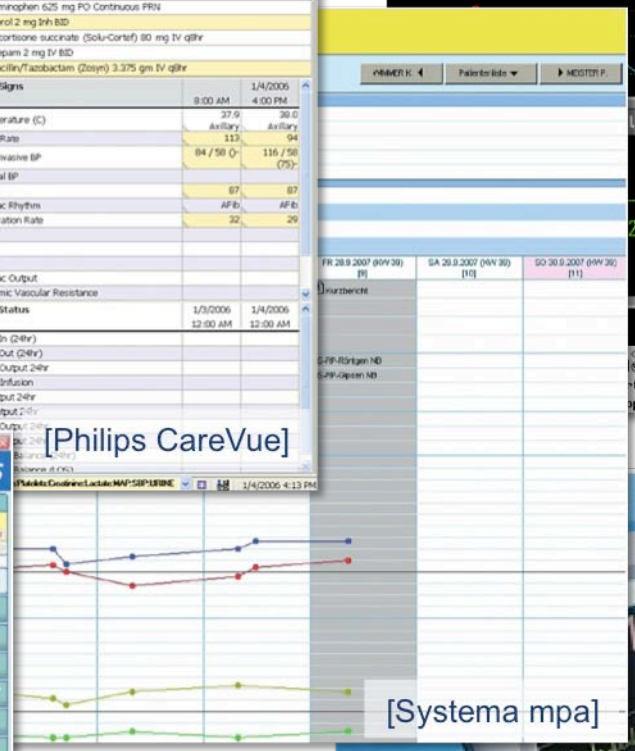
[Philips CareVue]



[Philips IntelliVue]



[iSOFT Lorenzo]



[Systema mpa]

[Dräger medical]

Challenges

Image credits: Sanja Gjenero, http://www.sxc.hu, Photo #886254

Image credits: Jenny W., http://www.sxc.hu, Photo #209336

Challenge #1

Interaction is key

Interactive Information Visualization: Exploring & Supporting Human Reasoning Processes

GRAVI

Interactive Information Visualization of Highly Structured Temporal Data

WWTF
Wiener Wissenschafts-, Forschungs- und Technologiefonds

Klaus Hinum, Silvia Miksch, Wolfgang Aigner

ieg information engineering group

TU VIENNA

Margit Pohl, Markus Rester

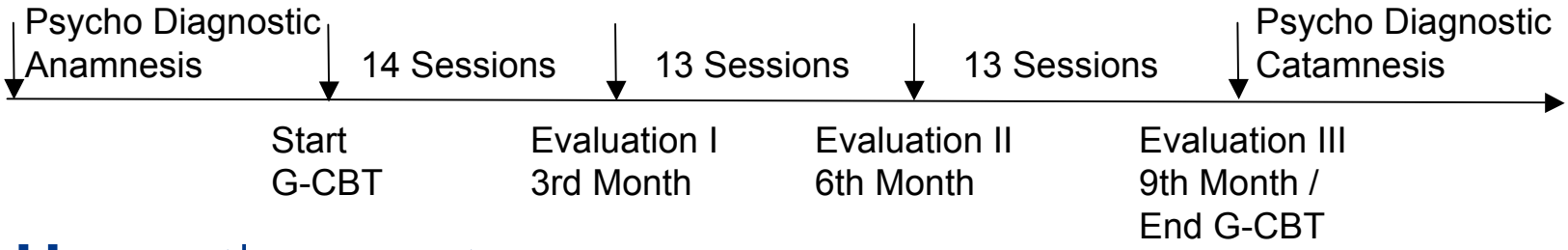
igw

TU VIENNA

Susanne Ohmann, Christian Popow

MEDIZINISCHE UNIVERSITÄT WIEN

Therapeutic Management of Anorectic Girls (*Cognitive Behavioural Therapy (G-CBT)*)



Users: therapeuts

Data: complex, highly structured, time-oriented

Task: finding predictors

Gravi++: Demo


File
Questions
Persons
Windows
Help
ListVis
Persons
Person:1C
Person:2C
Person:3C
Person:4C
Person:5C
Person:6C
Person:7C
Person:8C
Person:9C
Person:10C
Person:14C
Person:15C
Person:16C
Person:18C
Person:22C
Person:23C
Questions
Question:f(x)ASW
Question:f(x)BDI
Question:f(x)BMI
Question:f(x)CBCL Treffen Fr
Question:f(x)CBCL Zahl Fr
Question:f(x)MR EVA
Question:f(x)MRSOC
Question:f(x)Restraint
Question:f(x)SD
Question:f(x)SPS
Question:f(x)YSR Treffen Fr
Question:f(x)YSR Zahl Fr
f(x) BDI
f(x) Restraint
f(x) SPS
f(x) MR EVA
f(x) ASW
f(x) MRSOC
GRAVI
v0.511
Toolbar
Questions
Attraction Field
Label
Circular Placemen
Evenly Distribute
Show Question
Send to To
Persons
Show Traces
Show Whole Traces
Show Persons
Send to Top
General
Star Glyph
Show Gric
Show Tooltips
Open
Save
Time Control
3/5: 1.1.2004 - 1.1.2004
in2vis

Challenge #2

Support collaboration

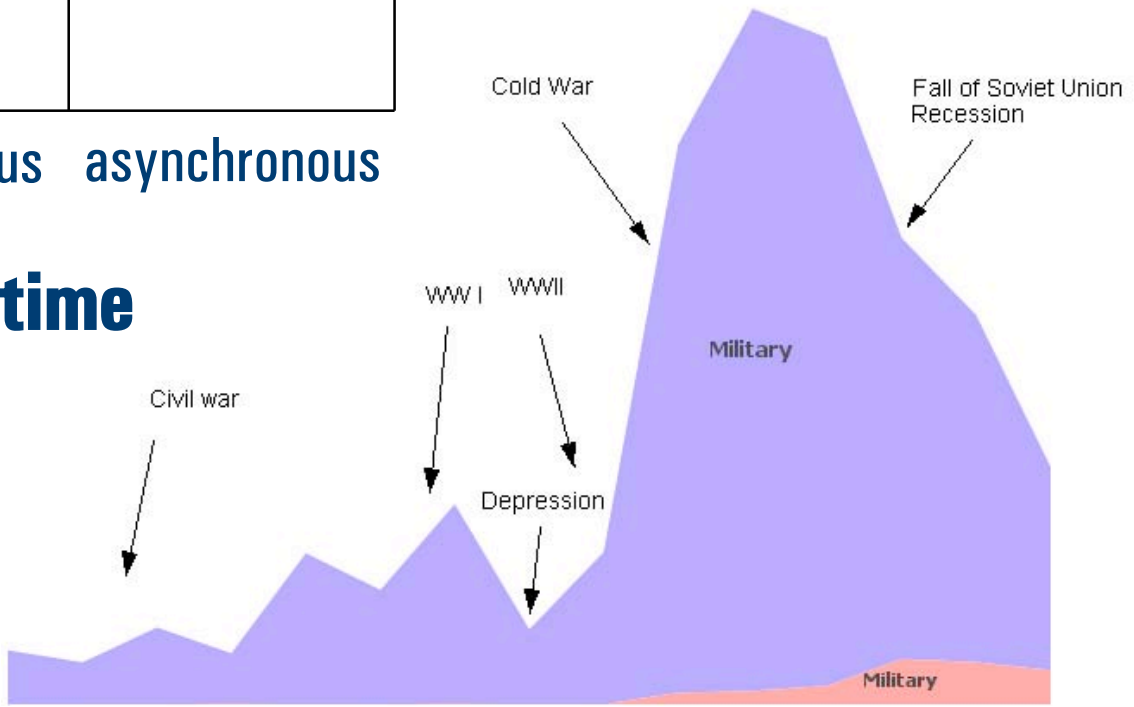
Image credits: iofoto, http://www.sxc.hu

Collaboration

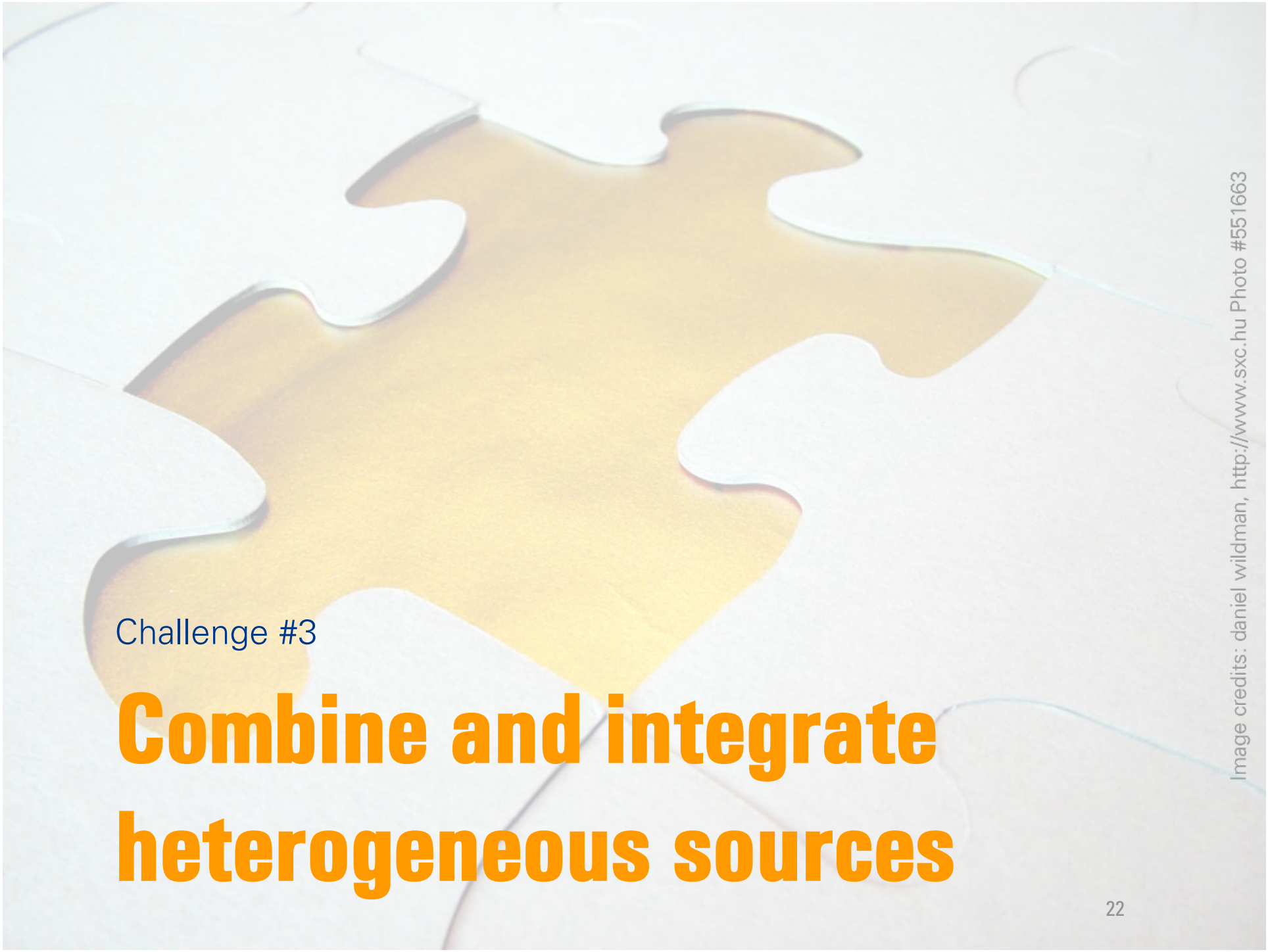
[Bafoutsou & Mentzas, 2002]

space	synchronous	asynchronous
collocated		
distributed		

time



[Heer et al., 2007]

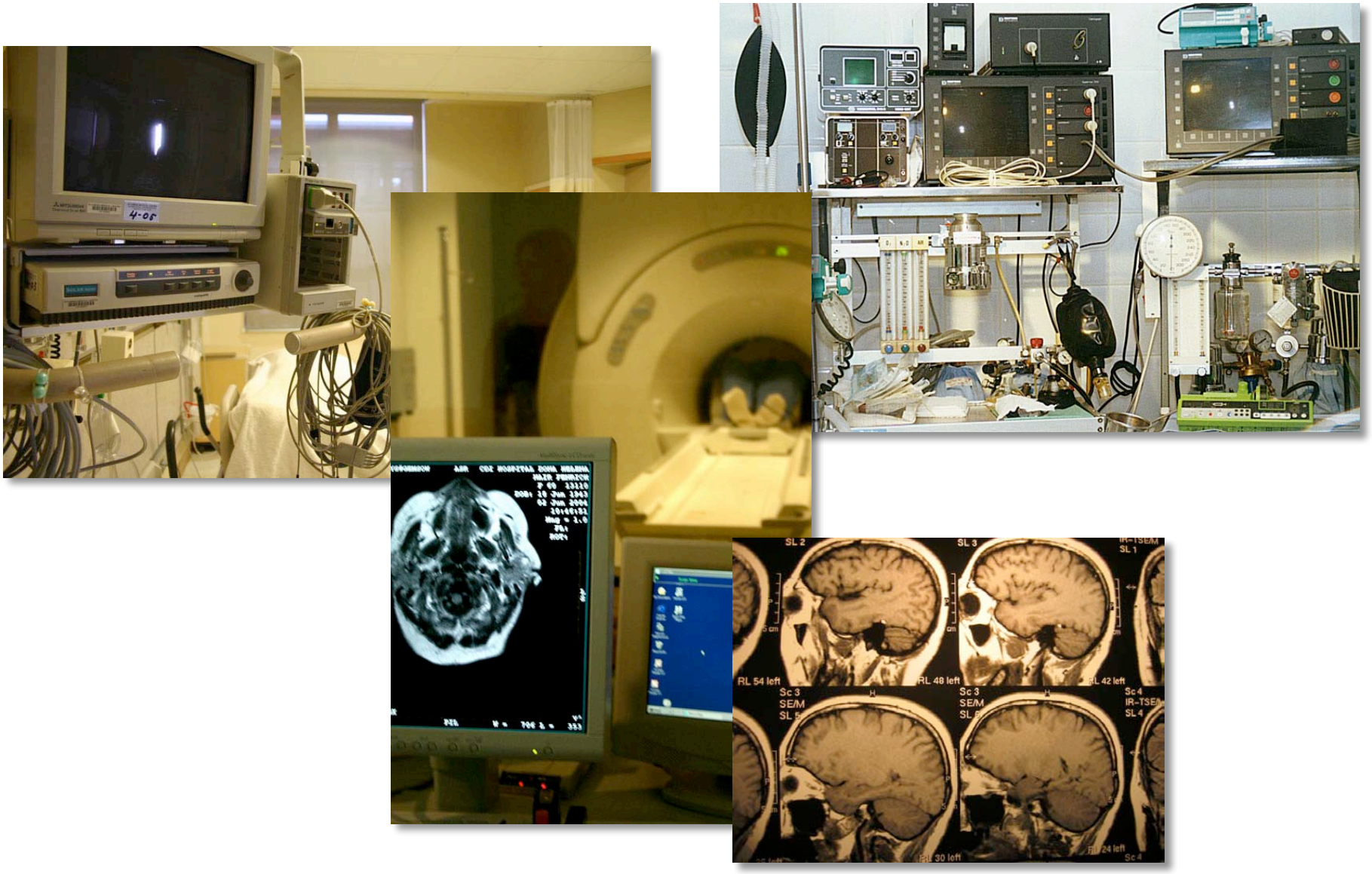


Challenge #3

Combine and integrate heterogeneous sources

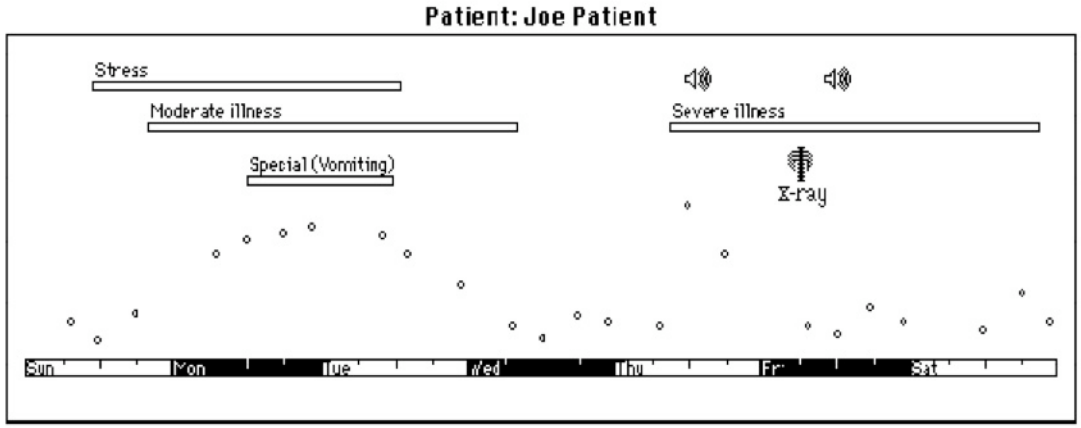
Image credits: daniel wildman, http://www.sxc.hu Photo #551663

Heterogeneous Sources



Heterogeneous Sources

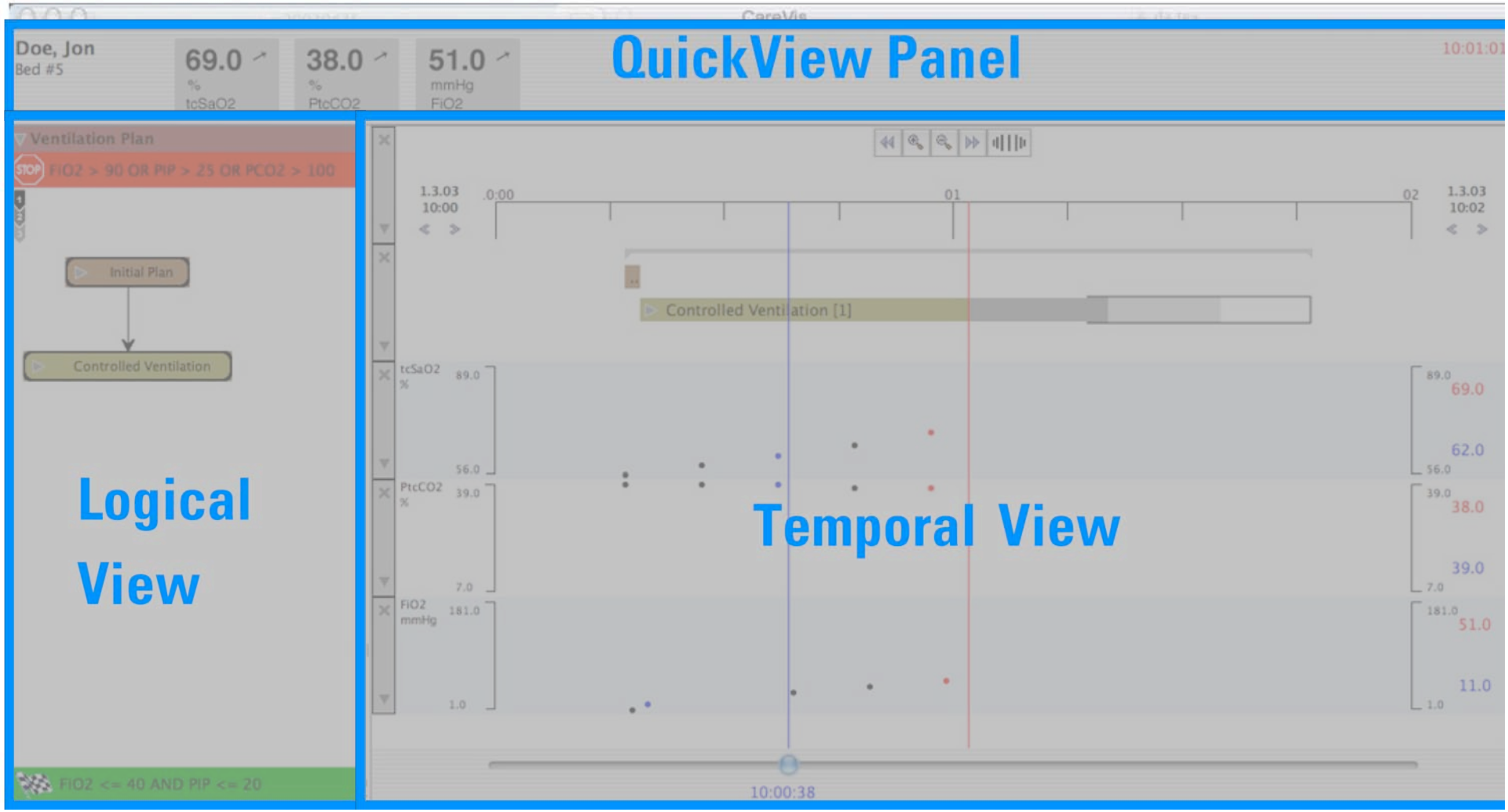
[Plaisant et al., 1998]



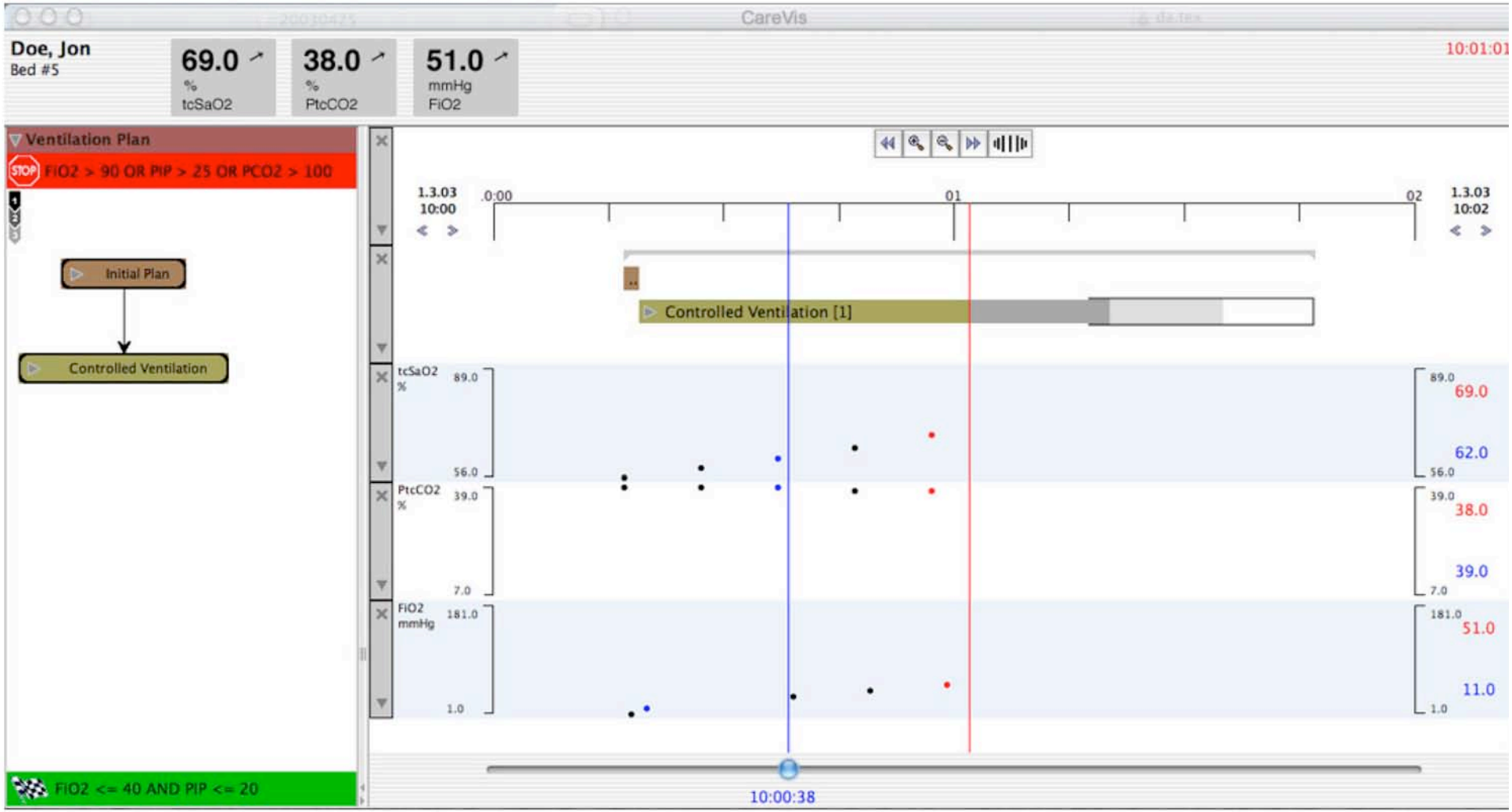
[Cousins andKahn, 1991]

Interactive Visualization Methods to Support Protocol-Based Care

Wolfgang Aigner, Silvia Miksch

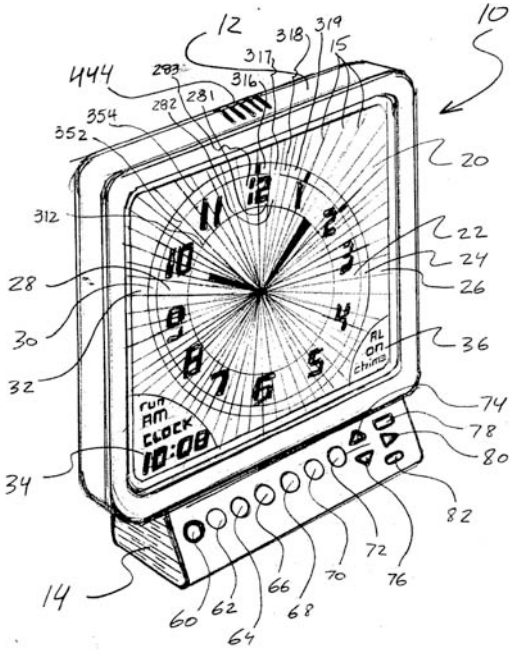


Integrated Visualization of Computerized Protocols and Temporal Patient Data



Integrated Visualization of Computerized Protocols and Temporal Patient Data

Time has a complex structure



Challenge #4

Care about semantics

Image credits: Raphael Caram, http://www.sxc.hu Photo #687116

Midgaard

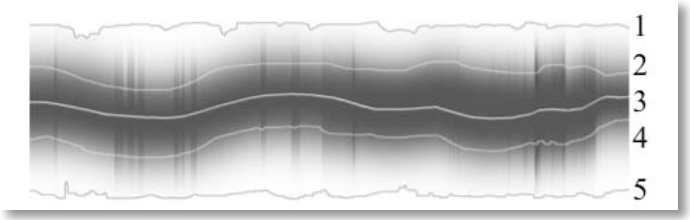
[Bade et al., 2004]

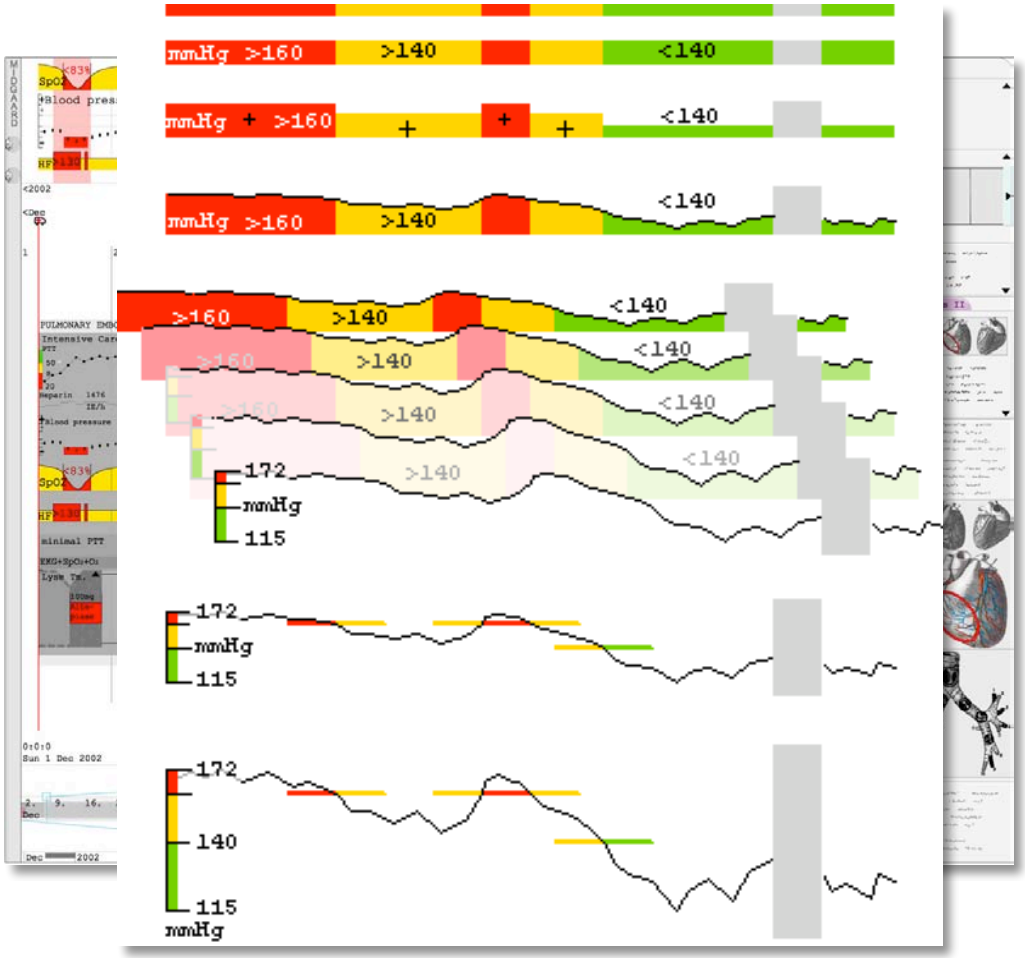
visualization of medical intensive care data

- qualitative scales
- quantitative scales
- qualitative / quantitative hybrids

semantic zoom

- smoothly integrated





Challenge #5

Don‘t forget about the hardware

Image credits: Brano Hudak, http://www.sxc.hu Photo #875772

Hardware + Software

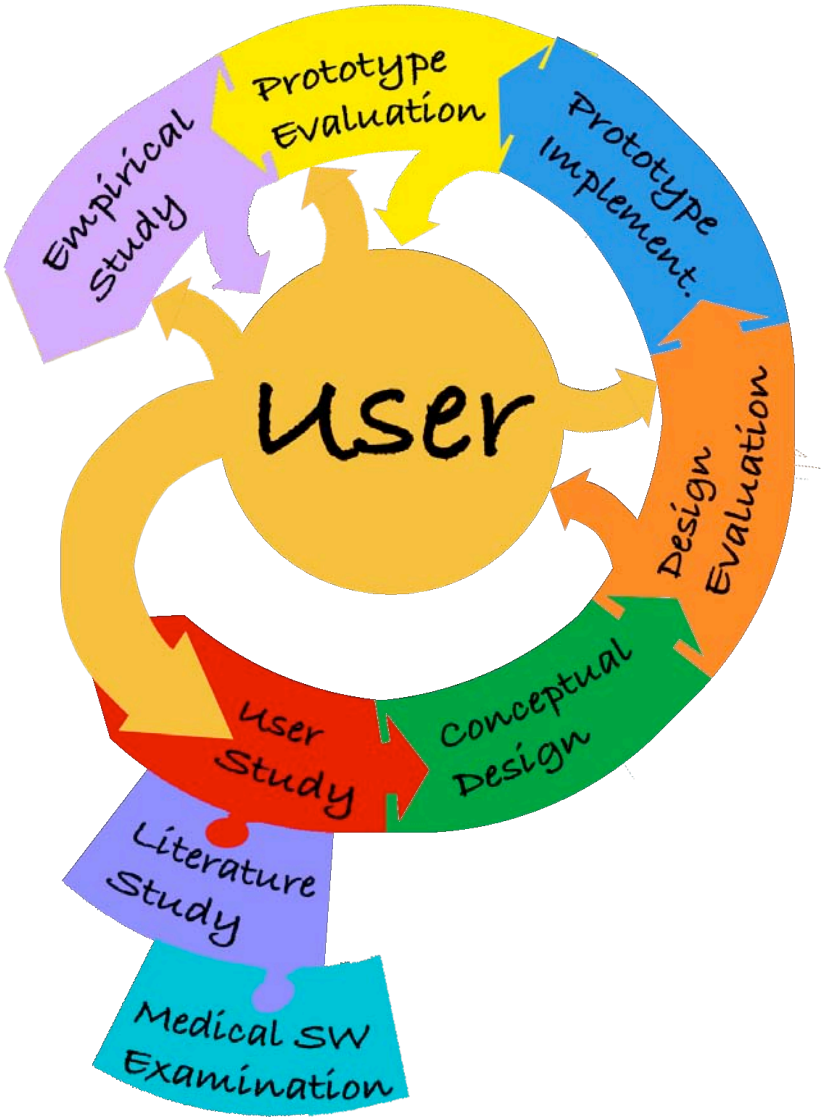
Challenge #6

Users first!

One does not fit all

Image credits: Ju e Marcinho Castro Porto, http://www.sxc.hu Photo #684744

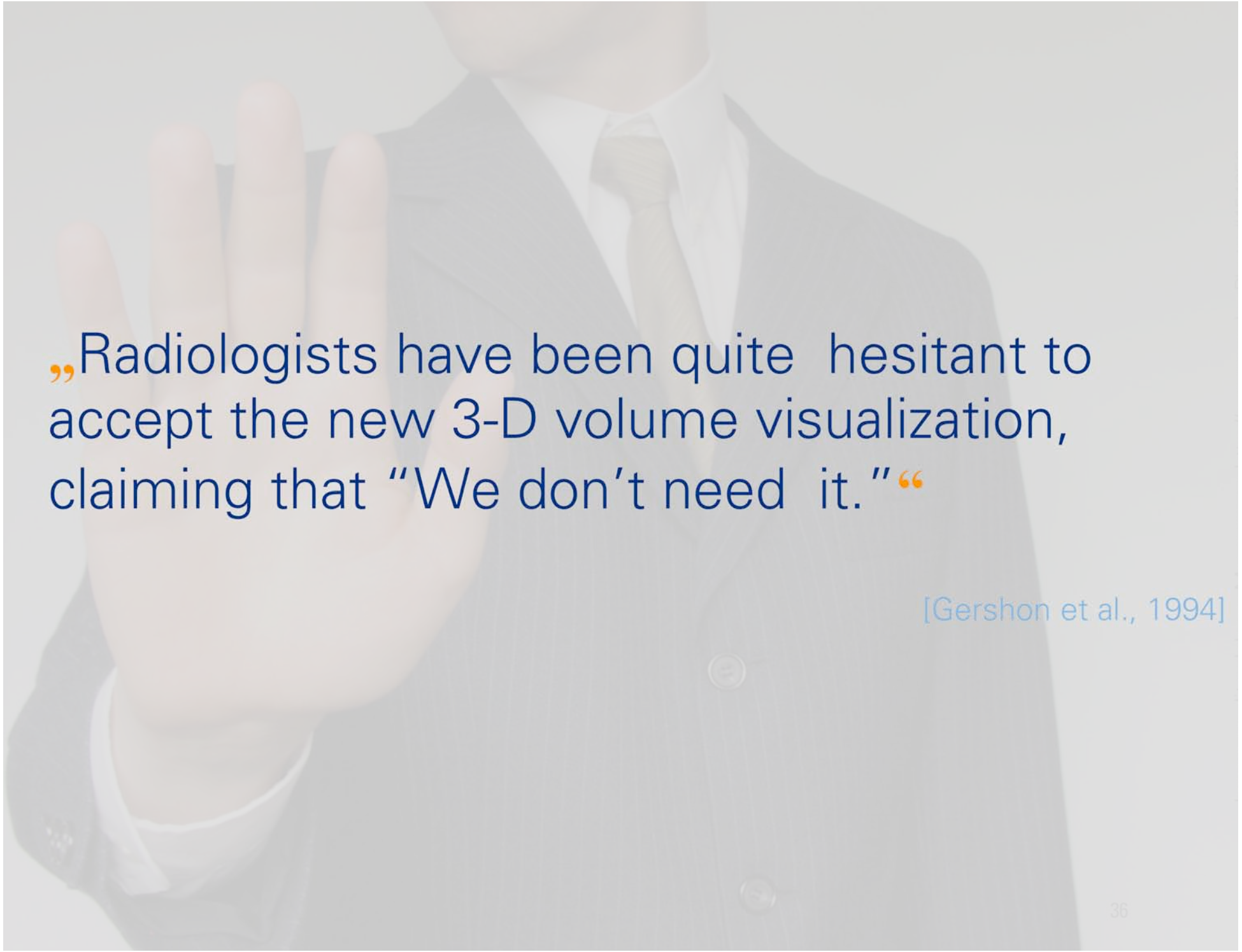
User-Centered Development



Challenge #7

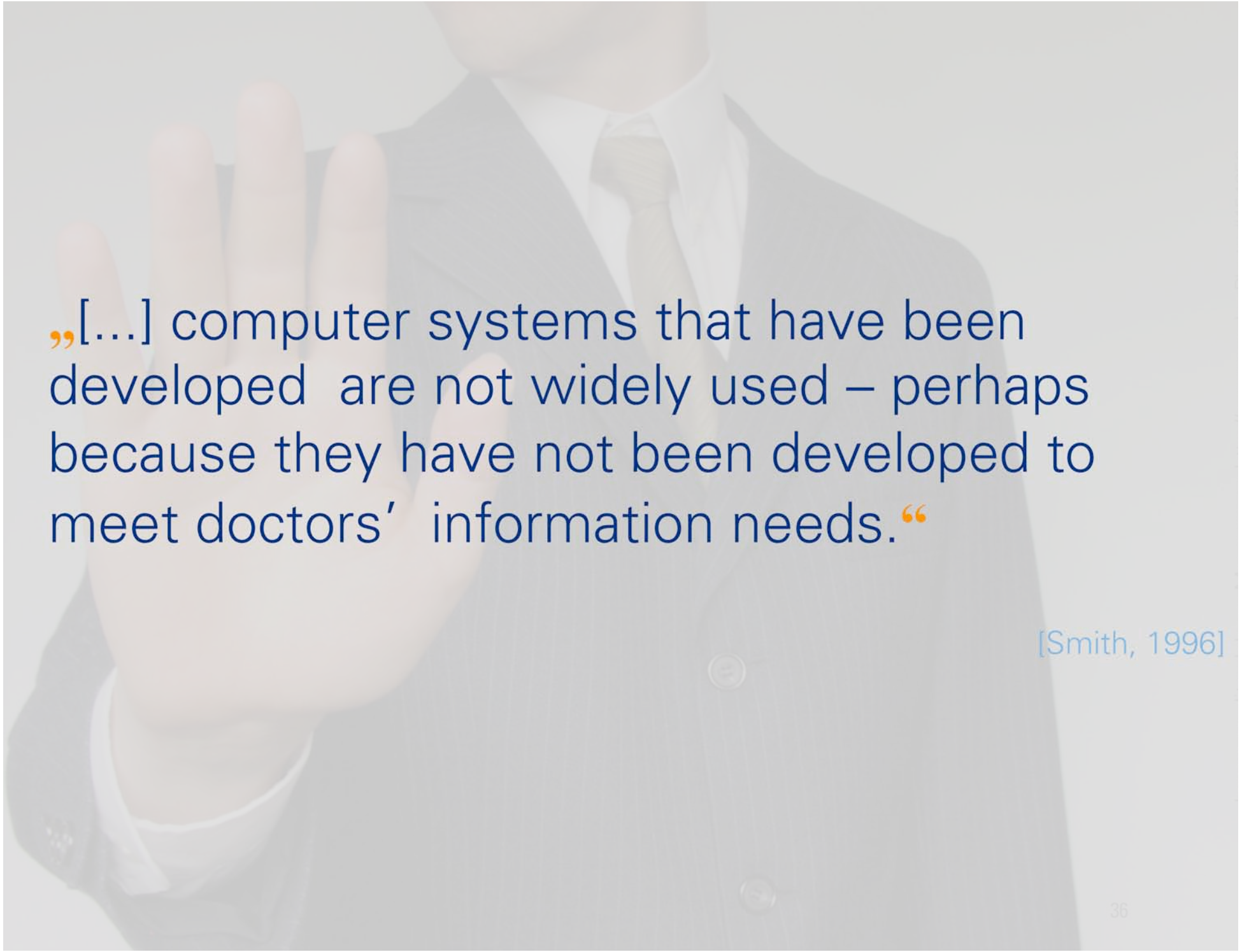
Research into practice

Image credits: Alex T., http://www.sxc.hu Photo #89658



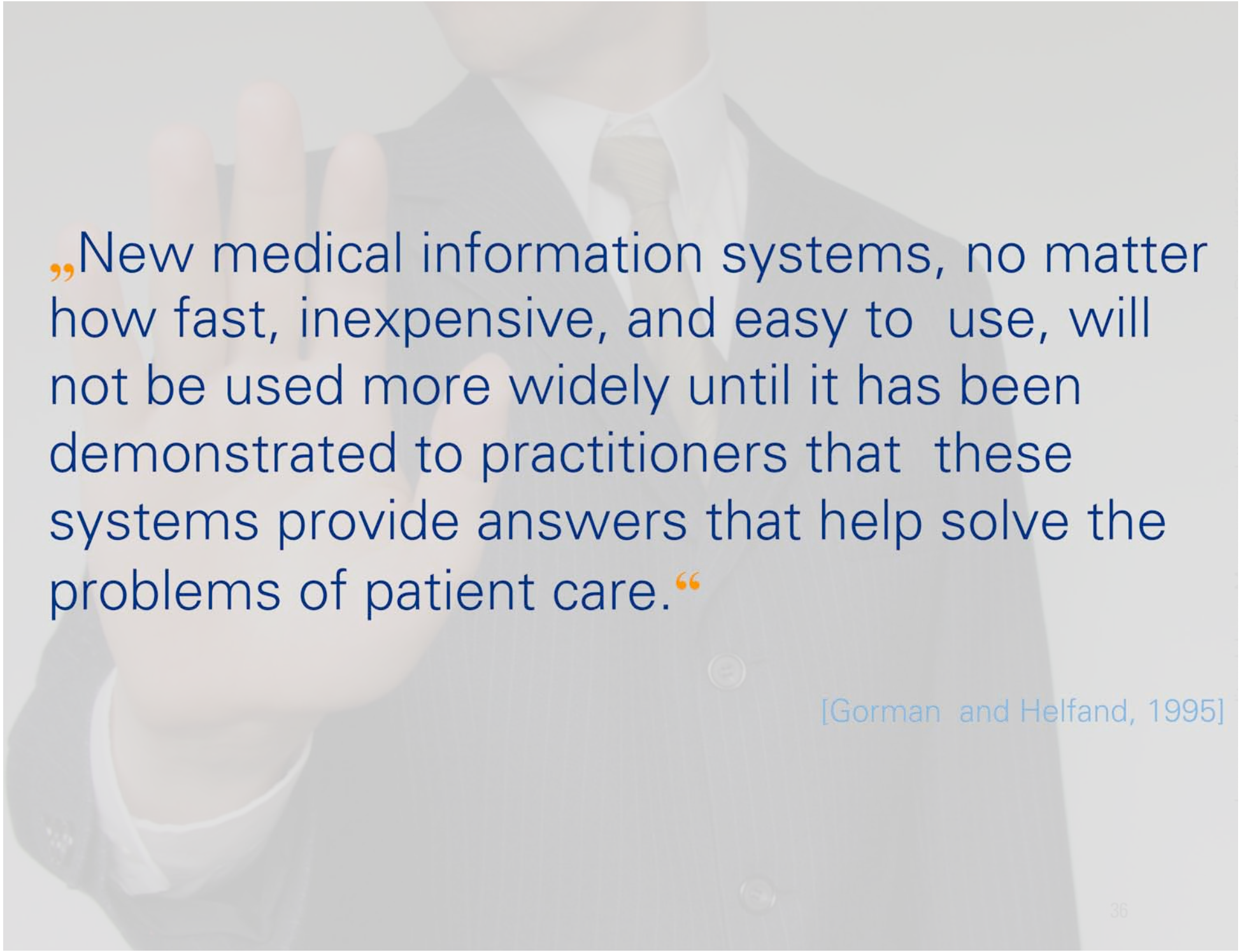
„Radiologists have been quite hesitant to accept the new 3-D volume visualization, claiming that “We don’t need it.”“

[Gershon et al., 1994]



„[...] computer systems that have been developed are not widely used – perhaps because they have not been developed to meet doctors' information needs."

[Smith, 1996]



„New medical information systems, no matter how fast, inexpensive, and easy to use, will not be used more widely until it has been demonstrated to practitioners that these systems provide answers that help solve the problems of patient care.“

[Gorman and Helfand, 1995]

Image credits: Davide Guglielmo, http://www.sxc.hu Photo #190593

Challenges

① Interaction is key

② Support collaboration

③ Combine and integrate heterogeneous sources

④ Care about semantics

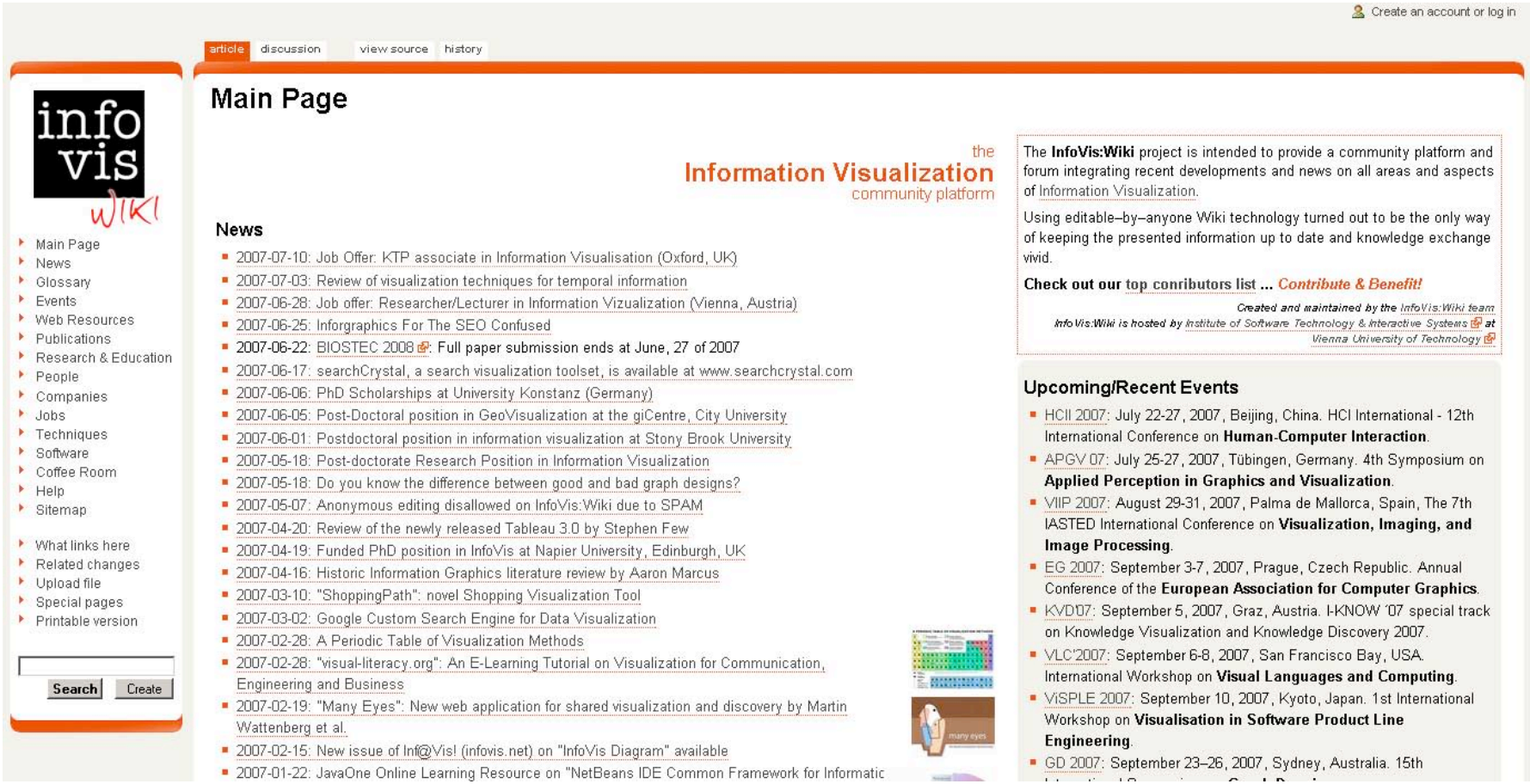
⑤ Don‘t forget about the hardware

⑥ Users first!

⑦ Research into practice

InfoVis:Wiki

www.infovis-wiki.net



Contribute & Benefit!

Contact

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W www.donau-uni.ac.at/ike

The purpose of computing is insight, not numbers.

Richard Hamming (1961)

Interactive Visualization and Data Analysis

Postgraduate Master Program, Master of Science – MSc

5 semesters, part-time

Danube University Krems

www.donau-uni.ac.at/ike/visual-analytics