Enterprise Systems in Healthcare - Blessing or Curse?
Research topics that interest me...

Three agendas:

■ Evolution and assessment of information systems
  - Evolution of information systems
  - Business value / assessment of IT-benefits
  - Design science research

■ Business networking and strategic use of information systems in healthcare
  - Strategic use and transnational adoption of eHealth
  - Identification in health networks
  - Customer-buyer relationship of healthcare organizations (pharmaceuticals, government etc.)

■ Enterprise systems and information analytics
  - Use of business intelligence in the context of healthcare
  - E-commerce in healthcare
  - Internet of services / future internet enterprise systems
What I will talk about...

Agenda for today:

1 Introduction to Enterprise Systems
   - The ‘old world’ of Enterprise Systems
   - The ‘new world’ of Internet Enterprise Systems
   - Implications for practice

2 Convergence of Health Information Systems and Enterprise Systems
   - Key drivers for change in the healthcare sector
   - Internet Enterprise Systems as enablers for a better living and future care

3 Future directions
   - Research areas supporting this vision
   - Practical examples
   - Conclusions
The old world: Functional boundaries and on-premise Enterprise Systems

- Business value through workflow automation and integrated data
- Focus on functionality of key business functions; mainly intra-organizational
- Relational databases as core technology
- Point-to-point interfaces with other enterprise systems
- Software delivery on-premise or application service providers (ASP)
- "Grey" user interfaces
The new world: Technological advancements of the next 10 years

The new world: Towards Internet Enterprise Systems

- Business value through user generated content and semantically annotated data
- Focus on social networking interactivity and integration of the physical into the digital world
- Enriched Web based services as core technology
- Software delivery on-demand (SaaS) provided on cloud platforms (PaaS)
- "User experience design" for graphical interfaces

The new world: Blessing or curse?

- The Internet becomes the platform through which knowledge is manipulated dynamically and represented in a radically different way to create new value.
- Internet Enterprise Systems blur the boundaries between intra and extra-organizational business units; cooperation becomes rooted in the essence of entrepreneurship.

But...

- Danger of widening divide between digital world and ‘real’ business world.
- Increasing demand for more bandwidth, security, privacy, knowledge, and user empowerment.
- Technical interoperability is still a big issue; what about ‘cultural’ interoperability?

Internet Enterprise Systems, so what?
Healthcare faces other challenges

- Competition from other industries for best talents
- Higher demand based on e.g. aging population
- Demanding customers and patients
  - Place of care moving to home
  - Focus on chronic disease
  - Informed patients

Skills shortage

- Patient Safety & Quality of Care
  - Medical errors
  - Drug adverse effects
  - Patient Privacy needs rise
  - Medical KPI’S become revenue drivers

Costs continue to rise

- Aging population
  - Cost of development of a drug rise 6-8% per year
  - Cost of technology rise up to 60%
Vision: Internet Enterprise Systems as enabler for a better living and future care

**Trends/Drivers**
- Staff Shortage
- Demanding customers and patients
- Costs continue to rise
- Patient Safety & Quality of Care

**Challenges**
- Inter-operability
- Digital divide
- Security & privacy
- Knowledge & empowerment

**Enablers**
- Internet of Services
- Internet of Things
- Internet of Networks
- Internet of 3D Worlds

**Future Care**
- Personal Health & Independent Living
  - Integration of home residence to medical and nursing
  - Supporting home infrastructure
  - Video communication and collaboration

**E-Health & Clinical Systems**
- Primary Care
- Secondary Care
- Patient & Material Tracking
- Treatment Planning

**Service Industry**
- Health Plan Provider
- Pharmacies
- Retail Industry
- Telcos
- Government

**Research & Medical Technology**
- Learning Provider
- Insurance Industry

**Pharma Industry**
- Integration of home residence to medical and nursing

**Integration of home residence to medical and nursing**
- Healthcare providers
- Home care
- Assisted living
- Video communication
- Collaboration

**Supporting home infrastructure**
- Sensors
- Monitoring
- Patient & Material Tracking
- Treatment Planning

**Integration**
- Home care
- Assisted living
- Personal health
- Independent living

**Enabling Technologies**
- Internet of Services
- Internet of Things
- Internet of Networks
- Internet of 3D Worlds

**Secondary Healthcare**
- Hospital systems
- Specialty care

**Primary Healthcare**
- General practitioners
- Nurse practitioners

**Assisted Living**
- Elderly care
- Disabled care

**Home Care**
- Medical services
- Personal care

**Personal Health**
- Fitness
- Nutrition
- Mental health

**Independent Living**
- Housing
- Transportation
- Social services
Research areas supporting the vision: Personal Health & Independent Living

Personal Health & Independent Living
- Personal guidance systems for people with impairments
- Consumer health informatics
- ICT for smart and personalized inclusion
- Interoperability of consumer and clinical systems
- Home care and chronic diseases
- Patient safety and quality improvement of medical treatments
- Home Care/Assisted Living
- Personal Health & Independent Living
- Social robotics
- Ubiquitous computing in healthcare
- Intelligent homes
- Smart devices for long-term care
- E-prescription
- Biosignal processing
- Tele-monitoring
- Interoperability with care systems
- Security issues in health networks
- Re-use of personal health information
- Social computing for people with impairments
- Brain-neural computer interfaces
- Insurance protection & administrative assistance
- Health information portals
- Personal health records
Research areas supporting the vision: E-Health and Clinical Health Systems

Medical knowledge & decision-support systems
- virtual physiological human
- modeling and clinical pathways
- advances in image & text processing

Bioinformatics
- clinical trial systems
- coding & classifications
- biostatistics & analytics

ICT for public health
- national health infrastructures
- ICT for epidemiology

E-Health & Clinical Systems
- Primary Care
- Secondary Care
- Pharmacies

Patient-centered Systems
- electronic medical records
- tele-diagnostics
- tele-medicine

Clinical Support Systems
- patient referral systems
- supply chain management & logistics in healthcare
- interoperability of different clinical and enterprise systems
- re-use of electronic medical records and ERP

Interoperability of medical and administrative systems

Primary Care
- coding & classifications
- advances in image & text processing

Secondary Care
- biostatistics & analytics
- modeling and clinical pathways

Pharmacies
- virtual physiological human
- clinical trial systems

E-Health & Clinical Systems
- medical knowledge & decision-support systems
- bioinformatics
- ICT for public health
- patient-centered systems
- clinical support systems
- interoperability of medical and administrative systems

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Research areas supporting the vision: General topics

Value of IT in healthcare
- business models & cases
- entrepreneurship
- economic aspects
- assessment methods

Security issues in health networks
- privacy
- legal aspects
- secure data exchange

Human-computer interaction in healthcare
- requirements engineering
- usability studies

Social implications
- ethical aspects
- cultural aspects
- digital divide between regions and ages

Standardization and conformity
- internationalization
- health services research guidelines
- e-health standards

Education, training and dissemination
- e-learning
- organization of medical and organizational knowledge base

General topics
- cultural aspects
Example (1): Business Intelligence in Healthcare

Medical Processes
- Diagnostic and Therapy
- Nursing care
- Research and Teaching

Business Processes
- Financial Accounting
- Monitoring and Controlling
- Organizational Development
- Compliance and Risk Management

Support Processes
- Human Resources
- Logistics and Supply
- Communication

Actors
- External
  - Patient
  - Government
  - Insurance Company
  - Other care institutions
- Internal
  - Wards
  - Doctor
  - Controller
  - HR-Officer
  - ... (...

Information
- Patients
- Medicine
- Financials
- Employee
- ...

Technologies
- Reporting
- Expert System
- OLAP
- Data Mining
- ...

Data Warehouse
- Clinical Operational Data Sources
  - EMR
  - PACS
  - ...
- Administrative Operational Data Sources
  - ERP
  - HR
  - ...

Example (2): Intelligent Supply Chains in Healthcare

Adapted from: T. Mettler et al., Testing the assumptions of an intelligent supply chain design, to be published, 2010.
Enterprise Systems in Healthcare (1): Blessing or Curse?
Enterprise Systems in Healthcare (2): Blessing or Curse?
Thank you!

... any questions?