

HEDA

Health Enterprise Data and Applications

Gennet Lab Ltd

Three level model of Electronic Health Records (EHR)



Co-operation and
healthcare processes



Data Exchange and
enduser software



Infrastructure, standards
and legislation

Three level model of EHR - Infrastructure:

Infrastructure – common secure environment for the data Exchange (interoperability of technical systems)

Legislation – what kind of data when and how is allowed to use

Standards – data standards (interoperability of healthcare processes - understanding each other „language“, machine readable data)

Security – reliability of the system (technically, legally)



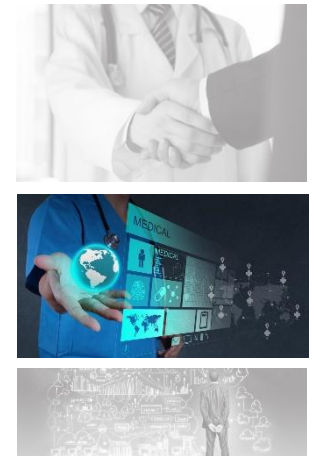
Three level model of EHR – data exchange:

Data exchange standards (HL7, ...)

Enduser software – EHR system

Usability aspects (system speed, UI, UC)

Connection with other systems (prescription, x-ray, financial, insurance, statistics, medical staff databases)



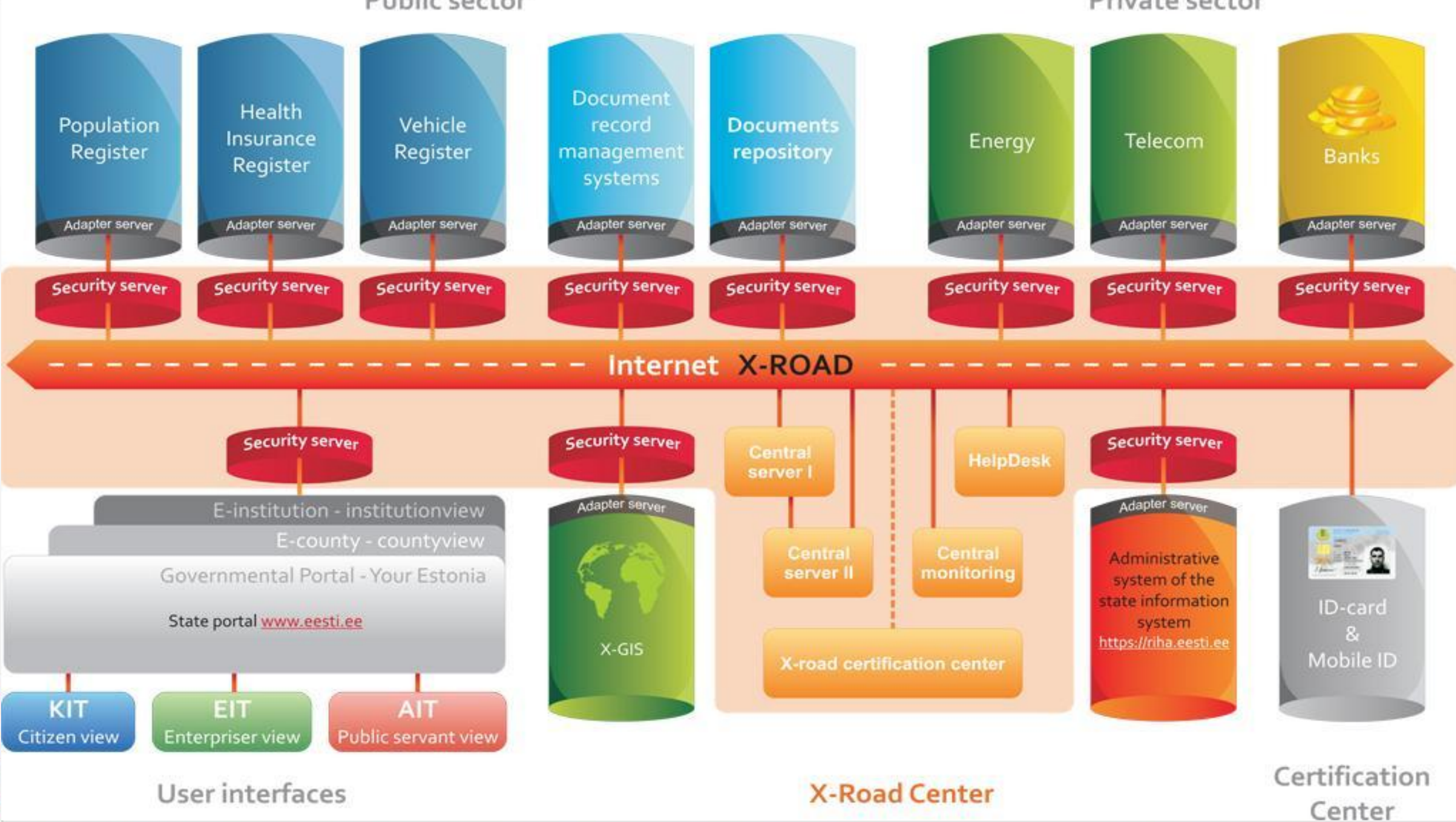
Three level model of EHR - cooperation:

Association of medical processes with EHR technical solution (process standards and compability)

Cooperation model – build up common system (sharing data with patient and other medical professionals)

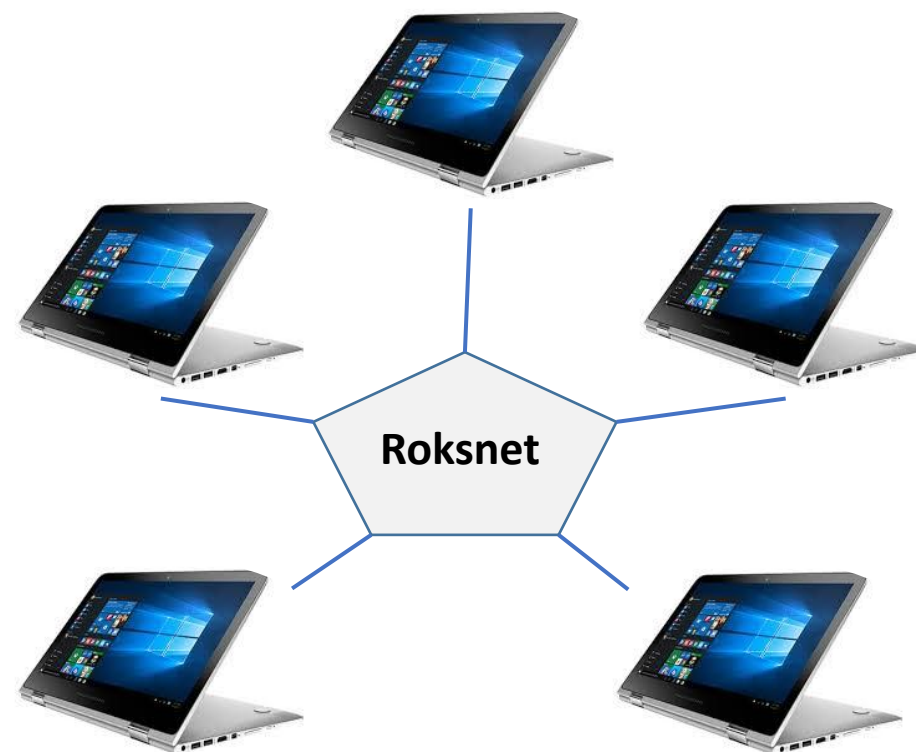
Mutual understanding and reliability – interoperability on the level of processes







Separate VPN connections between
each user



Common x-road standard in case of
regular internet connection


Advantages using Roksnet and x-road standard

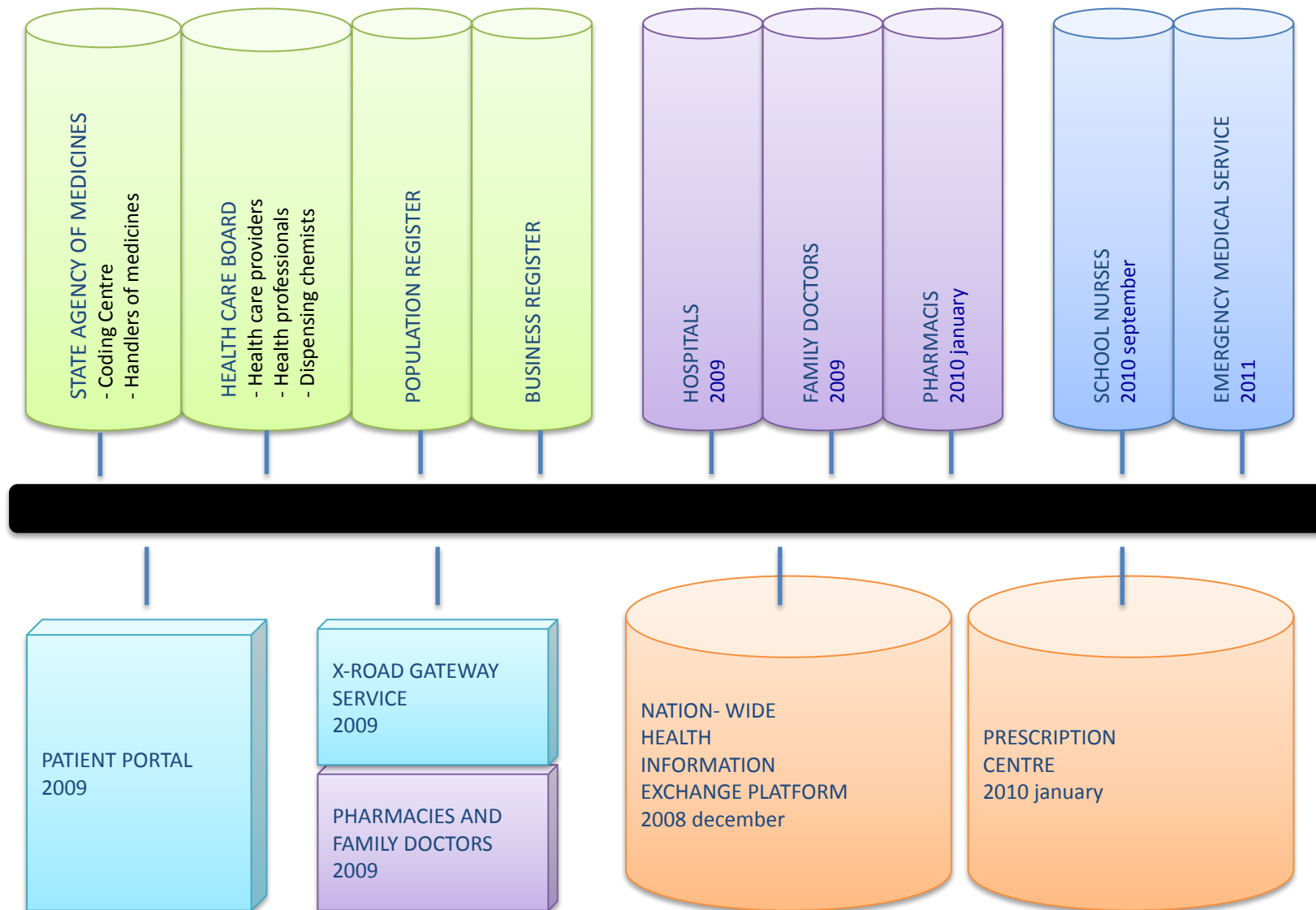
Roksnet(using X-road standard) is a secure data Exchange environment.

For the secure data Exchange is necessary to establish separate secure channels (VPN) between service providers and consumers. Roksnet is like a **secure two-side translation** solution (on the base of adapter server). With help of Roksnet services will be translated to the x-road standard on the side of the service provider. On the side of consumer services will be (re)translated to the „language“ of consumer. Therefore it is not important what kind of information system or database are using different service providers or consumers. Each has it's „own translator“ (as adapter server).

Thanks for the x-road standard it is possible to use for the secure data exchange a regular internet connection instead of number of separate VPN connections.

It is possible to build up Roksnet services one by one which makes the solution flexible and economically efficient. Roksnet can be used as a infrastructure base for healthcare data exchange between hospitals and regions.






Health Enterprise Data and Applications



GenNet Laboratories and HEDA

- **Market size** – HEDA previous version is covering **58%** of Estonian health software market, including West and East Estonian Regional Hospitals.
 - **Long experience** - the software is used since 1997. GenNet Laboratories has **26 years** experience of software developing.
 - **Large scale of functionalities** – HEDA offers all necessary functionalities for ambulatory and stationary care. Therefore all modules can be easily interfaced and there is no technical conflicts between different modules.
 - **Support** - HEDA modules and applications including data architecture and models are developed inhouse. All client specific developments will be completed fast and flexible and large scale support (including infrastructure technical support and data modelling support) will be provided.
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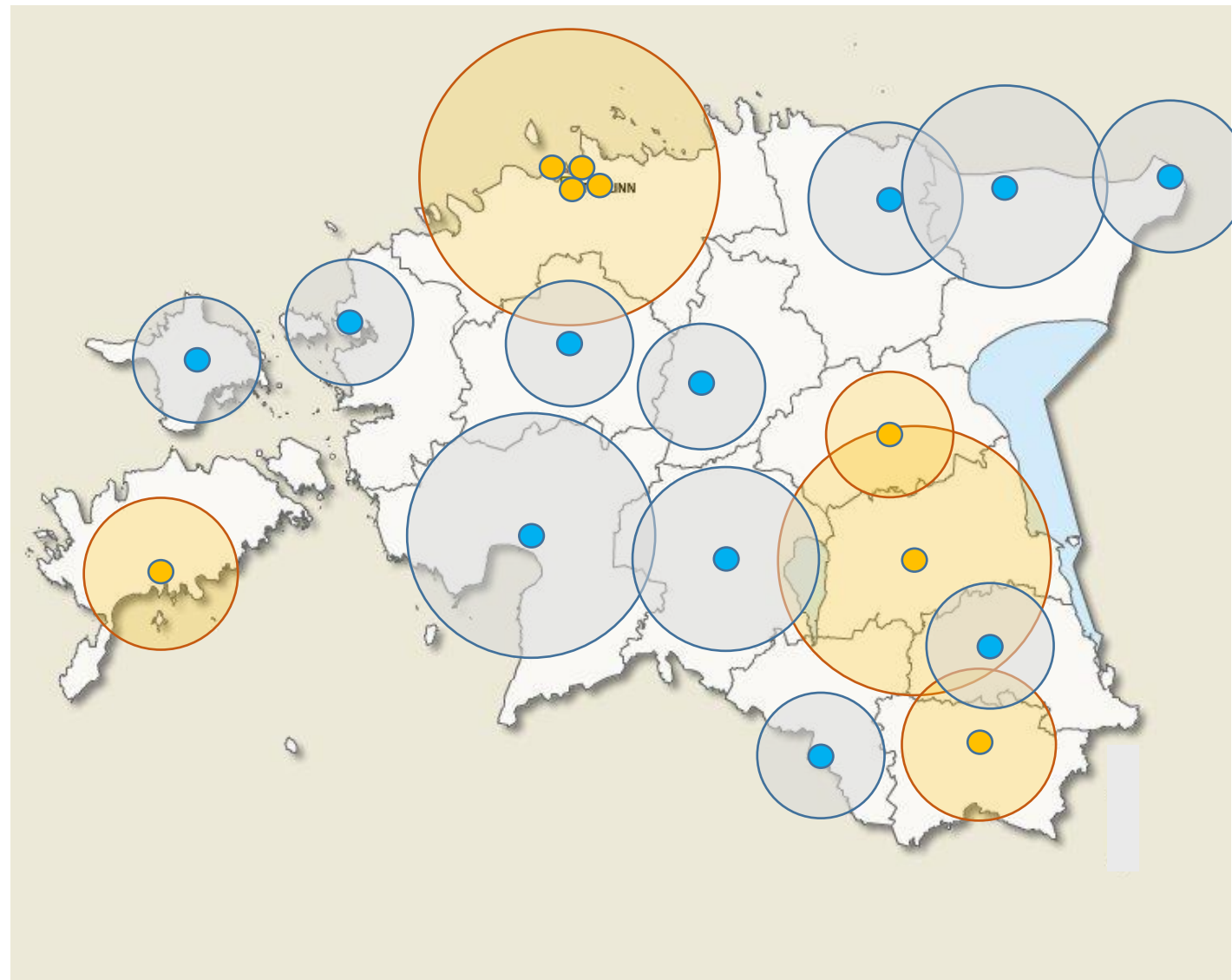
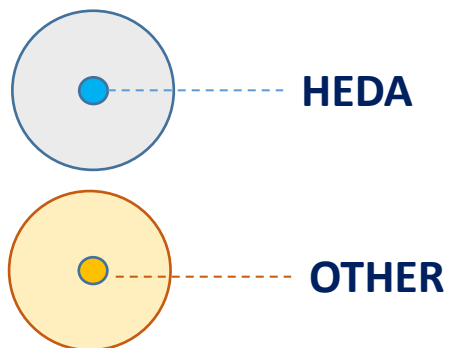
Estonian Hospitals software market distribution

Ester / **HEDA** – 58%

Liisa – 26%

EHL – 11%

NERH – 5%



Background and main advantages of HEDA


HEDA is a next generation version of EHR software which went to the production in Estonia in 1997.

Currently **HEDA** and its previous version covers 58% of Estonian healthcare market

High usability level - HEDA has designed on the base of long term healthcare user experience for supporting healthcare processes on the best way

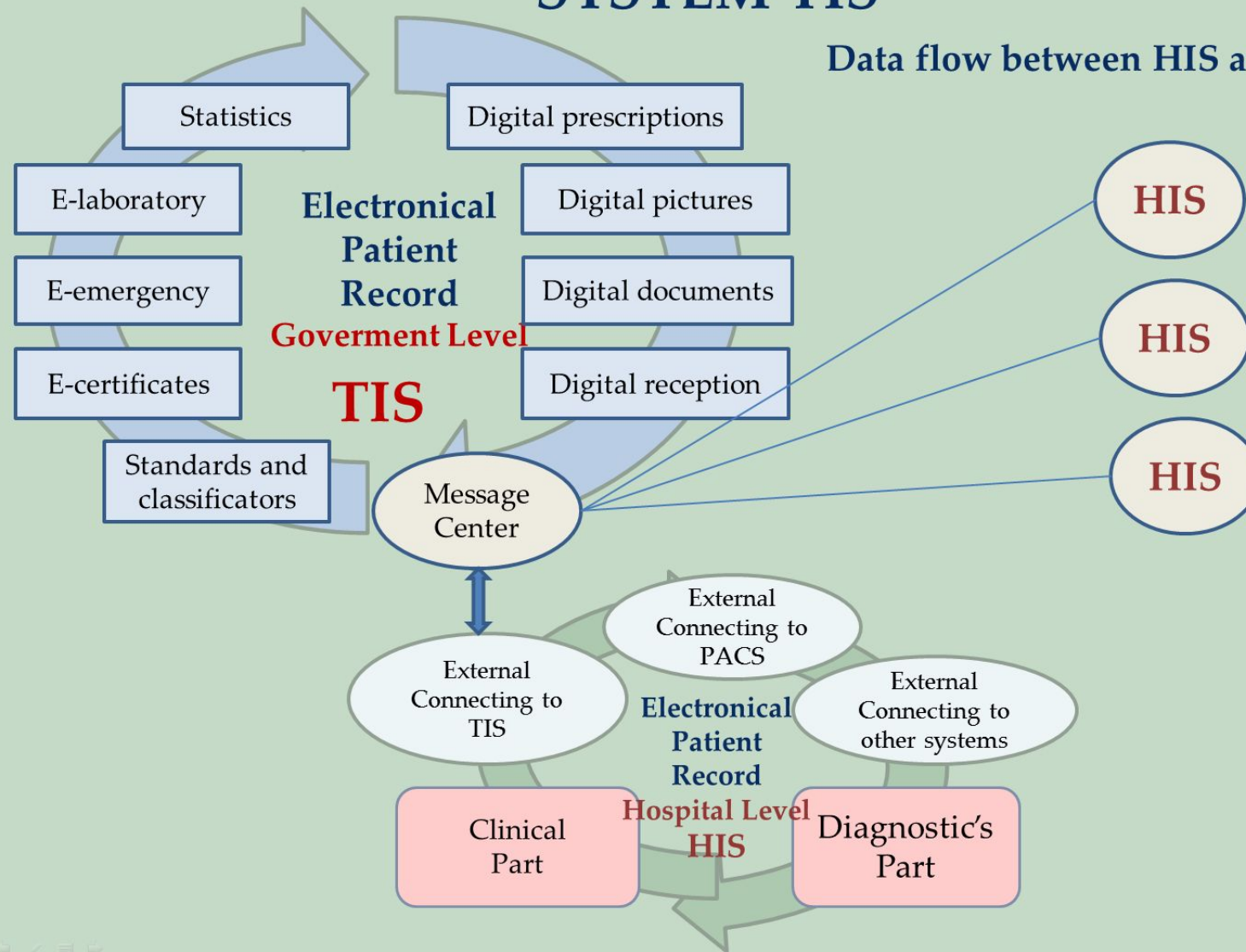
Wide range of support for implementing EHR - HEDA is offered with support for all three levels of the EHR model – support for infrastructure (Roksnet), usability and processes (modelling software for supporting healthcare processes as tailor made solution)

Wide range of modules covers most of hospital processes - HEDA modules covers almost all enduser needs, including solutions for the X-ray, ePrescription, PatientPortal, Telemedicine, Laboratory, Blood bank and Booking system. There are also modules for stock, staff, accounting and connecting external databases. Therefore necessity to use different softwares is very low.




CENTRAL HEALTH INFORMATION SYSTEM TIS

Data flow between HIS and TIS




Architecture and functionalities of the HEDA

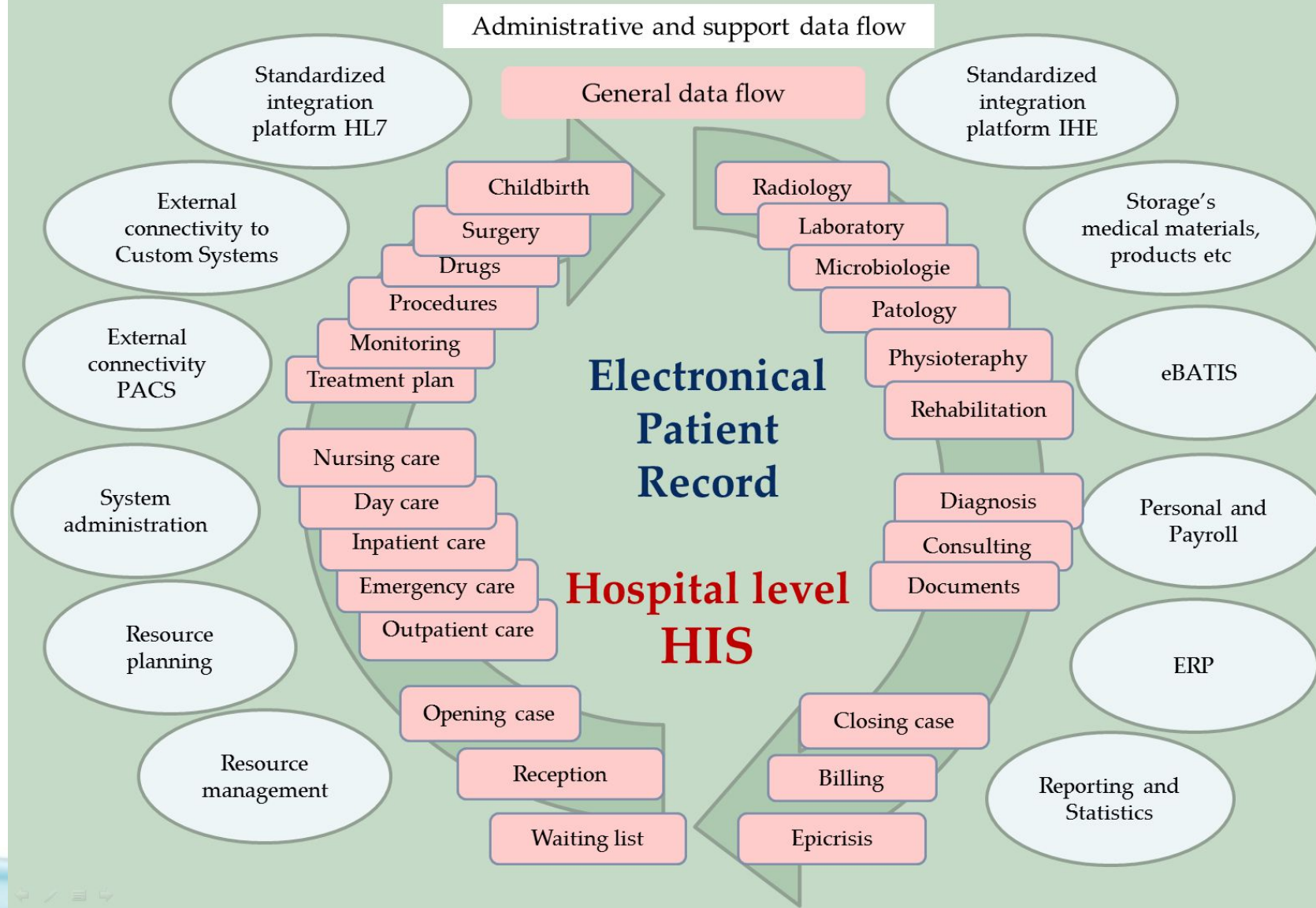
HEDA contains of **seven** bigger modules which have 75 different submodules:

1. **Resources** management (8 submodules)
 2. **Medical** functionalities (40 submodules)
 3. **Reporting** and data management (8 submodules)
 4. **External** interfaces (8 submodules)
 5. **System** administration (8 submodules)
 6. **Specialized** subsystems (2 submodules)
 7. **Telemedicine** and communication (1 submodule)
- 

HEDA modules and submodules main functionalities:

1. **Resources** management (8 submodules) – including management of classificators, staff, hospital structure, service, settlements, pricelists, helth insurance contracts and parameters.
 2. **Medical** functionalities (40 submodules) – handling of all medical documents and data including procedures, medical examinations, labtests, pathology, nursing, rehabilitation, drugstore, etc. - data management of different specialties and departments
 3. **Reporting** and data management (8 submodules) – statistics, financing, contracts
 4. **External** interfaces (8 submodules) – external databases like Public Rgister, Healt Insurance Fund, National Health Information System, X-ray database, external laboratories, medical devices, ePrescription and Code center etc.
 5. **System** administration (8 submodules) – managemnt of users, accounts, online services, user manuals, user interfaces, translation.
 6. **Specialized** subsystems (2 submodules) – patient portal and interface for GP's
 7. **Telemedicine** and communication (1 submodule) – data, Document and screen sharing, text, voice and video Chat, group calls. Adressbooks of doctors (for doctor to doctor communication). Information management during conversation.
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HIS HEDA™



Resource management functionality

Classifiers
and definitions

Employee
management

Hospital
structure
management

Bank account
management

Medical device
management

Pricing
management

HMO (Health
Insurance Fund)
contracts

HMO coverage
service
monitoring

General functionality

Patient
management

Electronical
patient records

Reception

Appointment
schedules

Procedure
schedules

Room schedules

Patient's
medical alerts

Billing

Doctor's
workplace

Emergency care
workplace

Referral notes

Epicrisis

Digital
prescriptions

Patient's
prescription
plan

Pregnancy card

Childbirth
registration

Abortion card

Consultation
card

Laboratory

Diagnostics

Rehabilitation

Active care

Immunization

Patient
observation

External system connectivity

HMO patient
coverage

Population
register

National health
information
database (TIS)

Image archives

Decision
support
database

National
prescription
database

Data warehouse

Reports

System administration functionality

User account
and group
management

Authentication
requirements
management

Privilege
management

Online user
manual
management

Online terms of
service
management

Appearance
preferences

Translations

Audit logs

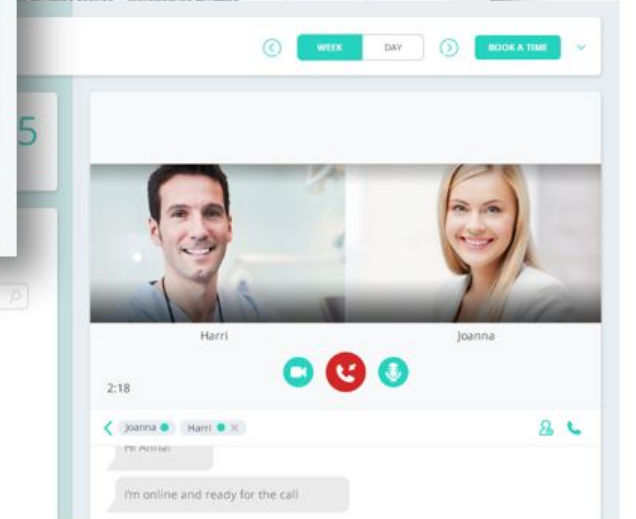
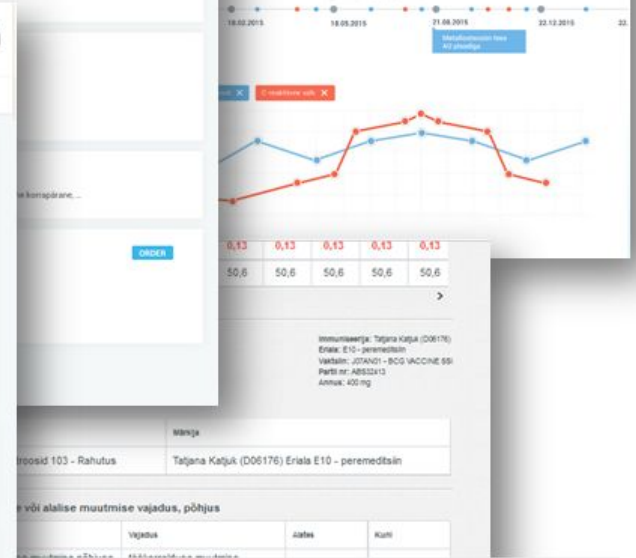
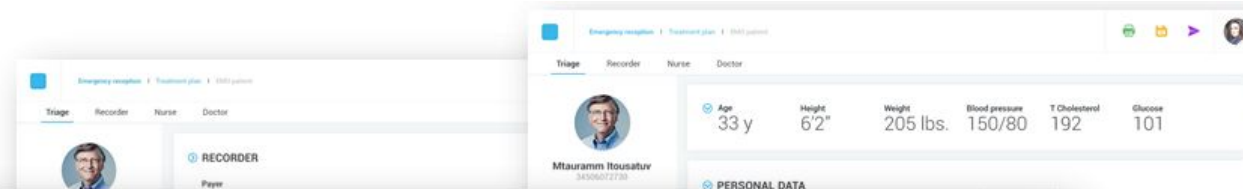
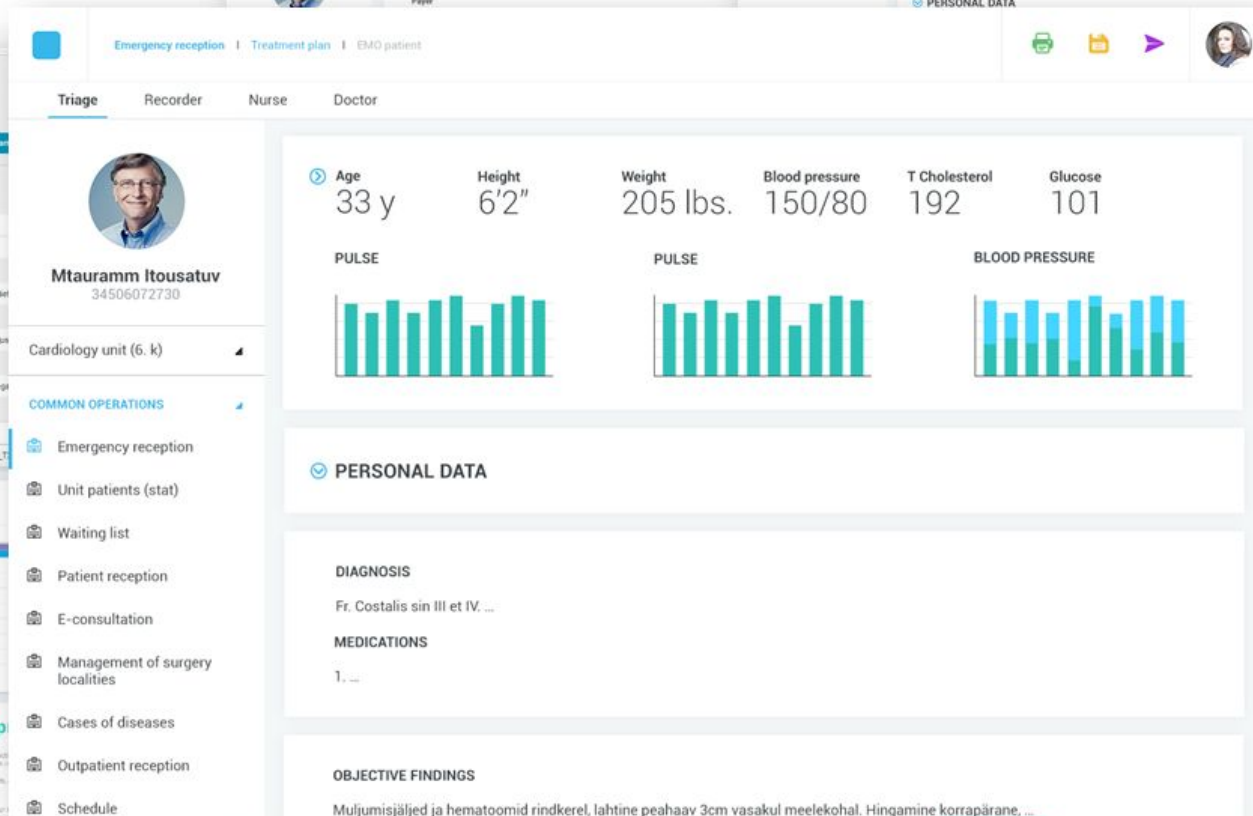
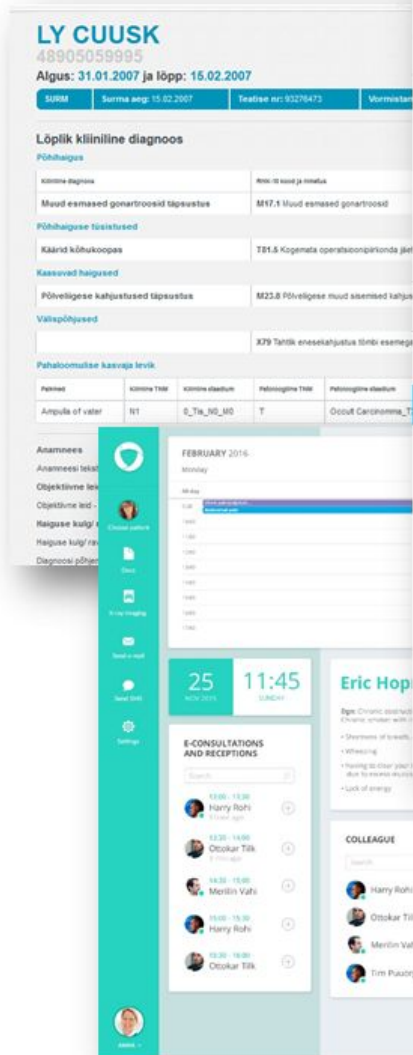
Specialized subsystems

Patient 's portal


General
Prctitioner's
portal

EPR APTUS/HEDA

Examples of HEDA submodules and UI



- **HEDA can reduce healthcare cost up to 25%:**

- Common treatment information management system offers possibility to handle easily treatment information. All members of the treatment team (including external members) can complement **common treatment information flow** instead of creating many separate documents with repeated information.
 - Information can be **automatically combined** for the doctor as **a summary of the treatment** data. Therefore doctors do not need open all documents one by one.
 - Due to connectedness with healthcare process HEDA also makes available **real time informaton for the management** – treatment cost, treatment quality, length of treatment etc. – what makes service providing more cost effective and increase treatment quality.
 - Integrated telehealth **communication tool** can save patient and doctors time related with consultation process.
 - HEDA modules are suitable both **for large hospitals, regional healthcare networks** and also for smaller **GP practices**. Common technical solution between healthcare service providers and common information flow makes healthcare service providing more cost effective.
 - HEDA is build up to manage machine readable data (not PDF documents) that makes possible to use **automatic informations management** for saving medical staff time.
 - **Patient Portal** makes possible for patients (also abroad) to give **remote accept** for medical professionals to **look patient treatment data** (important in countries where is used Opt In system) .
 - Via Patient Portal is possible more efficiently **involve patients** to the treatment process through: teleconsultations; **automatic feedback** to patient health problems and monitoring data; making treatment data available also to patient.
- 

Security

HEDA™ conforms to level **K2 T2 S2** of ISKE security standard. ISKE is a 3-layer baseline security system, which specifies different levels of requirements to data availability, integrity and confidentiality.

Conforming to K2 T2 S2 level means the following:

K2 - system is available at least 99% of time per year. Maximum allowed one-time downtime time does not exceed 4 hours.

T2 - events that create, delete and modify data have to be detected and traced. Data is periodically checked for integrity and being up-to-date.

S2 - data is confidential. Access is allowed only for certain user groups with verified needs.



Technical requirements

HEDA™ has the following requirements for server-side software:

Software platform (Linux 6.x suggested, MS Windows 2012 R2 possible)

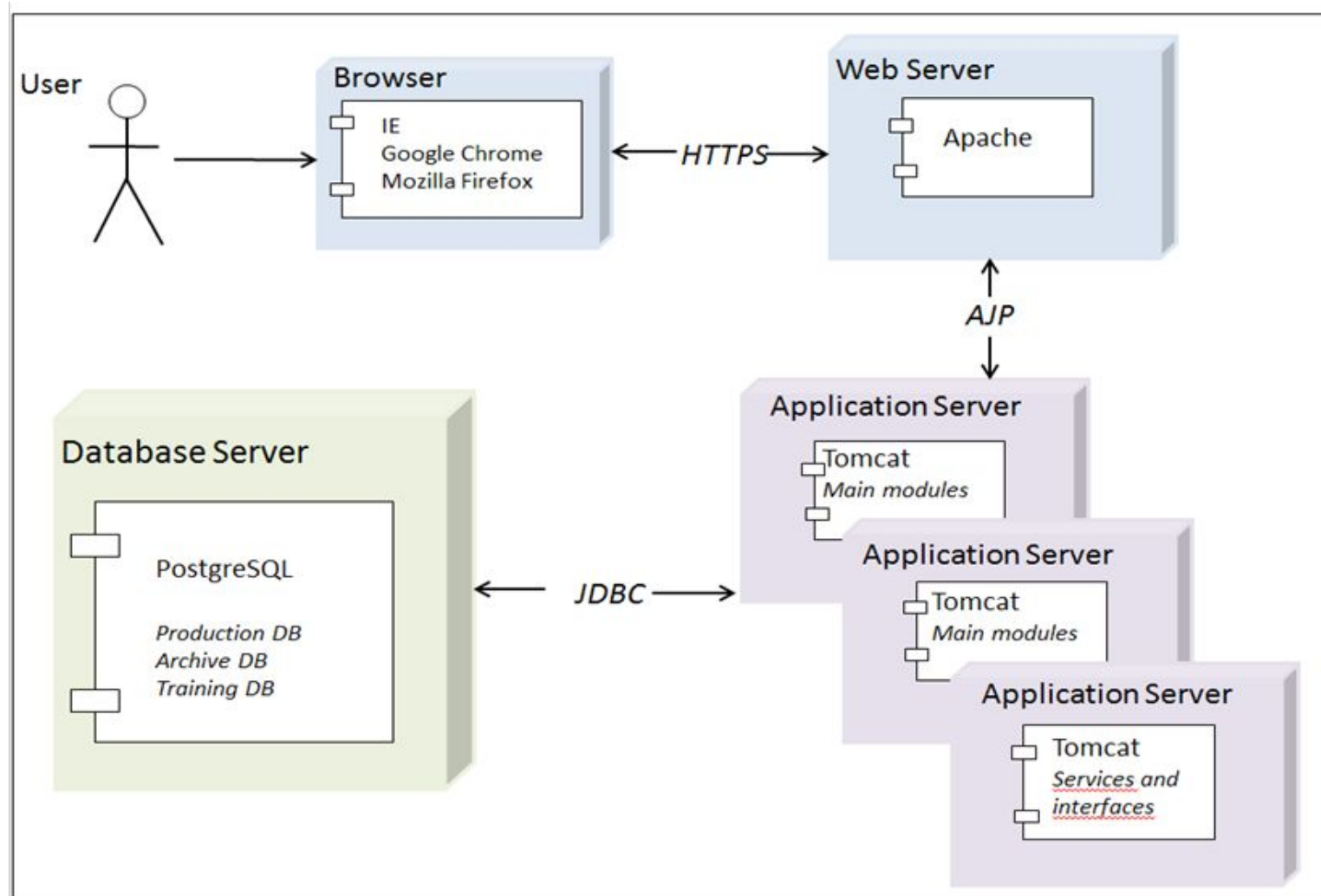
Database server (Postgre SQL >= 9.x suggested, MS SQL or Sybase possible)

Application server (Apache Tomcat >= 7.x)

Web server (Apache 2.x)


Most of proposed system software is open-source and does not require purchasing any licenses. In addition to free possibilities, MS Windows Server and MS SQL Servers are supported.





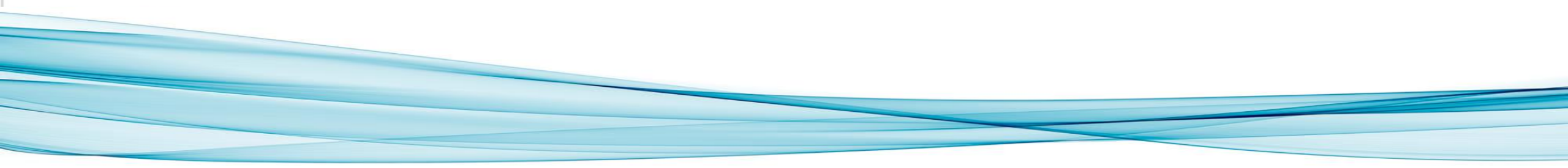
10 key-factors of the EHR



1. **Decision point** – create common electronic data exchange system for hospitals / region;
 2. **Legislation** – obligation to share data. Opt Out/Opt In;
 3. **Standardization and data quality** – common data standards. Process standards;
 4. **Reliability** – security and transparency of all actions related to EHR;
 5. **Usability** – machine-readable data. Fast and simple system;
 6. **Technical base** – common infrastructure (X-road / Roksnet);
 7. **Interfacing** – connecting (technically) healthcare providers;
 8. **Inclusion** – all healthcare partners are involved to the process;
 9. **Involving clients** – solutions for patients (patient portal, ePrescription);
 10. **Interoperability** – benefits for all partners in healthcare via technical solutions;
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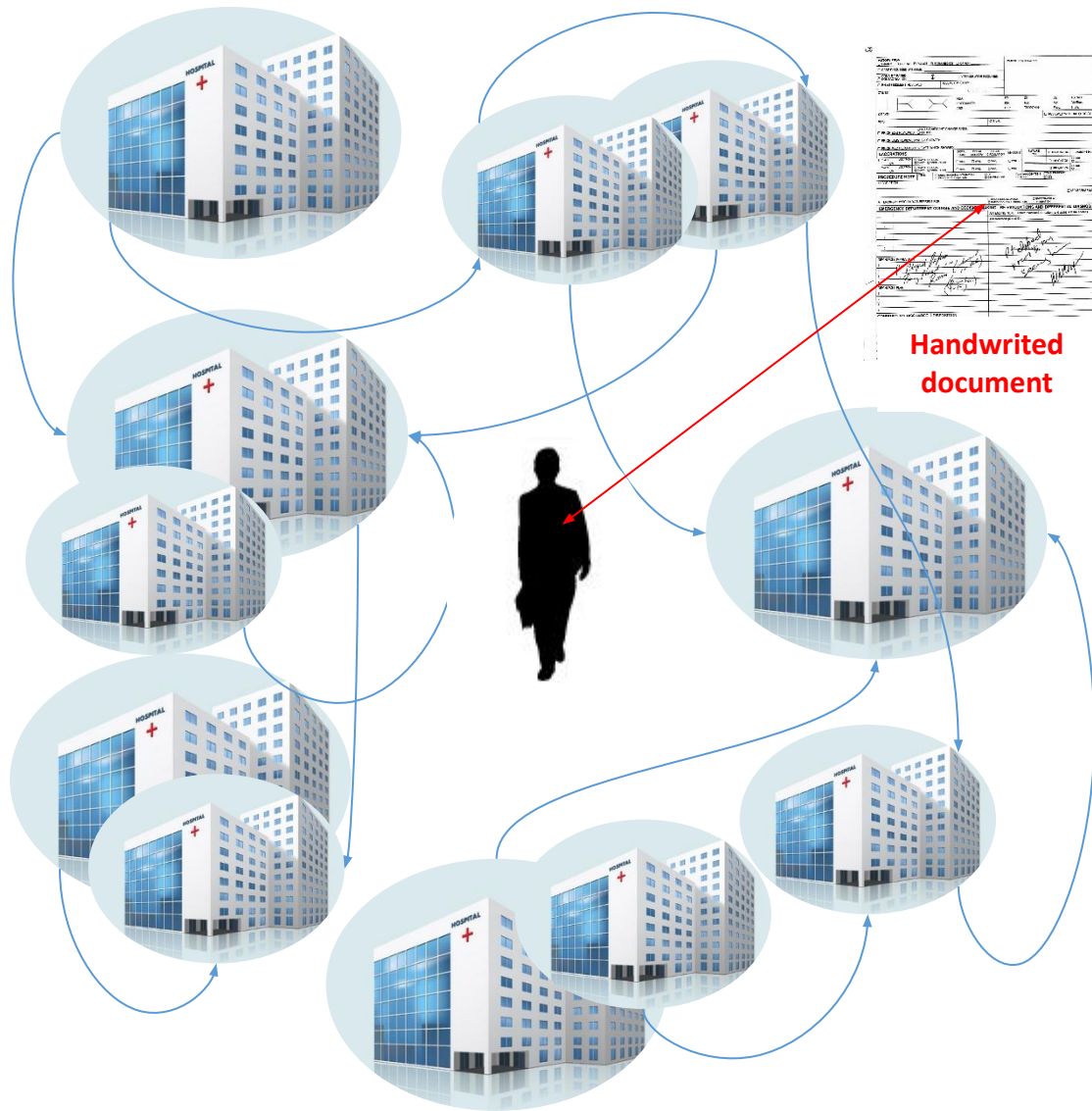
1. Decision point:

Does there exist necessity for the **secure healthcare data Exchange system** for the:

- Better **public health outcomes** (through better prevention and treatment decisions)
 - **Lower healthcare expenditures** (transparency of the system, better control of the expenditures, avoiding duplication of healthcare procedures)
 - **Higher employment availability** (better treatment results, better public health, saving patient time related to healthcare, less incapacity benefits, less days of incapacity)
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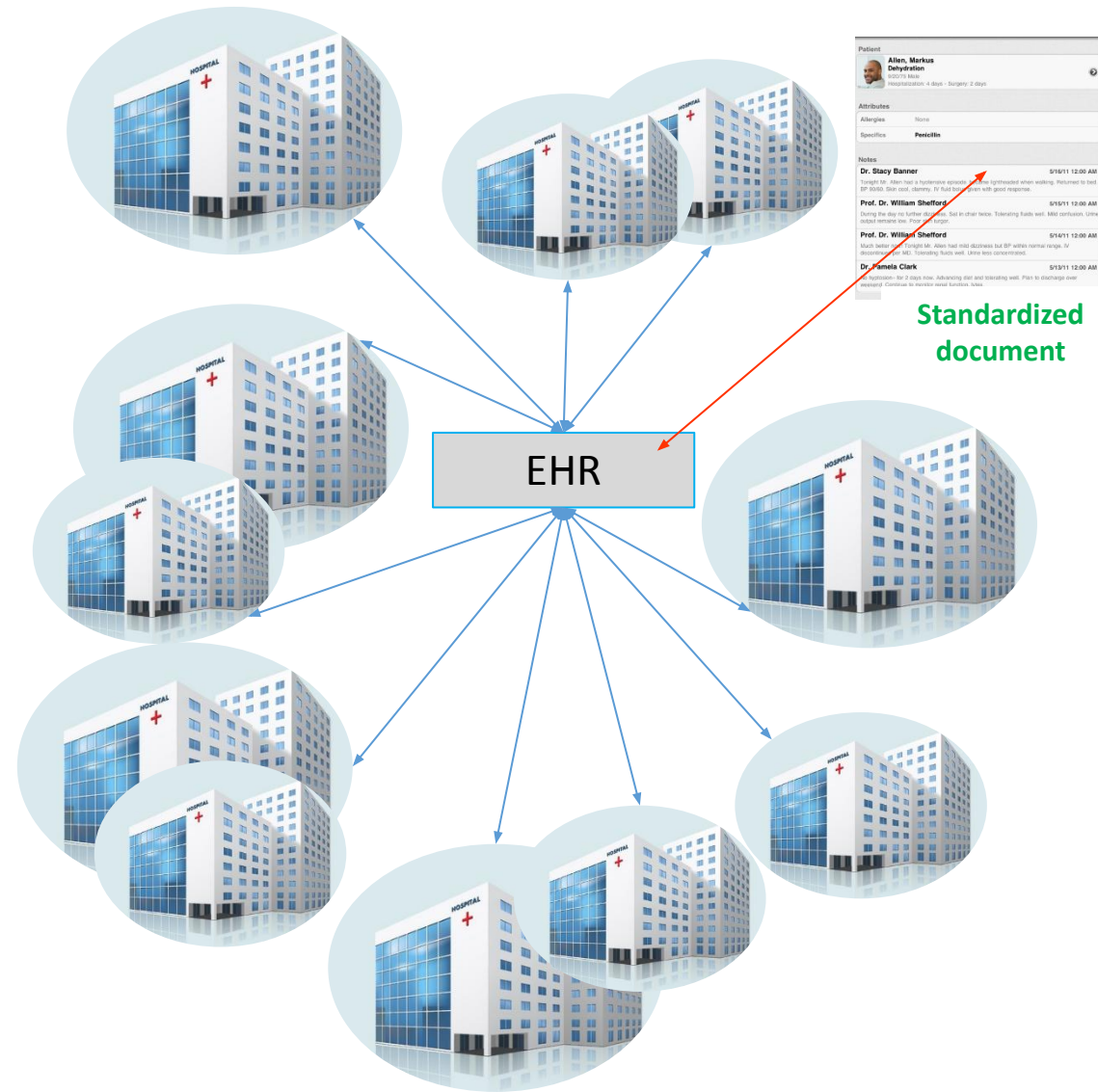
All healthcare service providers (HSP) and treatment data are connected on the base of common standards (technical, data and process standards)

- Treatment data are **available for all HSPs**.
- Patient **does not need** to operate with any **paper documents**.
- Patient's **treatment history** will be available also for patients via Patient Portal.



Handwritten document

Paper-based data exchange




Standardized document

Electronic data exchange

Advantages of the EHR:


- Saving patient time (not necessarily saving physicians time)
- Availability of the medical information and treatment history
 - Avoiding mistakes
 - Better prevention
 - Better rehabilitation
- Transparency of the health services
- Avoiding duplication of tests and procedures

Discussion points:

- EHR implementing and management costs
 - Measuring value of the EHR
 - Interfacing costs and interests of partners
- 

2. Legislation – what is mandatory for achieving the goal

Data exchange is supported by law

- Possibility to **share** medical data with other medical professionals
 - Data **standards** are indicatively supported by law.
 - Secure standards and accepted/supported infrastructure.
- 

Variable 1	Variable 2	Registrants	Baseline Correlation	GE Correlation	SE Correlation	GE Change (+/-)	SE Change (+/-)
Grade	Number of days active	All	0.800	0.750	0.745	-0.050	-0.055
Grade	Number of days active	Explored + Certified	0.553	0.558	0.564	+0.005	+0.011
Grade	Number of events	All	0.722	0.701	0.697	-0.021	-0.025
Grade	Number of events	Explored + Certified	0.458	0.495	0.501	+0.037	+0.043
Grade	Number of forum posts	All	0.146	0.064	0.156	-0.082	+0.010
Grade	Number of forum posts	Explored + Certified	0.074	0.036	0.108	-0.038	+0.034
Grade	Number of video plays	All	0.396	0.397	0.403	+0.001	+0.007
Grade	Number of video plays	Explored + Certified	0.159	0.194	0.189	+0.035	+0.030
Number of events	Number of days active	All	0.844	0.837	0.835	-0.007	-0.009
Number of events	Number of days active	Explored + Certified	0.736	0.773	0.776	+0.037	+0.040
Number of events	Number of video plays	All	0.665	0.698	0.714	+0.033	+0.049
Number of events	Number of video plays	Explored + Certified	0.587	0.628	0.634	+0.041	+0.047
Number of forum posts	Number of days active	All	0.207	0.104	0.207	-0.103	+0.000
Number of forum posts	Number of days active	Explored + Certified	0.180	0.103	0.200	-0.077	+0.020
Number of forum posts	Number of events	All	0.287	0.117	0.194	-0.170	-0.093
Number of forum posts	Number of events	Explored + Certified	0.279	0.113	0.176	-0.166	-0.103
Number of forum posts	Number of video plays	All	0.091	0.035	0.100	-0.056	+0.009
Number of forum posts	Number of video plays	Explored + Certified	0.051	0.014	0.050	-0.037	-0.001
Number of video plays	Number of days active	All	0.474	0.492	0.505	+0.018	+0.031
Number of video plays	Number of days active	Explored + Certified	0.311	0.404	0.407	+0.093	+0.096
Average		All	0.463	0.420	0.456	-0.044	-0.008
Average		Explored + Certified	0.339	0.332	0.361	-0.007	+0.022




- Availability of the medical data
- Standards
- Set of medical data



3. Standardization – what data and how will be exchanged

Data Exchange will be organized in a standardized format:

- Data have to be **machine readable** (not PDF);
 - Queries can be made in a detailed way (not whole document) - **field by field** (for example: diagnose, lab tests etc.);
 - Healthcare standards are managed in a **centralized way** (by connected healthcare providers).
- 

Advantages of the standardization:

- All participants can change information with each other
- Exchangeable information is understandable for all participants
- Data are comparable
- Data can be handled automatically



4. Reliability – for use it you need to trust it


People have to trust the system

- All actions in EHR are traceable (**who and when** have looked data)
- EHR is in accordance with **higher security** requirements




5. Usability – people like to use clear and beautiful things/solutions

Users need fast and simple system

- **Entering** data to the EHR (include as much as possible existing data from different sources – for example personal data of the patient from the population register)
 - **Integrating** data from different sources (saving time, effectiveness)
 - **Graphical solutions** for better overview and effectiveness
- 

6. Technical base – appropriate infrastructure is a premise for successful technical solution

Common infrastructure for the data Exchange – x-road / Roksnet

- Common **secure environment** and standards for data Exchange and e-services instead of multiple separate VPN connections
 - Possibility to use **regular internet connection** (VPN is not needed)
- 

7. Interconnecting – system has value in case of all parties are using it

All HSP of the region (state) are connected with each other

- HSP's have accepted the cooperation model and make data available for healthcare partners between medical professionals
- Split expenses of infrastructure and software



8. Inclusion – all parties have to accept new system

All healthcare parties are involved to the decision process

- All HSP's understand benefit of the EHR
- Endusers accept EHR and will use it
- There is a consensus between partners what kind of problems should EHR to solve



9. Solutions for patients – clients have to use the system

EHR is for HSP's and for patients

- ePrescription and Patient Portal are important applications of the EHR
- Patients as users make the system needed and widely accepted



10. Interoperability – *what kind of benefit we are expecting*

Interoperability – system will be successful if all parties have interests to run the system and get benefit

- Data and process standards
- Management of the healthcare processes



Conclusion:

When measuring the effect of the investments to the EHR we need to remember that the **benefit in healthcare will appear on the other location than EHR investments**. Investments are made to the IT systems with the purpose of developing healthcare processes and reaching to the better public health. It has a positive impact for the healthcare expenditures, general employment and indirectly also to the GDP.

Only technical solution does not guarantee expected results. Technical solutions have to be implemented together **with changes in healthcare processes** and have to be supported by respective legislation.

All parties have to understand the **benefit** of the created system for being motivated to use it.





Thank you!

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Annex 1: Comparison of healthcare information systems (3)



Features	Epic	Cerner	HEDA
	Web-based. Local and Cloud computing	Cerner Millenium EMR (EMC, Cloud computing) since 2001. Cerner CommunityWorks for small hospitals.	Web-based. Local and Cloud computing
Standards			
EHR standards	HL7 v2 ASCII, HL7 v3 XML, FHIR	HL7 v2 ASCII, HL7 v3 XML	HL7 v2 ASCII, HL7 v3 XML, FHIR
HIPAA compliance (security)	yes	yes	yes. HEDA meets the requirements IPAA (ISKE K2T2S2)
Data			
Database	Chronicles Extended Relational Database Management System. One database.	Cerner 'Health Facts' database, Oracle RDBMS. Oracle Enterprise Manager to Support New Cloud Services	HEDA Electronic Health or Medical Record(s), Postgre SQL (ORDMS, object-relational database management system). One database for many health enterprises is possible.
Special databases			XML database BaseX (freeware) for confirmed XML documents.
Source code			
	Epic's code base is the same across all customers worldwide.		Basic Code + locally specific code.
Configuration possibilities	yes, functionality unique to a contry or region is turned on by configuration settings in each locale.	yes	through business rules only

System management

Administration	eMAR		Administrative module
Resource Planning			Resource Module
Schedules and orders	Enterprise Scheduling 'Cadence'	Order Management	
Patient information	Customer Relationship Management/Call Management		SMS service, e-mail service

Ambulatory treatment

Reception	Enterprise Registration 'Prelude'	Enterprise Registration Management	Registration and Reception Module
Department	EpicCare Ambulatory Electronic Medical Record (EMR)	Ambulatory EHR, PowerWorks® Practice Management (PM)	Ambulatory Cabinet Workplace, Doctor's Workplace
Documentation		Clinical Documentation	Consulting Card, Prescriptions, Referral notes, Epicrisis

Department	ASAP Emergency Department Information System	PowerChart FirstNet	Emergency Module
Triage	Nurse Triage	Triage and Tracking Board	Nurse Triage Workplace
Documentation		Clinical Documentation	Patient Card, Operation card, Epicrisis, Referral notes, Consulting

Inpatient Treatment

Hospital	EpicCare Inpatient Clinical System	PowerChart	Inpatient Module
Documentation	Clinical Documentation, PowerNote		
Treatment plan		PowerPlan	Treatment plan Workplace, Treatment Diary
Anesthesia	Epic Anesthesia Information Management System		Anesthesia Workplace
Operating Room	OpTime Operating Room Management System	SurgiNet	Operating Room Planning Module
Intensive Care	Epic's ICU module		TISS Workplace
Womens health	yes	yes, PowerChart Maternity	yes, Pregnancy Card, Childbirth Card, Newborn Card
Bedday's Calculation	yes	yes	yes
Meals and Diet's	yes	yes	yes
Inpatient Pharmacy	Inpatient Pharmacy System 'Willow'	PharmNet	Hospital Apotheca Module, Drug Administration Workplace
Activity indicator's	yes	yes	yes
Visualization	yes, Health Information Management	yes, CareAware, PowerVision	yes
Monitoring	yes, Health Information Management	yes, CareAware	yes

Diagnostic			
Radiology	Radiology Information System 'Radiant '	RadNet	Radiology Module
Laboratory	Beaker Public Health Laboratory System	yes, Laboratory, uCern	Laboratory Module
Clinical Laboratory	Beaker Clinical Pathology	yes	Pathology Module
Pathology	Beaker Anatomic Pathology	yes	Pathology Module
Microbiology		yes	Microbiology Module
Medical Devices (connectivity)	yes, IHE and other standards	yes, IHE and other standards	yes, IHE and other standards
Imagines, PACS	yes, DICOM	yes, DICOM	yes, HL7 connect to different PACS systems
Analytics and Reporting			
	Enterprise Intelligence 'Cogito'	CCL Scripting, Open Engine, Discern Explorer, PowerVision	HEDA reporting module (web application Crystal Reports XII)
Billing and Budget			
	Resolute Hospital Billing	yes	Billing Module. Budget and Contacts Module