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INTEGRATED IT SYSTEMS AND THEIR INFLUENCE ON MANAGING THE FINANCES OF A HEALTHCARE UNIT

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Abstract   This paper describes the properties and components of integrated hospital IT systems, and the correlations of those comprehensive systems with the use of tools supporting financial management of the units. The first part discusses the essence of Integrated IT Systems and attempts to apply the system's logic to the traditional model of hospital functioning. The second part analyses current information about IT sector trends and possible applications of modern technologies in healthcare units. The third part of the paper discusses the potential of computerising the medical sector as an element of helping hospitals function more effectively.

INTRODUCTION

Integrated IT Systems (ZSI) designed to support medical units form one of the most advanced software groups for enterprises. Systems of that class have mechanisms to support information flow and recording, tools to manage hospital components, as well as tools to integrate all areas of its activity. In the long term, proper implementation of ZSI is very likely to result in considerable financial benefits, starting with almost or completely immeasurable ones – such as broadly understood improvement of information flow or quality of the services, or simplifying the managing process – to measurable ones, such as precise values of financial indices and, finally, a better general financial condition.

The history of software to support enterprise management dates back to the late 1950s. The first area covered by computer support was materials management and inventory planning, hence the name of those first systems was IC (Inventory Control).

Another decade brought intensive development of computer technology and increased computing power, which aided constant acceleration of software operation. The first systems were also implemented in medical centres then (Barnett, 1987). And thus, successively there appeared system elements dedicated to business areas. Installed locally on individual computers they could not communicate, however. The next stage in their development was interaction and feedback to the user after data was processed. In the 1990s, the foundations for the ERP system model that we know today were created. It was expanded with such modules as accounting, finance and management control, and (quite importantly) with the possibility to integrate particular modules responsible for various tasks (Parys, 1999, p. 24-27; Popończyk, 1996, p. 11-14). ERP systems are constantly changing as concerns the technologies they use and the functionalities offered (Kumar & Hillegersberg, 2000). 21st-century ERP systems mainly offer the possibility to integrate various

systems and exchange information among them in the B2B model (Kumar & Hillegersberg, 2000). ERP system development and improvement trends include e.g. (Adamczewski, 1999; Gupta, 2000; Maciejec, 2001; Scheer & Habermann, 2000; Sprott, 2000; T. Parys, p. 20-27):

1) expanding the system with software for new modules (directions of the unit's functioning) mainly by developing newer versions of already existing modules and adapting them to current legal norms,

2) considering branch-specific solutions (in this case, healthcare-specific),

3) ZSI architecture is based on a core that offers basic activity, and a set of elements.

The whole hospital software is divided into two complementary parts. One is called the grey part, or the administrative part. It contains modules of finance and accounting, HR and payroll, materials management, public procurements, fixed assets records, equipment records. The other, medical part, called the white part, has functionalities to handle e.g. patients statistics, orders, operating room, clinic, occupational medicine, rehabilitation, laboratory, sample collection facility, medical documentation, dialysis centre and hospital infections. It must be kept in mind that systems designed for the medical sector classify in some respect to ERP class solutions, yet they are enriched with unique branch qualities – information flow and medical sphere management. Hence to distinguish the branch, we use names classifying the area of medical activity. The name HIS (Hospital Information System) denotes the system's main body. There are also supplementary system classes capable of independent functioning, designed due to their considerable complexity and significance for the hospital's functioning. Such systems cover diagnostics areas – RIS[1] (Radiological Information System), PACS[2] (Picture Archiving and Communication System) and LIS[3] (Laboratory Information System). Their autonomy and at the

same time their key role makes them statistically the first stage of hospital computerisation if the hospital does not have the financial means for comprehensive system implementation.

Due to its modular structure, the construction of a comprehensive hospital system may be adjusted to the organisational structure of the unit it is implemented in. Should that be done? The architecture of modern IT systems is created based on an analysis of the best management practices and most effective units. ZSI implementation in a medical unit is the perfect moment for reorganising and thoroughly modifying the unit's structure.

MODULE DESCRIPTION

Cooperation Chart for Hospital ZSI Modules
The diagram below shows the data flow between particular elements of the hospital system[4].

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1   RIS (*Radiological Information System*) – system to handle patients statistics and store examinations within imagery diagnostics and support medical description of radiological materials.
2   PACS (*Picture Archiving and Communication System*) – system used to store, access and manage diagnostic imagery.
3   LIS (*Laboratory Information System*) – system to manage the diagnostics laboratory, i.e. enter and store examinations, automatically analyse and generate results.

4   System – set of elements with a specific structure, which forms a logically ordered whole. After *Polish Dictionary*, http://sjp.pwn.pl/slownik/2576909/system.

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Figure 1: Chart of hospital organisational units' structure. Information transfer between the units
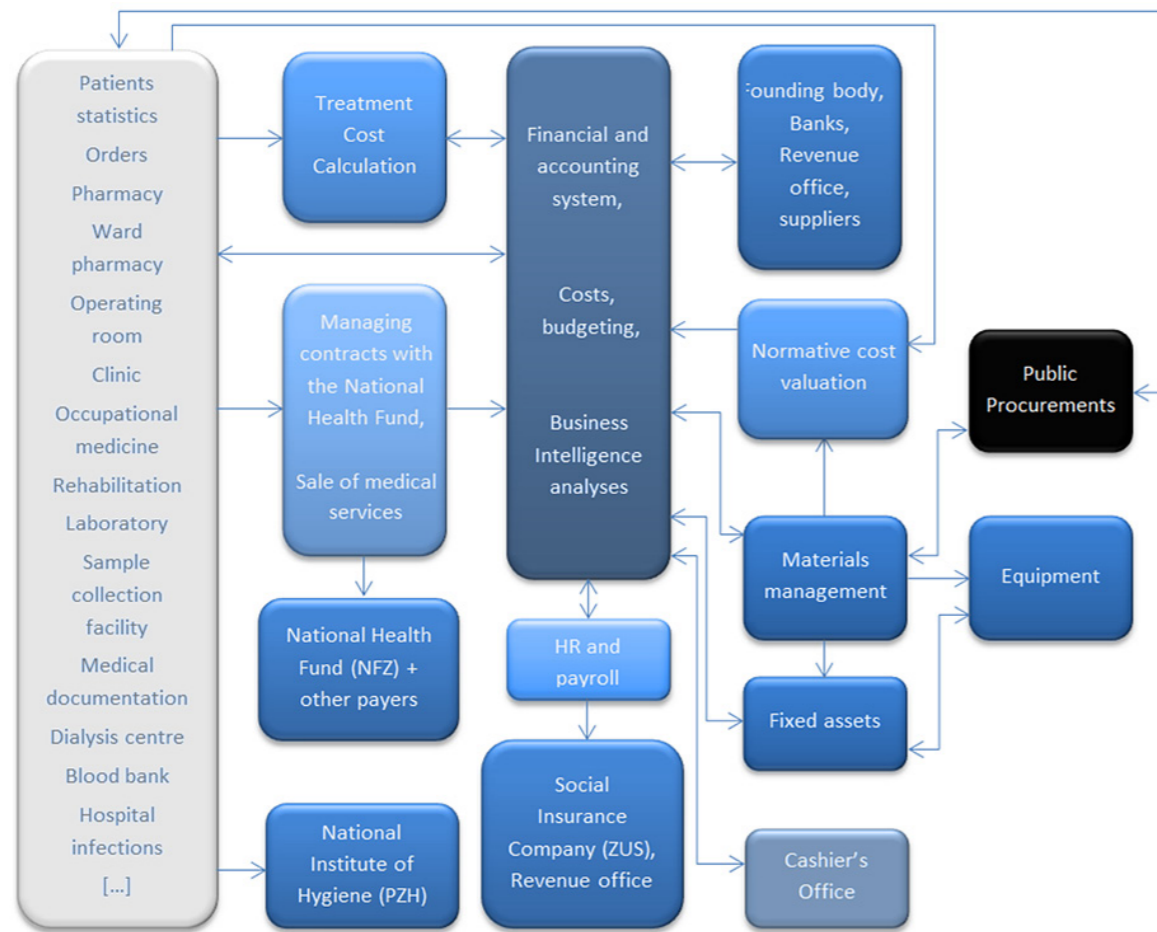
Source: Own study

Analysis of figure 1 shows that there is a core of the system, which collects information from almost all modules. It is the finance and accounting module, which then transfers the data to the Management Information System.

Modules of the Administrative (Grey) Part

A Hospital Integrated IT System bears to a considerable extent the hallmarks of an ERP class system, and thus it contains modules typical of enterprises, represented here as the 'grey part'. As an extension of ERP, the grey part includes a module to manage settlements with the National Health Fund or the sale of medical services. Data of the administrative part serve mainly to gather and process economic information, which is then used in reporting and in feeding the management information system (Business Intelligence class). Below a short description of selected modules.

Finance and Accounting

This module's task is to support the hospital's bookkeeping according to the accounting act as concerns bookkeeping and financial reporting. The key principle of using such software is its conformity with the regulations. Typical features of the system include the possibility to create an account plan, keep books, gather and process financial and accounting data, print reports, create and manage the budget, or record data concerning costs. The system's functionalities may include a register of sales and purchases.

HR and Payroll

The module supports managing the human resources of a medical unit and employee pay calculation. Due to the complicated structure of working time in a hospital (shifts, bonuses, large number of components), such software considerably improves a ward's functioning, i.e. automatically generates schedules and calculates the pay. The module must conform with the legal norms binding at the particular time.

Materials Management

This module helps record materials flow both as concerns quantity and quality. The software allows to create the required number of warehouses within the unit and perform any operations related to materials flow. Important is the notifying function, i.e. automatic warnings if resources are running out, which helps limit the risk of lack of materials to a minimum.

Fixed Assets and Equipment Records

Records of the assets (fixed and impermanent) of a medical unit allow to write off and depreciate fixed assets. The module functions in accordance with the binding legal regulations. It allows to e.g. record fixed assets, keep inventory books, keep files of fixed assets. There is also a possibility to record fully depreciated (low-value) fixed assets.

Internal Orders and Public Procurements

Internal orders in a large regional hospital can amount to several dozen daily at the least. A solution to greatly improve the effectiveness of order flow and their execution is the possibility to remotely report the demands of organisational units and employees, monitor order status and notify of their execution.
Settlements with the National Health Fund and Managing Sales of Medical Services
Each service provider who signs a contract with the National Health Fund for reimbursement of the scope of services given in the contract must record and export data concerning the provided services – as stated in the contract – to the payer's system (electronically). When the data is verified, the calculation process is initiated (on the payer's side). A bill template is then uploaded and loaded into the system which operates settlements with the Fund, and a bill or invoice is generated. In the case of selling (commercial) medical services, the procedure

is much simpler and is limited to creating a price list, contractors' list and an offer structure (types of payment).

Normative Cost Valuation

Each hospital has specific resources and offers certain services. A typical resource is e.g. a hospital bed or the time of the employee currently on duty. Services can be divided into simple (indivisible) and complex ones (aggregated simple services). A complex service is for instance surgery for appendicitis – it consists of many smaller services. Use of resources over time is a cost that can be assessed. Normative cost valuation allows to evaluate the costs necessary to provide a given service, divided into materials and staff. What is particularly important for the financial director is the comparison of the real cost of a patient's stay to the amount of reimbursement for that stay. If a model is assumed in which all hospitals have full knowledge on service profitability (where the services are provided at an optimum cost), the market will be able to react to the demand very quickly.

Modules of the Medical (White) Part

As has been mentioned above, a unique property of ZSI designed for the medical sector are elements concerning the functioning of the hospitals' medical sphere. For instance, one of the basic functionalities is collecting and distributing medical information concerning the course of a patient's treatment from beginning to the end of their stay. The system should support treatment by enhancing the ergonomics of work and decreasing the time of accessing information about the patient's health, and allow to create medical documentation and ensure reporting tools for external units (NFZ, PZH, Main Statistical Office) – e.g. generating lists of the services provided, or statistical reports on waiting lists. Below given are short description of the main modules contained in the set defining the medical part.

Patients Statistics

This is the key module, the basis or skeleton of the medical part, in a sense. It serves to record patient statistics and any event which must be included in medical documentation. Elements composing the medical documentation must meet the requirements stated in the directive of the Minister of Health of 21st December 2006 on types of medical documentation

in healthcare centres, the manner of keeping it and detailed conditions for accessing it. Typical hospital sections using patients statistics within the medical unit are:

1) the admissions ward (registering patient data, registering information of the stay at the admissions ward, refusal to admit a patient or direct the patient to a ward, waiting list records),

2) wards (accepting patients, defining diagnosis according to ICD-10[5] glossary, entering the performed medical procedures according to ICD-9[6] glossary, collecting information forming case history, preparing medical documentation, discharge documents, death record, defining the DRG[7]),

3) hospital statistics department (authorising excerpts for complete documentation of stay, making a statistical record, analytical operations, reporting).

It ought to be added that the module of patients statistics is only used in stationary (closed) treatment, i.e. in hospitals.

Orders

Electronic exchange of data between the particular hospital units considerably helps eliminate time-consuming procedures. Full use of that feature can be seen in the case of orders for diagnostic or laboratory examinations, treatments, diets. The data exchange is bilateral, i.e. the results of the ordered activities are entered in the system and the ordering unit is notified. It is possible to print out the results.

Laboratories

Various laboratories have their own specific character (X-ray laboratory, USG laboratory, pathomorphology laboratory), yet the character of their activity is highly similar and differs only in nuances. Each laboratory may record and queue orders and enter the results of particular examinations in the system.

Hospital Pharmacy and Ward Pharmacies

The main (hospital) pharmacy is sometimes treated as a typical warehouse and consequently included in the administrative part. Yet its function bears direct relation to treating patients, thus this paper includes

it in the medical part. The pharmacy module is used to manage internal drug turnover – it helps to control their amounts and record their distribution to ward pharmacies as needed. There are usually additional features allowing to order drugs according to the relevant act8. Ward pharmacies allow to automatically control expiry dates, and then issue drugs according to the directives of authorised staff. Data recorded in the drug management module feed the treatment cost calculation module.

Management Information System – Business Intelligence

This software is top in the hierarchy of the whole Integrated IT System in a hospital. The target group (recipients) are people in the management, in particular the Chief Financial Officer, Chief Accountant, Chief Executive Officer, Chief Medical Officer. The idea of that software class is finance and business analytics, i.e. writing reports or balance sheets, listing key indices of financial and economic effectiveness of the hospital's activity. A typical feature of BI class systems is the "management dashboard". It is a specially developed (defined) set of indicators showing the required data. BI system architecture consists of a data warehouse fed from the databases of the grey and the white part. For the application to show current results, the warehouse must be supplied with fresh data.

Management Information System – Treatment Cost Calculation (TCC)

The idea of software calculating treatment costs is to facilitate control of medical activity costs both individually and in aggregate. Knowing which treatment elements are important as concerns costs allows to activate the functions which prevent unprofitable service orientation. Similarly, selecting treatment elements the reimbursement of which exceeds costs results in the management focusing on contracting and providing those financially effective medical services.

Making (long-term) strategic decisions concerning the medical services offer must be based on data from the relevant time period. One of the basic functionalities of IT systems is reporting based on a data slice. The system allows to filter information

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5 Information on the International Statistical Classification of Diseases and Related Health Problems ICD10 at http://srk.csioz. gov.pl/php/index.php?_mod=hcdmod&_op=listall&id=70.

6 Information on the International Classification of Procedures in Medicine ICD9 at http://srk.csioz.gov.pl/php/index.php?_mod=hcdmod&_op=listall&id=96.

7 Information on Diagnosis Related Groups at http://www.nfz. gov.pl/new/index.php?katnr=7.

8 Act of 12th May 2011 on reimbursement of drugs, foods for special medical purposes and medical products, http://isap.sejm. gov.pl/DetailsServlet?id=WDU20111220696.

e.g. with consideration for time scope or a selected medical procedure. What is more, data concerning the patient and the provided service scope are automatically taken (updated) from the database fed with current data from other modules, like Patients Statistics, Laboratory, Hospital and Ward Pharmacies, in accordance with the parameters set when implementing the system. The data processed in the system produce a report which includes the number of days of the patient's stay, the drugs administered and their cost, examinations ordered plus cost, and other costs included within the general costs of a stay. It is important how the costs of the used drugs and the performed services are calculated. Drug prices are taken from a specific delivery defined earlier in the system, and service costs are assessed based on the costs from the last month when the service was provided. Collecting the above data allows to perform economic analyses according to the required criteria, e.g. a specific procedure, disease entity, diagnosis, consumption of the given drug, type of drugs, bed occupancy, ward occupancy. The quality of data

entered in modules supplying TCC has a vital impact on the usefulness of reports generated by the system. According to modern software engineering methodologies, ensuring mechanisms to protect the application's business logic against wrong operations of a user are of key significance. All categories significant from the perspective of financial analysis are validated or have glossaries based on international standards. An example of that is the ICD (International Classification of Diseases) glossary published by the WHO, where the ICD9 version holds a list of medical procedures which can be performed in a patient's treatment, and ICD-10 lists the possible names (diagnoses) of diseases. For drugs, the Anatomical Therapeutic Chemical (ATC) Classification System is used, also published by the WHO.

Architecture of Information Flow to the TCC Module

Data from TCC allow to adjust the scope of services to the demand. It may thus be said that it offers the function of surveying real market needs.

Figure 2: Diagram of information flow to the treatment cost calculation module
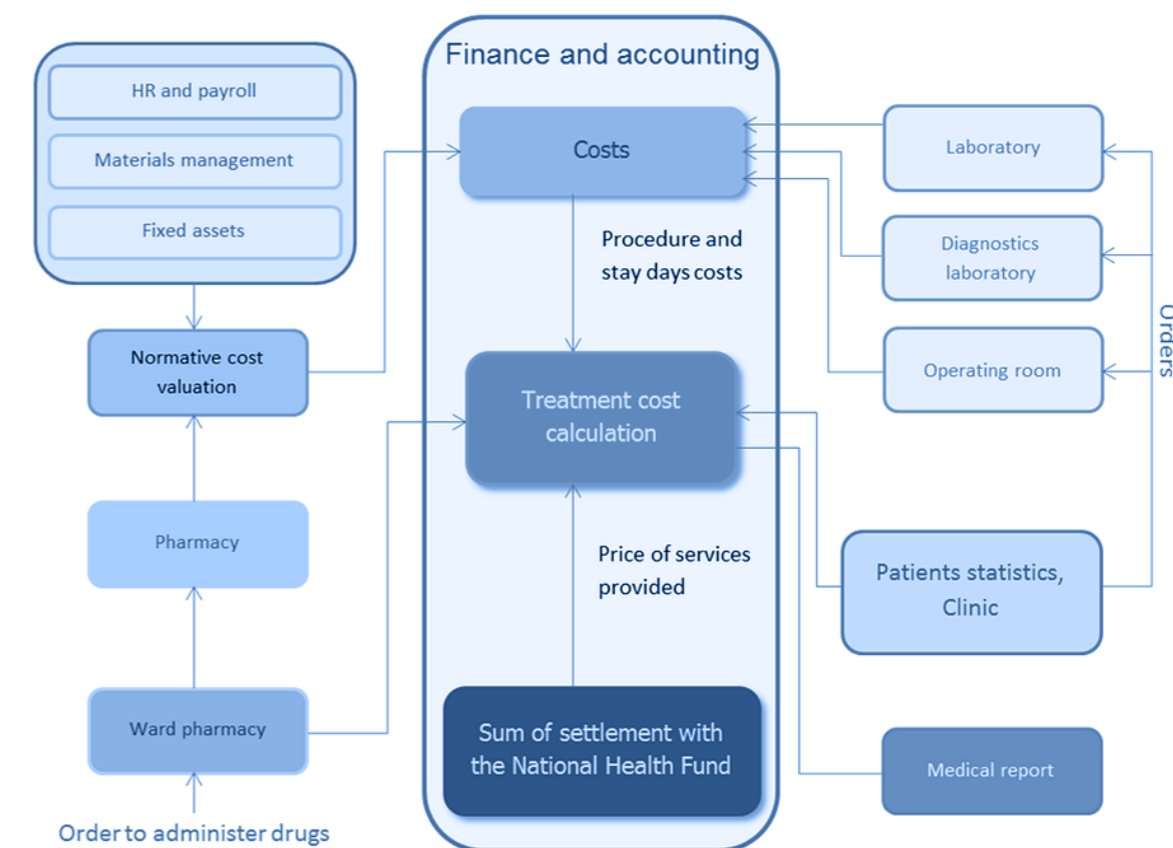
Source: Own study

DEVELOPMENT TREND OF IT SYSTEMS IN MEDICAL CENTRES

The first step forward will certainly be abolishing the duty to keep medical documentation in paper form. Currently, medical documentation may be kept in an electronic or paper form[9]. Starting 1st August 2014, medical documentation will have to be created and kept exclusively electronically[10]. The advantages of the change seem obvious. Decreasing the amount of paper used and consequent decrease of administrative costs, pro-environmental effect, quicker access to data, considerably longer durability of the data carrier are only some examples.

It is worth considering how to combine IT knowledge with effective management processes into a highly efficient matter which will fill the gaps in productivity and services for a patient of the medical branch. The image of hospitals in some 10-20 years from now should correspond with the trends developing now. One of the greatest visionaries of the IT branch, Steve Jobs, believed a trend to be the art of connecting dots. To quote, "You can't connect the dots looking forward; you can only connect them looking backwards." It is the 'back', past events that give foundations for 'forward', future trends.

So what are the technologies which start to germinate now? What solutions are currently developed with great dynamics? Many innovative companies of international standing publish occasional spots (of an advertising and informative character) to show the development path of their products. When published, these are usually quite daring visions, frequently bordering on technologies taken straight out of science fiction films, but sooner or later those remarkable technologies become part of our everyday life.

According to the direction of the global development of the software branch, medical systems' evolution will go towards mobility. We can already observe medical tablets being used all over the world, also in Polish hospitals. The tablets enable immediate and wireless access to the hospital database, executing orders, completing the case history on a current

basis during the rounds, or drug consumption record when it is administered. Today, medical tablets are already in use. What will happen in a few years? Human eyesight is truly an amazing cognitive tool. The number of displays used around us rises rapidly. Each device designed to present data must have a display. And if the omnipresent displays (in a hospital) were to be substituted with just one, user-integrated device? The technology of augmented reality is currently used in mobile devices (mainly phones) and navigation ones. Its unique functionality combines real world with a real-time computer-generated one – to the image directly from the camera, graphics are added to describe the objects shown there (e.g. street names, buildings, tourist information). A similar technology is used by HUD[11], used in army fighter planes and some sports cars. A hospital in which employees wear special glasses or contact lenses to help perception seems to be a highly effective unit. With each look at the patient, the doctor gets current information on who the patient is, on the examinations ordered, examination results, case history, or current measurements. What is more – based on the data shown by diagnostic devices and the patient's unique features (patient's allergies) the doctor may order administering the suitable drug from an automatically managed storage of intra-hospital drugs. There already exist solutions which allow to project an X-ray image onto the patient's body to analyse the functioning of internal organs. The nurse may monitor the time and patients' vital signs on a current basis (items displayed permanently), or when s/he looks at the selected patient, selected information about the stay and treatment will be displayed. Calling for help with a patient in one gesture should also pose no problems. The potential of augmented reality as a technology seems to be boundless.

To give reliably processed information, the system needs much data. There already are places collecting colossal amounts of data. Those are social network services or personalised browsers which collect user information. Development clearly heads towards filtering the huge mass of data, extracting the most useful and valuable ones, and then turning them into knowledge. Further progress will bring mobile devices equipped with diagnostic tools which can analyse the state of health, as well as medical diagnosis

support based on a cloud with information about the patient available online (lifestyle, habits, last travels, colds, diet, etc.). When making a diagnosis while with the patient, the doctor may certainly use such information.

Large computerised healthcare units usually work with software from one supplier that is available at the local server. In other words, the whole Integrated IT System works thanks to collaboration between the modules, which cannot come from many various suppliers (though there are exceptions, i.e. when the software from suppliers is complementary). Future heads towards shifting software to cloud computing in the SaaS (Software as a Service) model, where the user has access to all modules (not necessarily from one producer), e.g. through a Web browser, and is not interested in the issues of equipment, software installation, integration or updates. The basic differences between the current application serving and the cloud are payment and scalability. In the second case, the user pays only for resources actually used, and scalability allows to increase and decrease resources in a practically unlimited scope in a very short time.

## HEALTH SERVICE COMPUTERISATION POTENTIAL

It is assessed that the Polish health service sector employs about 400 thousand medical employees[12]. With a little over 700 hospitals, the arithmetical mean oscillates at about 690 of all (not only medical) employees per hospital. According to the report from a survey on "Resources and potentials of healthcare centres within IT and their participation in the teleinformation space" conducted on 27% of Polish hospitals in 2010, doctors make up 18% of all staff. It is only for a marginal part of hospital staff that the defined duties do not include knowledge of IT system elements. An important index showing the computerisation potential is the number and type of software currently used in hospitals. The diagram below shows the ranking of the areas of hospital activity which are computerised most often.

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12   The number of doctors licensed to practice as doctors in 2007 in Poland was 126 thousand. The number of nurses was 273 thousand. Together, that gives the number of 399 thousand. P1 Project Feasibility Study, September 2009, Ernst & Young.

Figure 3: Percentage of hospitals without specialist medical IT software against the total number of hospitals in Poland (%) N=187
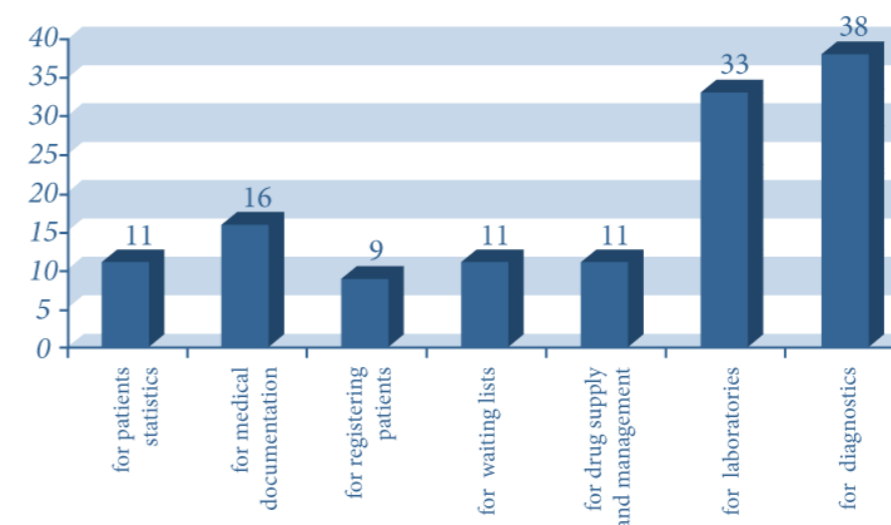
Source: Healthcare Information Systems Centre (CSIOZ), "Resources and potentials of healthcare centres within IT and their participation in the teleinformation space" survey

The IT system module used most frequently is electronic registration of patients (it is used by 178 out of 187 respondents). It probably results from

the fact that this module is the least complicated as compared to others, and easy to implement. Patients registration may be considered a basic functionality

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9   Directive of the Minister of Health of 21st December 2010 on the types and scope of medical documentation and methods of its processing, in force since 1st January 2011, states that "medical documentation (…) is kept in an electronic form or in a paper form."

10   Draft on the act on information system in healthcare (art. 56. 1). Until 31st July 2014, medical documentation may be (…) kept in a paper form or in an electronic form.

11   HUD (Head-Up Display) – transparent display that presents data without requiring users to look away from a given sight.

required for practically all the other modules to work. Additional correlation was noted between the module's functionality as a basic "staple" module and owning and using the given software in reality. Specialist IT software is used by as many as 97% of the examined hospitals, meaning that nearly all hospitals have been computerised at least to a minimum extent. The hospital part which is most computerised is the diagnostics area, which probably results from the facts that services are provided much quicker, and that more services are planned to be provided under

contracts with the National Health Fund. According to the report, nearly 32% of the examined hospitals declare having software to integrate the administrative and the medical part, and 69% claim that their systems of settlements with the National Health Fund are integrated with the white part. About 1/5 of respondents claim to have data warehouses, which also shows the degree of using Business Intelligence class systems. The table below shows the degree of system integration, dividing hospitals by the number of beds

Table 1: Hospitals by degree of IT system integration in % N187

Hospital categories by the number of beds	Administrative software integrated with medical software	The system for settlements with the National Health Fund is an integral part of the medical system	Data warehouse
Total	31	69.5	19.8
40-200	20.4	63	13
201-400	28.9	68.2	19.7
over 400	41.8	76.1	25.4

Source: Healthcare Information Systems Centre (CSIOZ), "Resources and potentials of healthcare centres within IT and their participation in the teleinformation space" survey

The system for settlements with the Fund is clearly the one best integrated with the other modules. It is worth adding that the Fund stimulates computerisation, in

a way, due to its requirements for service providers as concerns exchanging settlement data.

Figure 4: Demand and supply in healthcare
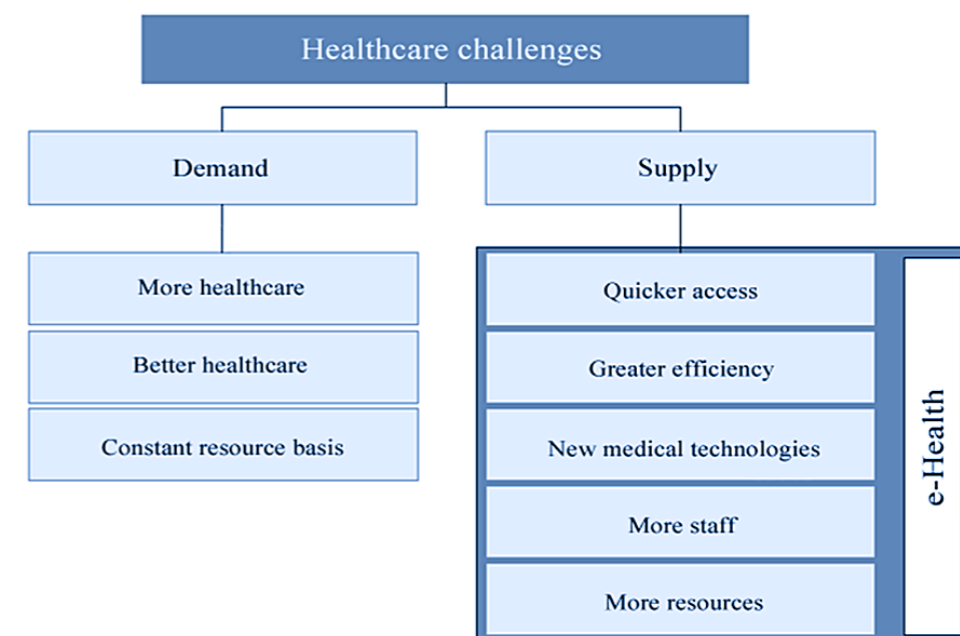
Source: Feasibility study for the project "Electronic Platform for Collecting, Analysing and Giving Access to Digital Resources on Medical Events", version 2.2.3, Ernst & Young Business Advisory Sp z o.o., Warsaw 21st December 2009

What challenges does the healthcare sector in Poland face? There are definitely more for the supply area. Quicker access and greater efficiency are strictly technical matters – implementing medical systems is thus of key importance. The changes occurring in Polish demographics will bring more problems related to access to healthcare. Obviously, better IT tools will relieve the system, yet educating the staff (in medicine and IT) must be focused on. True potential lies in educated staff and the tools available to them.

EXAMPLES OF BENEFITS RESULTING FROM IMPLEMENTING THE SYSTEM

IT systems are being implemented as intensively as never before. The topic may even be named trendy. Due to the individual character of an enterprise (the more of a hospital) it is not easy to prepare statistics of process improvement (e.g. concerning time or resources needed). Are the benefits given by the systems so huge? The question can be answered by describing true cases – practical experiences of a software developer and medical system implementation specialist.

CASE 1

The case concerns a hospital with about 500 beds, with the following areas being computerised: laboratory, settlements with the National Health Fund with statistics, and hospital pharmacy. The areas are not integrated. Computerising of hospital units is attempted – the hospital kitchen is chosen, functioning as a food warehouse. Two people employed to handle the warehouse (i.e. orders based on a menu prepared by a dietician, receipts, issues, goods inventory records, monthly balance) cannot find time to meet to analyse their work. The person who manages the kitchen is open to suggestions and manages the employees' time to analyse processes and possibly improve effectiveness. A simple application is created for keeping records of goods and inventory balance and creating balance sheets and reports based on information entered in the database. At first the sceptical attitude of future users causes some difficulties when the application is started. Once they are informed of the application saving time in the future, it is implemented as planned. Earlier attempts to make inventory balance with the previously used method – in a notebook with a calculator, called

a sheet – and making all the needed reports took up to 2 weeks. Once the warehouse was computerised, all reports are prepared with a few clicks and printing a few A4 pages. Inventory balancing has become far more precise as compared to what had been. The effectiveness of the considered hospital unit grew by thousands of percents.

Case 2

Another example is the hospital laboratory. Atmosphere at work was tense – about 15 people (only women) were employed in the laboratory. With the previous effectiveness, the number was too small. The problem consisted in lack of software to record the materials sent out to external laboratories, which can perform examinations that cannot be made on site. There was also no tool to record the orders for all examinations (also those on site) divided into payable and non-payable, and to record confirmations for examination results being issued. It was necessary for the people who were usually responsible for the above activities to meet. 3 people were appointed. 2 of them were reluctant to cooperate and acted in a way that threatened correct implementation of the application. The goodwill of the other person greatly influenced the project's success (it was the person who was mainly responsible for balance sheets). Functionality analysis was made, then the future users verified the result each week, and specified new functionalities or extensions to the existing ones on a current basis. After 3 months the application was completed and presented as a ready solution functioning on a "living body". One of the users stated that 2 days of work from before (assuming no mistakes made) were substituted with one click. A month later a visit to control the software's functioning and ask for opinions showed that the previous tensions in the laboratory decreased considerably. Effectiveness grew, there was more time for other responsibilities. Patients (customers) who come for examination results are served better and quicker, and get the relevant results.

Case 3

There is a document listing drugs permitted for internal hospital use, called the "hospital formulary". The definition could be as follows: carefully selected drug formulary guides clinicians in choosing the safest, most effective agents for treating medical problems (Rucker, 1990, p. 928-942). This case presents a comparison of using an automated mechanism for creating the said document against

the traditional method "by hand". At the initiative of a creative manager of the hospital pharmacy (already computerised), the idea arose to solve the problem of creating and updating the formulary. Based on current tenders, a list of drugs was made, ordered according to the Anatomic-Therapeutic-Chemical classification[13], with an index, including several thousand items. The formulary may be updated at any time, and the procedure lasts only a few seconds. Previously, it was updated annually, due to the extremely time-consuming process of making it. During a conference of hospital pharmacy managers (with about 20 people present), the declared average time for creating a formulary in the traditional manner was approximately 3 weeks for a team of two. Again, thanks to use of IT technologies effectiveness, increased tremendously – the document was generated about 15 thousand times quicker.

Conclusion

Let us sum the paper up with the words of Albert Einstein: "Computers are incredibly fast, accurate, and stupid; humans are incredibly slow, inaccurate and brilliant; together they are powerful beyond imagination". History shows that computer technologies and software appeared and evolved to broaden the spectrum of human possibilities. The complementarity of people and machines, as stated in the quoted words of A. Einstein, perfectly fits in the benefits resulting from implementing an Integrated IT System in a hospital. When trying to define the perfect model for hospital functioning, four assumptions are made. First, any processes of diagnostics, processing information about the patient, creating and transferring documents, last as briefly as possible (as computers are fast). Second, repeatable processes that can be automatised are delegated to machines and are fully background processes[14] with zero mistakes (as computers are accurate). Third, a hospital should focus on its main objective – treating people while using the possibly fullest set of information about the patient (as people are brilliant). Fourth, the IT system is thus constructed as to provide information that makes it possible to create knowledge in the form of indices presented in the Management Information System (as people are brilliant).

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13   ATC   (Anatomic-Therapeutic-Chemical   classification) – system to order drugs and other medical means and products.
14   "Background" meaning no active human participation. It is a separate parallel process.

Trying to find a balance between high quality of medical services with effective management of a medical unit on the one hand and the available equipment and human and financial resources on the other, the following conclusion may be reached. Managing a hospital is a multidimensional problem. To visualise, the scales which balance the above elements are more than two. If a hospital shifts to

one side (and loses balance), it must be corrected as quickly as possible, so short reaction time is important. A venture – the correcting weight – must be measured suitably (accuracy). An intelligent doctor using quick diagnostics and precise treatment tools guarantees the patient's health. An intelligent manager using Equivalnet tools guarantees the hospital's health.

References

Adamczewski, P. (1999). Systemy zintegrowane klasy ERP – realizacja i rozwój (ERP Class Integrated Systems – Creation and Development). In: *Human-Computer Interaction'99,* B. F. Kubiak, A. Korowicki (eds.), Gdańsk 1999.

Barnett, G. O., *History of the Development of Medical Information Systems at the Laboratory of Computer Science at Massachusetts General Hospital,* Harvard Medical School.

Gupta, A. (2000). *Enterprise Resource Planning: The Emerging Organizational Value Systems,* Industrial Management & Data Systems, 100/3.

Kumar, K., van Hillegersberg J. (2000). ERP *Experiences and Evolution, Communications of the ACM,* vol. 43, No. 4.

Maciejec, L. (2001). *ERP i co więcej? ERP migracja w stronę Internetu (ERP and What Else? ERP Migration Towards the Web),* Computerworld Raport, Feb.

"Resources and potentials of healthcare centres within IT and their participation in the teleinformation space" report survey. Report on the survey", http://www.csioz.gov.pl/publikacje.php.

Parys, T. (1999). *MRP II przykładem systemu zintegrowanego (MRP II as an Example of Integrated System),* Informatyka, 1999, No. 9, p. 24-27.

Popończyk, A. (1996). *Dwa w jednym, czyli system informatyczny i system MRP II w przedsiębiorstwie (Two in One, or IT System and MRP II System in an Enterprise),* Informatyka, No. 10, p. 11-14.

Rucker, T. D., Schiff, G. (1990). *Drug Formularies: Myths-in-Formation, Medical Care,* 28, p. 928-942.

Scheer, A. W., Habermann, F. (2000). *Making ERP a Success, Communications of the ACM,* vol. 43, No. 4.

Polish Dictionary,
http://sjp.pwn.pl/slownik/2576909/system.

Sprott, D. (2000). *Componentizing the Enterprise Application Packages, Communications of the ACM,* vol. 43, No. 4.

Act of 12th May 2011 on reimbursement of drugs, foods for special medical purposes and medical products at http://isap.sejm.gov.pl/DetailsServlet?id=WDU20111220696.