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Project description

Title: The Successful Electronic Health Record (S-EHR)

1) Summary

Electronic health records (EHR) are also called EPR systems (electronic patient records). Some of the claims about EHR systems are that they are instrumental for improving the health sector, but currently they are cumbersome to use, threaten confidentiality, are expensive, cannot integrate properly, etc.

This project addresses one of the issues: removing the "cumbersomeness". We want to design and implement effective EHR user interfaces on stationary as well as mobile IT systems. The systems must be easy to learn and must support the daily work efficiently.

One challenge is that different medical specialties need different user interfaces for efficient support. The assumption in the health sector has been that this implies a forest of different systems, which would increase the cost further. As part of the project, we want to prove that it need not be so. A single system can show data in many ways, each providing efficient support of a medical specialty. Furthermore, third party or the local IT staff can improve and expand the user interface in cooperation with clinical specialists - without breaching compatibility with other EHR systems.

Why haven't market forces developed such a system long ago? Here are two of the reasons: Methods for systematic user interface design are not widely used, and the time pressure of a public tender makes it impossible to do so. We are not under the same time pressure, and we are internationally recognized for our unique expertise in systematic user interface design. We collaborate with hospitals to improve innovation and to ensure that the real demands are met, and with a successful Danish supplier of EHR systems to ensure that the solutions are fully implemented on at least one platform.

2) Objectives of the project

The objectives to be met in the project are as follows:

a. Design high-usability EHR interfaces for at least two medical specialties, including departmental support such as booking, duty change, and reminder lists.
b. Develop functional prototypes to prove the high usability of the user interfaces, test new work processes as needed, and estimate the performance improvement in real life.
c. Transfer the prototypes to a commercial product.
d. Teach local IT staff and clinical specialists how to improve and expand the user interfaces.

3) Assumed significance of the project's main results

The project aims to contribute to two major trends: improvements in EHR (Electronic Health Records) and more adaptable ERP systems (Enterprise Resource Planning systems).

The general benefits expected from EHR include:

a. Clinical data will always be available to the clinical staff. Today the paper records have to move around, and they are often hard to locate. The project aims to make it easy to record the data electronically for shared use.
b. Improved quality and fewer errors. The project aims to provide better support for decision-making through better overview of data, and reduce errors through automatic reminders when things are overdue. However, it is not part of the project to provide automatic checks of for instance medication, but it supports integration with third-party modules that provide such checks.
c. Improved use of resources. The project aims at supporting the booking process, particularly linked booking, in such a way that resources are used better.
d. Correct formal data registration for billing, etc. The project aims to provide most of this as a free side effect of the daily clinical work.

A typical ERP system has a kernel that allows software houses to develop specialized versions suited to special industry sectors. This project aims to take diversification one step further:

e. Show how better data visualization can be added to the system.
f. Show how the system can handle multiple user interfaces targeted to different user groups.
g. Show how the system can handle much more complex data than today (an EHR system may for instance have to handle 20,000 types of patient services, many of them with their own data structure).

4) Premises for the project

There are mixed opinions on the existing EHR systems. As with other new technologies some parts work okay, while other parts are problematic. However, the large pattern is that existing EHR systems focus on registration for billing and legal purposes, but give poor support for the daily medical tasks. Most data is shown as lists of events with date, time and what happened at that time. As some surgeons say, "the screens look like something from a bank".

One problem is that present paper-based patient records are thick like books. It is hard to provide overview of this data on a computer screen, and even harder if we use mobile devices with small screens such as PDA's and Smartphones. On the other hand, in some areas the present paper journals give poor overview too. IT systems should for instance be able to give a much better overview of development over time, they can warn of conflicting treatments, they can warn about overdue lab results, etc.

It may be surprising that market forces have not created good IT support for EHR. There seem to be several reasons for this:

a. Methods for developing good user interfaces are not widely used, neither on the supplier side, nor on the customer side.
b. These methods are not suited in public acquisitions because requirements are defined early on to select the best supplier. As a result, suppliers don't get a chance to invent and develop effective solutions.
c. The products are usually not open for third party additions, partly because customers don't ask for it. The result is that it is very expensive to modify the user interface later or enhance the product in other ways.
d. Clinical data are much more complex and varied than data in other application areas. An EHR system may for instance have to handle 20,000 types of patient services, many of

them with their own data structure, for instance combinations of numerical data, free text, pictures and data lists.

e. Current commercial products such as ERP systems have limited tools for visualizing complex data. The data presentations are mainly long lists of data, plus simple curves such as sales over time. Additional visualization tools such as Gantt diagrams and the many advanced tools developed by Shneiderman and Spence are hard to integrate.

This situation is well suited for a research-based solution. Lauesen is widely recognized for his approach to systematic user interface design, and for his approach to requirements in public acquisitions. His textbooks in the area sell around 1500 copies a year; he has helped around 30 universities worldwide to teach according to the books; and he has helped around 30 companies to use the methods. More than 30 people a day (excluding search robots) visit his web site to download documents such as tutorials, slides for the books or research publications.

Furthermore, our ITU team has expertise in product development, ERP systems, and system architecture, and we have conducted several projects in the health sector.

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