Knowledge Management in Internal Medicine– Experience with Lotus Notes

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Abstract.   There is growing demand for the presentation and retrieval of clinical guidelines which are relevant for the everyday usage of clinicians. An intranet-based solution compares favorably to paperwork, but a standard web based on plain HTML does not support very well features such as document structuring and text retrieval. At the start of this project (year 2000), content management systems were rudimentary and expensive. We have therefore implemented an Intranet which is entirely based on Lotus Notes/Lotus Domino. The essential advantages to this solution are the integration of full-text retrieval, structured documents and document hierarchies into a departmental intranet.

1.   Introduction

Within the department of Internal Medicine, there was demand for the presentation of guidelines and of local procedural standards. An intranet solution based on a web server alone was rejected because this solution lacked document structuring, authoring, and workflow support. Content management systems (CMS), on the other hand, were less developed then than they were now, and they were expensive.
Our essential requirements were: System development and integration costs should be marginal, authorization and production of documents, should be supported by the software. We decided to base the intranet entirely based on Lotus Notes/Domino. Principles governing the design and the structure of websites containing guidelines have been described before. e.g. by the American Medical Association [1] and the National Guideline Clearinghouse project [2]. These principles have focused on quality and efficiency. In the project described here, our very modest objective was to get experience with groupware as a tool for document management in an intranet.

2.   Material, Methods, and Clinical Setting

The Medizinische Klinik and Poliklinik I is a department of the University hospital's Center for Internal Medicine of the Universitätsklinikum Hamburg-Eppendorf (UKE). The department serves the specialties Pneumology, Endocrinology/Metabolism, Gastroenterology/Hepatology, Infectiology, Intensive Care and Emergency

Admissions. There are 106 hospital beds and 13 ICU beds in the department. Server and clients run under Windows NT4, newer clients under Windows2000. Hardware was installed in the years 2000 and 2001. Lotus Notes/Domino Release 5 was used. Network infrastructure consisted of the two disjoint networks of the hospital. The "scientific net" is connected to the internet using UKE's web server, and the "medical net" is used for patient care.

3.   Results

Classes of relevant information were identified as follows:
1.   Procedural orders issued by the the Department
2.   Quality guidelines issued by the whole hospital
3.   Medical information about laboratory procedures
4.   Guidelines issued by the professional societies
5.   Medical information from within the hospital but beyond the intranet
6.   Medical information from the internet

The intranet based on Lotus Notes provides the user with documents from the above classes 1 to 4. Guidelines from the professional societies were downloaded regularly from the AWMF (Arbeitsgemeinschaft der Wissenschaftlichen Medizinischen Fachgesellschaften). Information from classes 5 and 6 was not presented in the intranet initially. Additionally, the intranet provides ancillary information: Local "yellow pages" (who is in charge of particular medical functions in the department), a rotation schedule, and the night shift schedule.

Lotus Notes provides a rich set of tools and functions. Of these, we have used the following: Hierarchical organization within a document; hierarchical organization of documents, hyperlinks; full-text searching, indexing by date, by author, and by predefined "categories". All of these functions were implemented using Lotus' predefined "document library". Indexing was realized by adding index fields to documents, and the index structure was constructed manually. The associated Notes designer form ("mask") was changed in order to present the indices. Construction time for this was a few hours for experienced users.

A year after project start, access to laboratory results of the information system *ixserv* was implemented. As *ixserv* presented its results as web pages, integration into Lotus notes was easy. Two years after the start of our intranet, the hospital provided an internet access using Citrix' metaframe technology. While this is an elegant means of providing internet access from within a protected environment, integration with Lotus was not feasible on the document level. In 2003, metafame based internet access was opnened to the whole hospital.

Access to the medical information system UpToDate [3] was initially local to the intranet. When metaframe technology was installed, the hospital as a whole subscribed to UpToDate's services. The end result was an internet access to UpToDate instead of the local intranet access. The same migration path was

employed for the German coding software DIACOS: Once it became avaliable on a dedicated server, the intranet provided access to that central service via metaframe technology.

4. Discussion and directions for the future

The base hardware and the Lotus software have been reliable and stable. The intranet was integrated into the physical network structure of the high-security medical network of the hospital without any major problems. Management of service packs and patches to Windows NT had been a time-consuming endeavour, and we highly recommend to use patch deployment software in the future.

Once the hospital's IT department was ready to provide services which were essentially identical to ours, we moved to migrate our services to theirs. The success story here is the integration of UpToDate (a web-based information service in internal medicine and general practice) into the offerings of library IT at our hospital.

A major advantage of Lotus Notes is its "document" concept, incorporating full-text searching and structured documents. This allows for a very easy construction of polyhierarchical structures. A major disadvantage of Lotus Notes is that the look and feel of Notes is proprietary. Thus it presents a third interface paradigm to the user, given that Microsoft Office and the Web are ubiquitous. This has hampered acceptance of this intranet, particularly for non-technophile users.

Lotus Notes has been tried as base software for clinical information solutions before. Little is published in MEDLINE though, but there are interesting reports on Notes based solutions in the web [5, 6, 7]. Most of these applications have centered on form management and document management. In fact, Notes is very strong in these applications, and it has the potential for inexpensive, successful solutions once the Lotus Notes infrastructure is installed. Database access and access to archive tools using Lotus Notes is, in our opinion, initially expensive because it requires the management of a complex interface. Lotus Notes seems to be weak in the integration of biosignal and picture information into documents [8]. Recently, efforts to foster collaborative computing in a clinical setting have been supported by IBM's new Center for Healthcare Management [9].

Lotus Notes provides the user with a powerful set of tools for network-based collaboration ("collaborative computing"). Moreover, the interface is proprietary. In our experience, the estimated learning curve for Lotus Notes is intimidating for some users. This can only be alleviated by a strong user support and by a firm commitment to this "exotic" groupware solution. This is also true on the technical side: Administering and customizing a Lotus Notes infrastructure requires access to specialist knowledge. (In our case, we bought support from a Lotus Notes "third party partner" for the initial phase.)

For a Lotus Notes based solution, there seem to be only two viable strategies: Pervasive introduction of this groupware system, requiring also strong technical knowledge of the system, or the usage of Lotus Notes "in a box" for limited projects.

In the area of content management systems, Notes now competes with a number of commercially available or open source products for content management. In 2004, we

believe that a Notes interface to a CMS is not enough, both for the readers and the authors.

We are convinced that departmental intranets need content management systems (CMS) in the short term because only CMSs provide easy management of authoring, versioning, access control, and security defined by "users" and "roles". A CMS might be termed middleware, representing an additional layer on top of base software such as Lotus Notes. Giving a web interface to users is an additional strong asset.

5. References

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