Local Healthcare Content for the PDA

Patricia W. Martin, A.M.L.S.
Head, Electronic Systems, Taubman Medical Library, University of
Michigan, 1135 E. Catherine St., Ann Arbor, MI 48109

Rajesh S. Mangrulkar, MD
Assistant Professor, Department of Internal Medicine, University of
Michigan, Ann Arbor, MI 48109

Rebecca L. Tremaglio
Graduate Student, School of Information, University of Michigan, Ann
Arbor, MI 48109

Theresa S. Arndt, M.L.S.
Head of Outreach Services, Taubman Medical Library, University of
Michigan, 1135 E. Catherine St., Ann Arbor, MI 48109

INTRODUCTION

The reference librarians at the Taubman Medical Library at the University of Michigan undertook a digitization project to publish locally written content in a format appropriate for downloading to a personal digital assistant (PDA). Since clinicians carry cards, folded papers, and small books in the pockets of their lab coats and many of these reference tools were written by fellow clinicians and shared amongst themselves, digitizing them for the handheld computer seemed like a logical step.

To date we have produced three such tools. One is titled the Quarterly Susceptibility Report. This information is published on our health system intranet by the Departments of Pathology and Pharmacy Services to provide clinically relevant antimicrobial information to house staff so they can make effective selections of antibiotics in terms of current cost and locally documented microbial resistance. Originally, this report was produced in print every three months. With the advent of the web, it has been updated and posted monthly and the print version has been discontinued. The Library is now publishing a quarterly update for download to PDAs and distributing it through secure routes to interested staff.

Our second product is The J.T.F. Manual (Just the Facts) for Internal Medicine Interns. The Manual was originally written in June of 1991, by a physician in Internal Medicine, for third year medical students as they began their medicine rotations at the University of Michigan and the Ann Arbor Veterans' Administration Hospitals. It has been repeatedly revised over the years and is now intended to provide a basic guide for new house staff for navigating the systems that they encounter as they care for their patients in the hospitalized setting. Incoming interns receive a print copy as they begin their first year of training. In June 2004 the Library produced their first PDA version and sent copies to the program director for distribution to the residents.

The third product is a similar guide for physicians in the neonatal intensive care unit.

This paper discusses how the Medical Library staff decided to take on the role of publisher of PDA content. It also covers the challenges we faced in obtaining and converting the content and describes the usability study of one of our products.

BACKGROUND

PDAs have been around for a long time, since the early 90's if one counts the Apple Newton. Some health sciences libraries have been providing information and support for PDAs for over ten years.

The Arizona Health Sciences Library was among the earliest to become involved in PDA endeavors. Mari Stoddard (2001) writes of activities there dating back to 1993. They began to support handhelds when Hewlett-Packard gave them 200 DOS-based HP palmtops to distribute to medical and nursing students. From that initial push, their educational program in support of PDAs began. They provided cradles for syncing, and printer support. Library collaboration with the Pharmacy Residency Program led to a PDA-based system for reporting clinical interventions. Several web pages on the library web site provided information on handhelds and available library services, which included consultations to users, workshops, support for the use of handhelds in the curriculum, and a tables of contents service.

Garrison et. al. (2003) report on a wide range of PDA-related services provided by the Duke University Medical Center Library. This library began taking an active interest in PDAs in 1999. Library staff conducted email surveys to judge user interest and worked with a previously established PDA User Group to hold a symposium on the use of PDAs in healthcare. This fostered sufficient interest to lead to the appointment of a task force to explore the necessary infrastructure needed to support mobile computing. Other activities included workshops to teach PDA use and the development on an online tutorial.

These interesting examples notwithstanding, the integration of this technology into the work of most medical libraries has been more gradual. It has taken until 2003 to see the term "Computers, handheld" added to the National Library of Medicine Medical Subject Headings (MeSH).

In their very relevant article, PDAs and Health Sciences Libraries, Peters, Dorsch, Bell and Burnette (2003) suggest that the real revolution in this technology is yet to come and that health sciences libraries need to plan for meeting the needs and opportunities to be presented.

Along those lines, they explore ten potential roles for libraries:

- Facilitate communication and community-building.

- Collection development and content management.

- Demonstration systems for trial, purchase, adoption, and integration.

- Product evaluations and recommendations.

- Instruction.

- Curricular needs of the parent organization.

- Documentation and tutorials.

- Technical support and troubleshooting.

- Syncing stations, infra-red printing, and other value-added services.

- Wireless access provider.

We considered all these possibilities and identified closely with some roles, such as instruction, documentation, and facilitating communication. Others were not feasible in our setting.

Our user population is large and diverse in terms of information needs. Taubman Medical Library (TML) is one of 21 libraries within the University Library at the University of Michigan and serves the Health System (3 hospitals, 120 outpatient clinics, and a managed care organization) which employs approximately 2100 faculty physicians/scientists, 3000 nurses, nearly 1000 residents, and an additional 3000 allied health professionals. TML also serves the students of the Medical and Nursing schools and the College of Pharmacy. At the time we were first investigating PDAs, there had been no institutional endorsement of any PDA platform, and no financial support for technical support in this area. Our staff was in no position to take on technical support and troubleshooting for these devices. Given the size of our population and their diverse needs, we were wary of purchasing products such as textbooks or calculators and making them available to our patrons. Concerns centered on the ability of our budget to both cover the wide range of subject areas and deal with the typical funding models for such a huge potential population.

We were intrigued by the content management or "publishing" concept, and began by making simplified library web pages available through Avantgo®, and then turned to making other local information available for the PDA.

Our Projects

ACQUIRING CONTENT

Beyond a doubt, our biggest challenge was obtaining the local content. We spoke to several departments about collaborating, proposing that they provide content for this project while we reformatted it and distributed it to their staff. The content could include that from clinical practice guidelines to pocket cards of many types. For a variety of reasons, none of these discussions bore fruit. One of the concerns expressed was a vague uneasiness that condensed content may not be usable on the PDA. Some resources, such as clinical practice guidelines, were large and complex by nature and would require considerable effort on the part of guidelines committees to edit the content. There were also concerns about distribution of some types of local content. For example, would we be able to insure that only appropriate staff obtained content intended to be restricted to institution staff? Were there copyright problems to solve? And, of course, would the content really be helpful on a PDA? Some resources are likely more useful in print or viewed on a full-sized screen.

Persistence paid off, however. We found a partner in Dr. Rajesh Mangrulkar, with whom our librarians had worked closely, collaborating on both first and second year medical student courses and workshops. Dr. Mangrulkar offered the Just the Facts Manual (JTFM). One of the residents had already invested time into converting this manual into a Microsoft® Word document, but felt it needed to be converted in some other way to be more functional on the PDA. His residents also wanted a pharmacy/microbiology document on the PDA – a resource the group had been pursuing for months, but had encountered significant barriers centered on secure distribution.

We made the commitment to get the manual into a usable PDA format, and to pursue the pharmacy/microbiology product and try to resolve the distribution issues. Our goal was to have both tools ready for distribution to the new internal medicine residents on July 1, 2004.

REFORMATTING CONTENT

We procured funding for a special project from Librarians' Forum, a professional organization of University of Michigan librarians. From this source, we hired a School of Information student, who undertook a study of the state-of-the-art in formatting for PDAs. Based on this research, we selected the two best formatting programs. For the JTFM and the pharmacy information promised to the residents, we needed solid hyperlinking to move among pages, and thus decided to use iSilo and Repligo. Both tools had the

previously stated capabilities, but also the additional strengths of being able to lock the files so they could not be edited or beamed. We felt the pharmacy information, in particular, required this security. The primary drawback was that each required an inexpensive "viewer", which had to be purchased to be fully functional.

Using these programs, The J.T.F.M., which was the only one we would use for the usability testing, was converted to PDA format.

USABILITY TESTING

The usability testing was devised and tested with library staff, including the two versions of the Manual. Revisions to the usability testing were then completed.

A web-based survey was developed and all Internal Medicine residents were invited to participate.

This survey asked for information on the residents' computer background and level of experience with PDAs. We then invited all residents, via email, to do a usability test with us.

We conducted 5 one-on-one tests, comprised of a pre-task survey measuring computer and PDA experience, 10 information look-up tasks in either the iSilo or Repligo version of the Manual, and a post-task survey and debriefing on the tasks and software interface. The 10 tasks were intended to replicate the act of looking up information in a treatment setting.

The testing took about an hour per resident and was both audio and video taped.

RESULTS

In reviewing the results of the usability test, we compared the performance of the group using iSilo to the performance of the group using Repligo on a number of different dimensions, including correctness, average time per question, average number of steps per question, and user satisfaction with various attributes of each application. We also took note of participants' self-reported experience using, and expertise with, PDA devices. In general, we found that, regardless of their level of expertise with PDAs, participants who used iSilo performed better, and had better overall impressions of the effectiveness and usefulness of the application, than those who used Repligo.

Key Measures of Success

Summary Table

Testing Dimension / Objective	iSilo	Repligo
Task Correctness Rate	90%	75%
Time to Task Completion	No difference	No difference
Number of Steps to Task Completion	Fewer steps than with Repligo	
Testing Dimension / Subjective		
Usefulness	+	?
Enjoyment	+	? / -
Attributes	+	-
Ease of Use	+	-

Objective Measures of Participant Performance

Task Correctness Rate.
As a group, participants were successful at finding the right answer to a particular task 84% of the time. Those who used iSilo averaged a 90% correctness rate, whereas the Repligo users were correct an average of 75% of the time. This number is important in that most of the tasks our users were performing were intended to replicate the act of looking up information in a treatment setting, attempting to simulate real-life situations in which it is important that residents find the correct information as often as possible.

Time to Task Completion.
In comparing the amount of time it took the average participant in the iSilo and Repligo groups to find an answer, we learned that neither group had a clear advantage. However, when combined with the Correctness average above, it was clear that no matter which application allowed for faster performance, iSilo participants were more successful at getting correct results.

Number of steps to task completion.
Participants using iSilo also slightly outperformed the users of Repligo in the number of steps they undertook to find answers for each task. In 6 out of 10 tasks, when compared to the Repligo group, the iSilo group either took fewer steps or matched the number of steps required to reach an answer. Add this to the Correctness and Timeliness factors, and the iSilo group took fewer steps and more often got the correct answer than the Repligo group, without taking any more time to do so.

Additional Notes on Key Measures Analysis.
It is also worth noting that the iSilo group outperformed the Repligo group on 2 of the 3 key measures, despite the presence of a complete PDA novice in its group. This physician had never owned a PDA and had extremely limited exposure to them. If one removes the performance of the novice from the iSilo group, then both groups are equivalent in terms of self-described expertise level of the participants. When the two groups are equivalent, the iSilo group outperformed the Repligo group in all three of the key measures discussed above.

Subjective Measures of Participant Performance

Usefulness.
When asked, "Did you find the application useful?" the iSilo group responded with a unanimous "yes" vote. The Repligo group answered "Not sure." They explained that they would need to spend more time with the application to be able to make a better judgment, whereas the iSilo group all saw practical uses for the application immediately.

Enjoyment.
Upon being asked, "Did you enjoy using the application?" none of the Repligo users responded with a "yes." They either said "No" or "Not sure". In this latter case, they said they would "need more time to play with it to get a better feel." The iSilo group, on the other hand, was unanimous in their enjoyment of using the application. While this indicator on its own is not the most telling, if people enjoy using a product and are successful at achieving their goals when using it, they are more likely to use it in the future.

Attributes.
We also compared iSilo and Repligo on a 9 point scale measuring user perception of four key attributes, including (1) navigation (finding one's way around), (2) understandability of icons (it was apparent what would happen when one was clicked), (3) breadth of commands (there was a way to accomplish everything one wanted the application to be able to do), and (4) usability of the interface (it was clear and easy to understand). In all cases, iSilo scored better than Repligo in all four domains. While not all of the perceptions were positive (both programs scored neutrally or poorly on the 'understandability of icons' measure, for instance), the overall impression of iSilo was decidedly better than that of Repligo.

Ease of Use.
In rating whether each application was easy or difficult to use, participants again rated the iSilo application higher than Repligo. In fact, in the iSilo group (including the novice user) rated the product as generally easy to use, showing that even the novice was somewhat positively inclined towards it. When the novice's rating was removed from the assessment, the iSilo users rated the product as solidly easier to use than the Repligo users by a noticeable margin.

Summary
Combining positive user perceptions with the objective measures of its superior performance is indication of the success of iSilo over Repligo as a PDA document reader application. That it also fit our technological and budgetary requirements made it a good choice for our document conversion process. Based on this choice, we also converted the Quarterly Susceptibility Report. Both documents were provided to Dr. Mangrulkar for distribution through a secure server.

The manual which was produced for the neonatal intensive care unit was a simpler document. We used Adobe Acrobat 6.0 Professional to convert it, using bookmarks of the table of contents to provide convenient navigation. A free Adobe Reader for PDAs is provided at the adobe.com website.

Continuing Efforts

Taubman staff continues to update the Quarterly Susceptibility Report, and forward a copy to Dr. Mangrulkar for distribution. The developer of the report has also provided a link on his internal web site to the PDA version. There is control over distribution here as access is password protected. We have set an expiration date on this product, so that after 3 months it will no longer open on the PDA and users must return to the web site to retrieve the newly updated version, making it possible for us to avoid people consulting an out-of-date resource.

With regard to The J.T.F. M., we are working with Dr. Mangrulkar to revise the manual and take better advantage of the linking capability inherent in a computer-based product. We expect to have the revision ready for the next incoming class.

We are maintaining our surveillance for new collaborators for document conversion to PDA format, with the hope that we can develop additional content for distribution. In addition, we continue to spread the word that the staff of Taubman Medical Library will provide assistance in this type of resource conversion. The quest for content is ongoing and communicated in every class and presentation given on the topic of the Personal Digital Assistant.

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