

User-centered Evaluation of the Medical Text Indexing (MTI) System

By Miguel E Ruiz and Alan Aronson

Abstract

This study was conducted from July 1st to August 30th 2007. The study included on-line surveys as well as face to face interviews. All indexers (in house as well as contractors) were invited to take part in this study. 48 (37.8%) completed the on-line survey out of the 127 indexers contacted via e-mail. A total of 7 indexers participated in the individual interviews. Responders included indexers with different levels of experience (from novice to experts) and years of service (0 to more than 25 years). Half of the responders have been working as indexers for 8 years or less.

The most frequently used tool from the "related" tab are Neighbor and MTI which ranked the highest with 54% of the responders reporting to use it in a daily basis. Several responders reported that they used both tools which is the reason why they both tools in a daily basis. In terms of perceived usefulness, Neighbor is perceived as very useful or above average by 58.8% of responders while MTI 45.8% consider it as very useful or above average. Other tools in the "related tab", such as Pubmed ID, and text search seem to be used for only a small percentage of the responders. In terms of satisfaction and perceived usefulness of the MTI recommendations the indexers' opinion are split in three groups. Less experienced indexers use the MTI recommendations more often and find them helpful for their job as indexers. Several indexers expressed that they used the recommendation for indexing articles that are in areas that they are less familiar with. A significant number of indexers (75%) are not confident on the automatic recommendations. However, 40% of the responders said (agree or strongly agree) that the MTI recommendations help them to improve their productivity as indexers.

The responders were asked to rank the importance of the improvement. We ranked the improvements according to accumulated percentage of responders who selected between important to extremely important. MTI recommendations of full text ranked the first with 78% ranking, improvements to the look and feel of the MTI interface ranked second with 72%, explanation of where the MTI term comes from ranked third with 70% and subheadings recommendations ranked fourth with 68%. During the individual interviews we probed on this aspect and found that after explaining what the subheading recommendations and the full text explanation would do (by showing a prototype) most indexers found the subheading recommendation as a very useful improvement and the explanation of MTI terms extremely important specially if it could show this on the full text of the article since this will shorten the time they need to scan the full text document to find specific terms.

Survey responders gave a significant amount of feedback that will be passed on to the Indexing section for their consideration to plan improvements to DCMS. The improvements that most responders asked for include the updating of the online support material (i.e. manuals) as well as

personalization so that each indexer could select a set of preferences that will reduce the amount of clicking through the interface on the same selection over and over (i.e. if the indexer uses MTI recommendations for every document they index, then the related tab should show those recommendation as soon as they select "related" avoiding an extra click).

Introduction

This study started as an attempt to try to understand the human factors that affect the adoption of machine aided indexing systems. According to the Technology acceptance model proposed by Davis (1989) there are two major factors that affect the way users come to accept and use a new technology:

- Perceived Usefulness: "the degree to which a person believes that using a particular system would enhance his or her job performance"
- Perceived ease-of-use: "the degree to which a person believes that using a particular system would be free from effort"

In this study we attempt to assess these factors in the context of the adoption and use of the Medical Text Indexing (MTI) system. MTI has been part of Document Creation and Maintenance System (DCMS) since August 29th 2002 (McCray and Aronson, 2002). It is one of the tools available to indexers that work on assigning MeSH terms to medical articles indexed in MEDLINE.

Current production volume of the indexers is approximately 700,000 articles per year. Of these total about 30% of the articles are currently indexed using the MTI recommendations. According to conversations with James Marcetich and Joe Thomas most of the indexers that use the MTI recommendations use it to save typing time and in new indexers it has been observed to boost their productivity during the initial phase of their careers as indexers. One of the main concerns is whether MTI can be improved to get more meaningful recommendations and if these improvements could lead to a larger adoption by the more experienced indexers.

Given the large scale of the production system and the importance for the National Library of Medicine we propose to conduct a study to find out more about the way indexers at NLM use MTI and identify potential improvements to the system that could enhance the indexer's productivity and accuracy, and reduce cost related to MEDLINE creation.

This study was conducted from July 1st to August 30th 2007. The study included on-line surveys as well as face to face interviews. All indexers (in house as well as contractors) were invited to take part in this study. 48 (37.8%) completed the on-line survey out of the 127 indexers contacted via

e-mail. The following sections describe our findings and outline the recommendations that could help improve MTI as a tool for indexing.

Demographics:

Responders included indexers with different levels of experience (from novice to experts) and years of service (0 to more than 30 years). Half of the responders have been working as indexers for 8 years or less. Figure 1 shows the distribution of responders according to the number of years of experience that they have as MEDLINE indexers.

In terms of their background, most of the responders had a background in health science, as expected, and after this the most popular areas were foreign languages and physical and mathematical sciences (see Figure 2.) According to the self reported average production 64.5% of the responders indexed 50 to 200 articles per week and 77% work 20 to 50 hours per week (see Figures 3 & 4.)

6) Number of years working as a MEDLINE indexer

Mean = 10.94
 Min = 0.00, Max = 35.00
 Median = 8.00

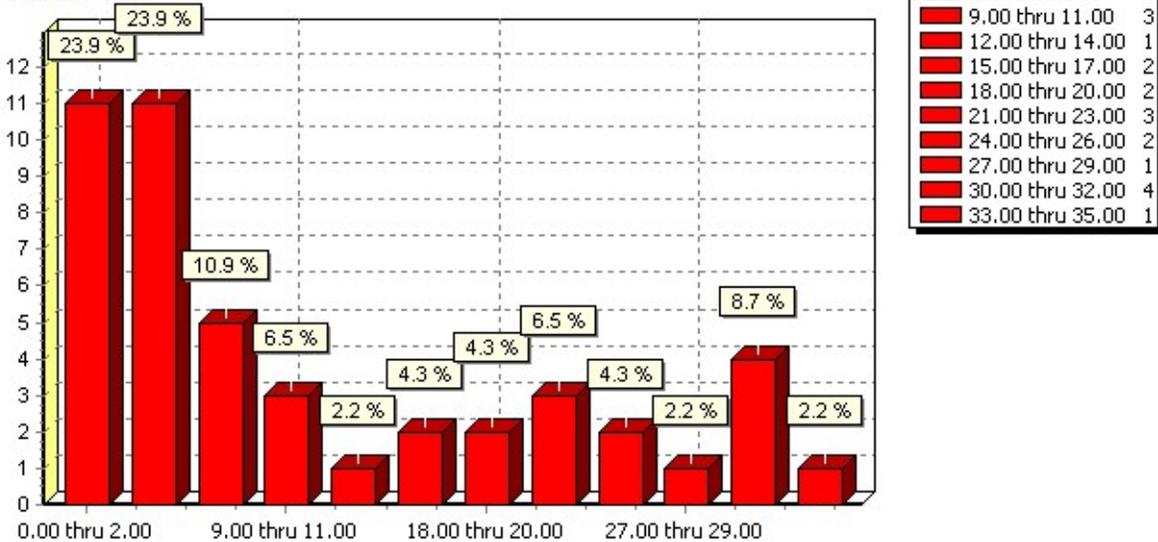


Figure 1

4) Which areas of knowledge would you choose as the most representative of your background?

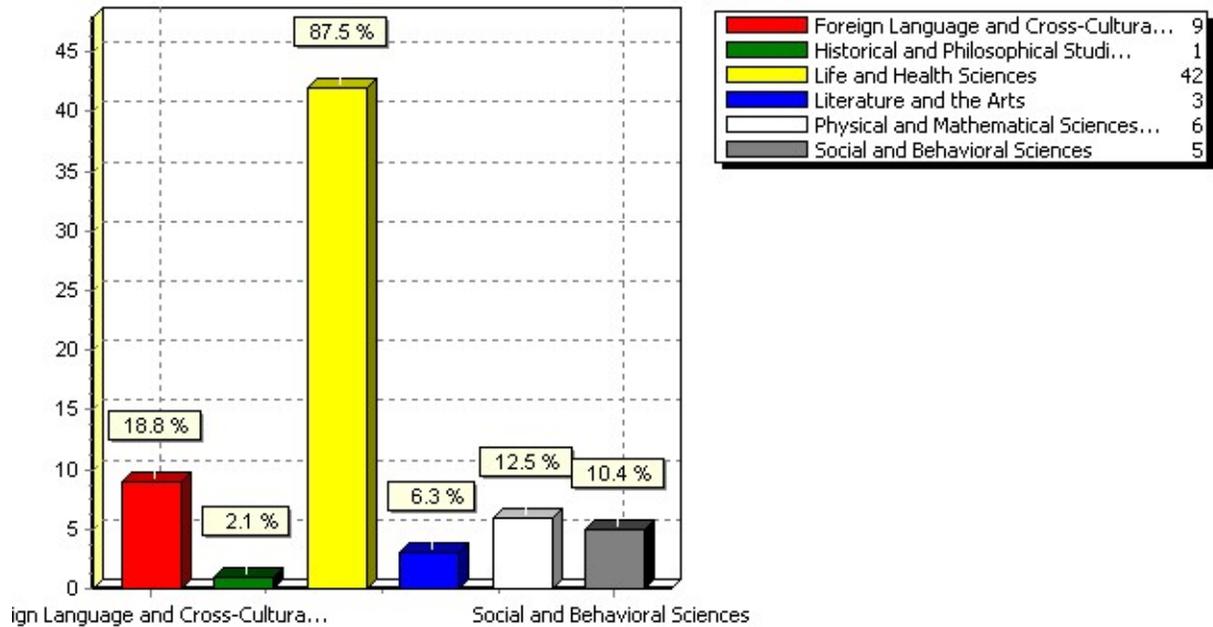


Figure 2

3) Average (What would you estimate have been your weekly maximum, minimum and average number of...)

Mean = 3.87
 Median = 4.00
 Mode = 3
 Standard Deviation = 1.73

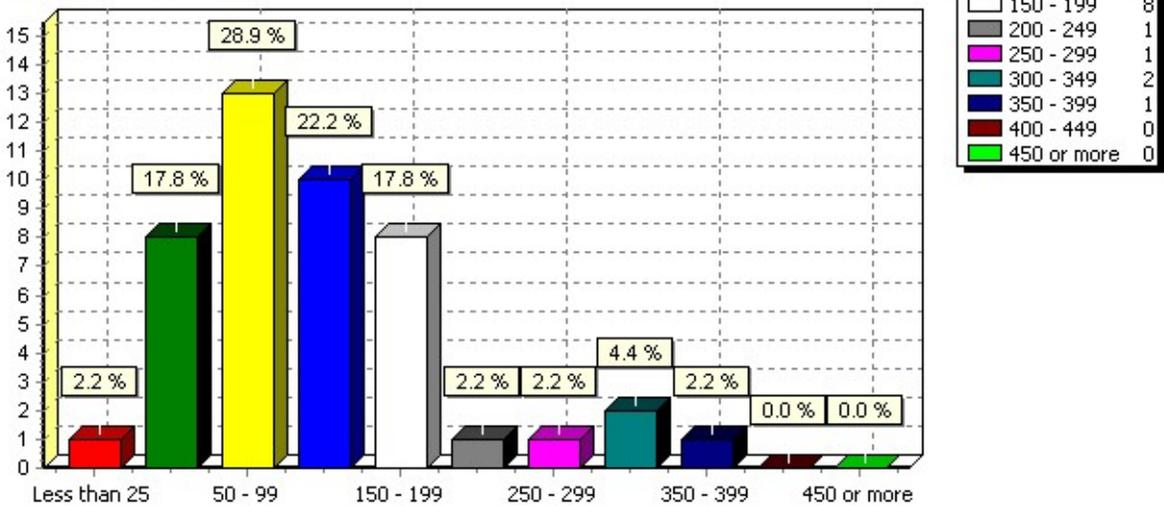


Figure 3

8) On average, how many hours per week do you spend working as a MEDLINE indexer?

Mean = 26.89
Min = 6.00, Max = 50.00
Median = 25.00

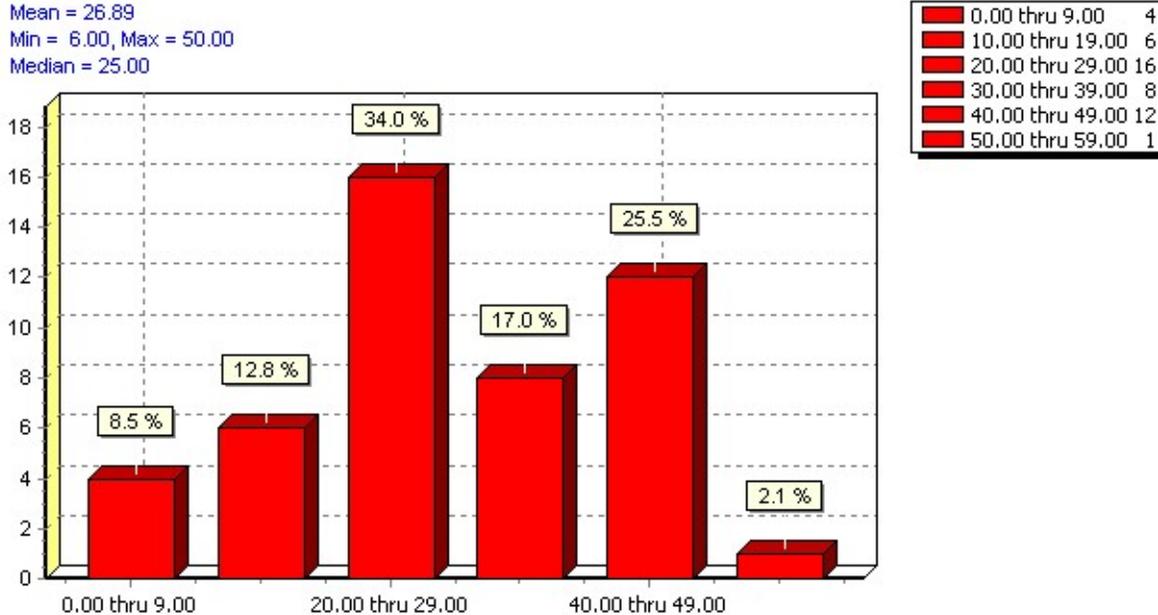


Figure 4

Evaluation of tasks performed:

We included two sets of questions to find out which tasks are more time consuming and intellectually challenging to indexers. A set of 16 tasks that are commonly performed during indexing were identified and the responders of the survey were asked to rate them according to the level of difficulty in terms of intellectual effort and time. The results indicate that the hardest tasks in terms of intellectual effort are:

1. Adding Gene RIF information
2. Translating the Title (if it is not in English)
3. Reading/understanding the article
4. Assigning MeSH headings
5. Assigning subheadings
6. Adding/Checking Chem and other Flags

In terms of time the top 6 tasks is the same but in a slightly different order:

1. Reading/Understanding the article
2. Adding Gene RIF information
3. Assigning MeSH headings

4. Assigning subheadings
5. Translating the Title (if it is not in English)
6. Adding/Checking Chem and other Flags

Figures 7 and 8 show a summary of the indexers response by presenting the average value of the ranking (0 = extremely easy, 10 extremely difficult or time consuming). The bars indicate the 25% and 75% percentiles to give an idea of the spread of the responses.

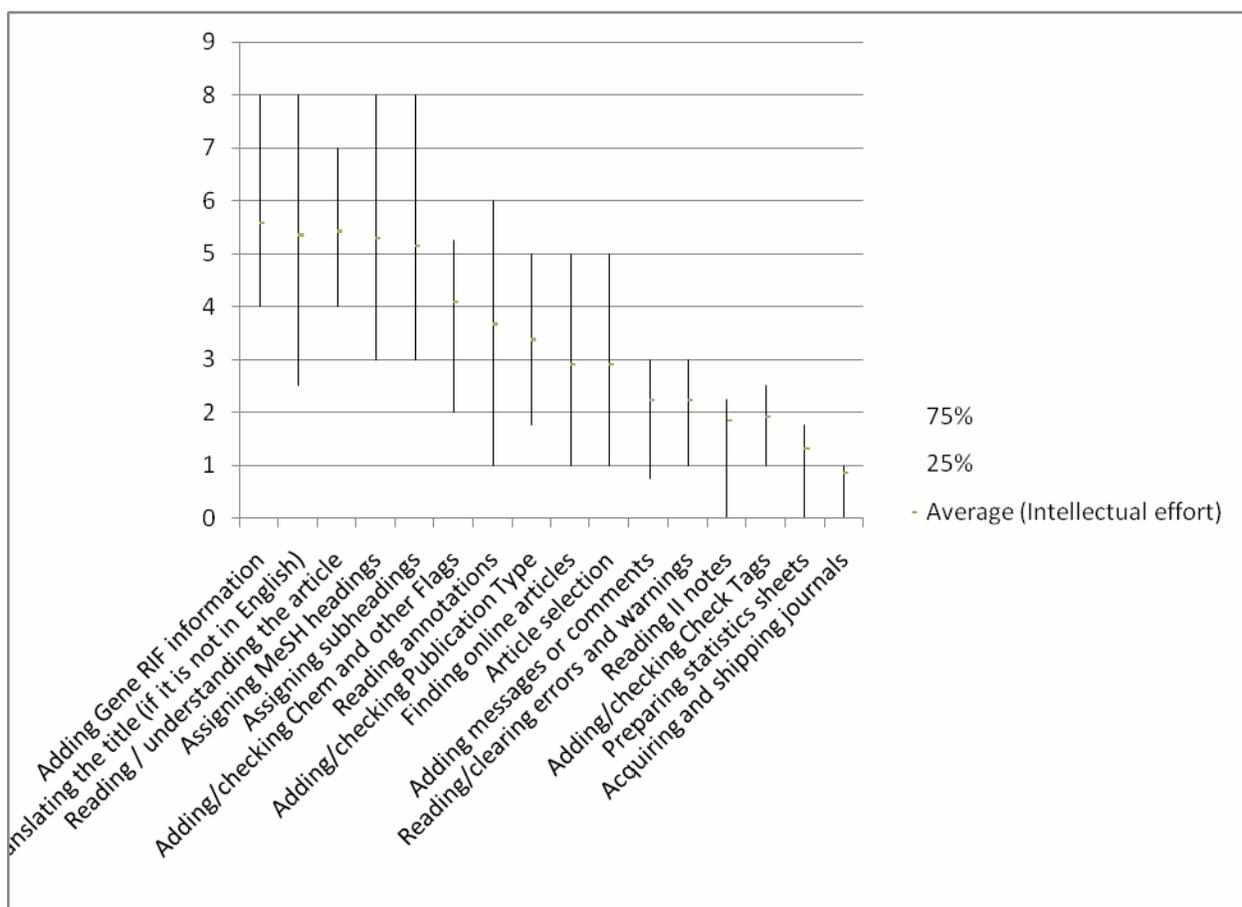


Figure 5 Ranking of tasks according to the intellectual effort reported by indexers

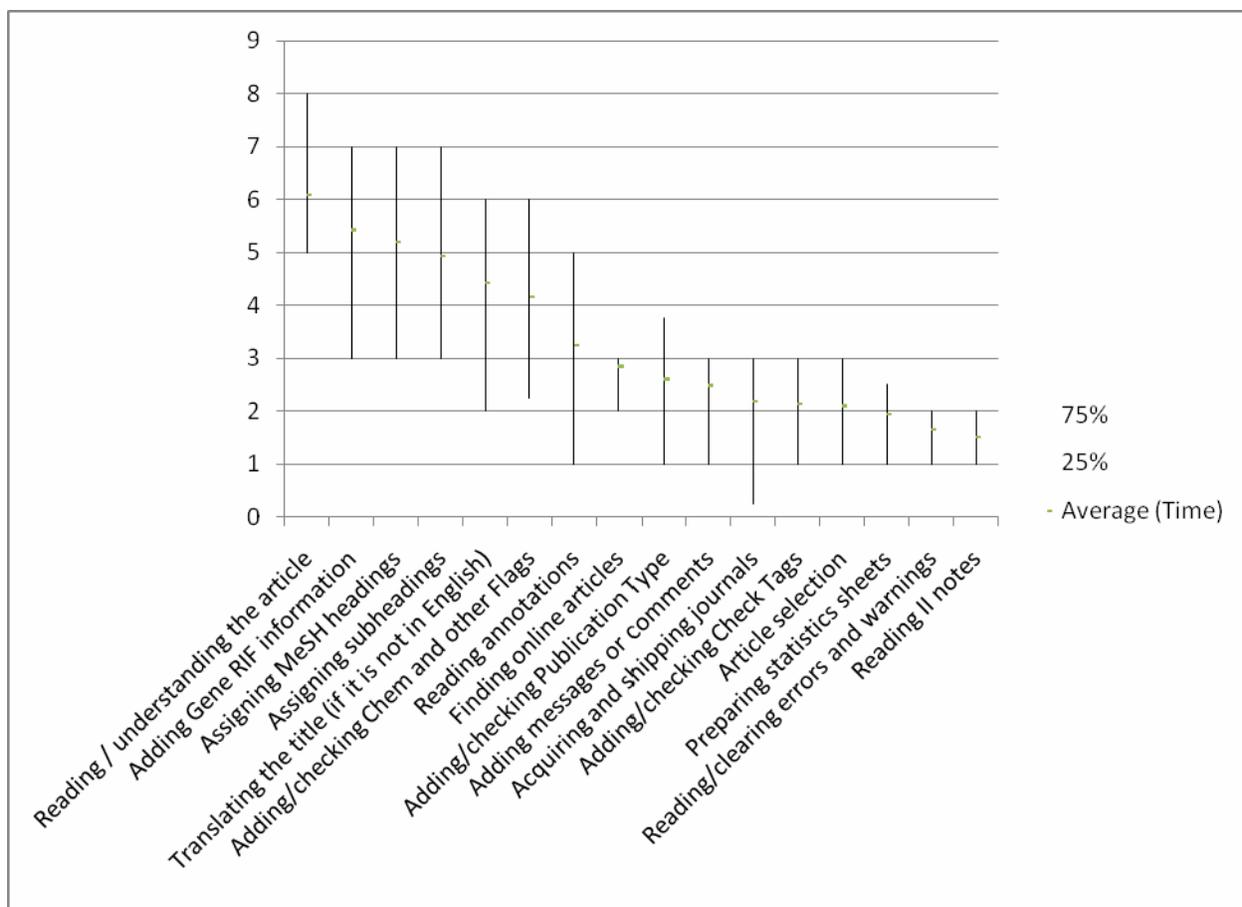


Figure 6 Ranking of tasks according to the time needed to complete them as reported by indexers

Usage of tools available in DCMS:

The survey included two sets of questions to find out more about the indexers preferences and opinion in terms of usefulness of the tools available through DCMS to their job as indexers. Since we were interested in exploring the usage of MTI one set of questions was targeted to find data to compare the tools available in the “Related” tab of DCMS.

In terms of frequency of usage, MTI (54%), Neighbor (54%), Title (37%), and comments (34%) are used in a daily basis. The results also show that a high number of indexers never use Pubmed ID (50%), Text (57%), or Title (43%). Figure 7 summarizes the responses for all tools in the “Related” tab.

In terms of perceived usefulness of the tools available to indexers we include not only those listed in the “Related” tab but also other tools available in DCMS to support the

indexers work. Figure 8 shows the users perception of usefulness of tools available in the related tab. We can see that the users preferred neighbor as the most useful tool and MTI as the second most useful tool. Figure 9 show a similar graph for other tools available to indexers in DCMS. An overwhelming majority of indexers find the MeSH browser as a very useful tool, auto scroll is second and quick edit is third. All these tool rank higher than those tools in the related tab.

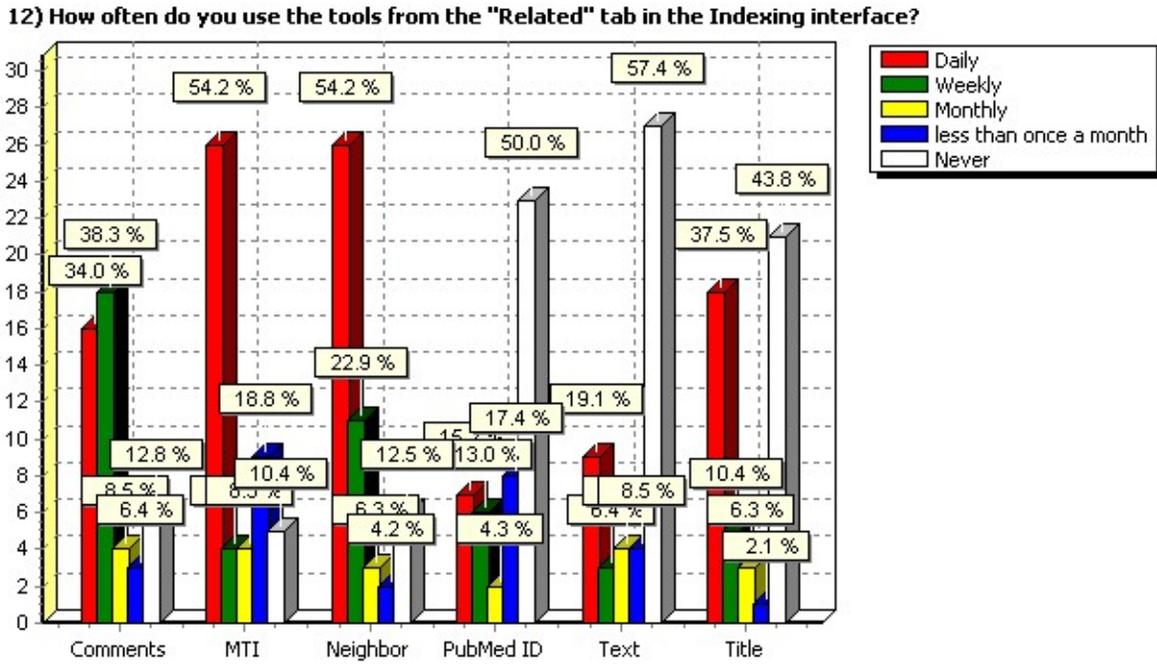


Figure 7

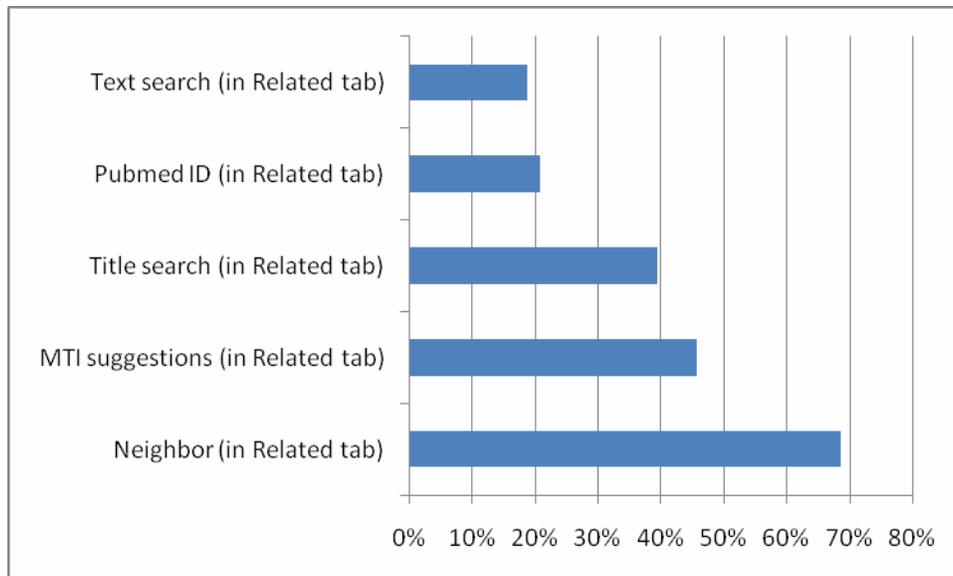


Figure 8 Percentage of users that rated the usefulness of these tools as "above average" or "very useful"

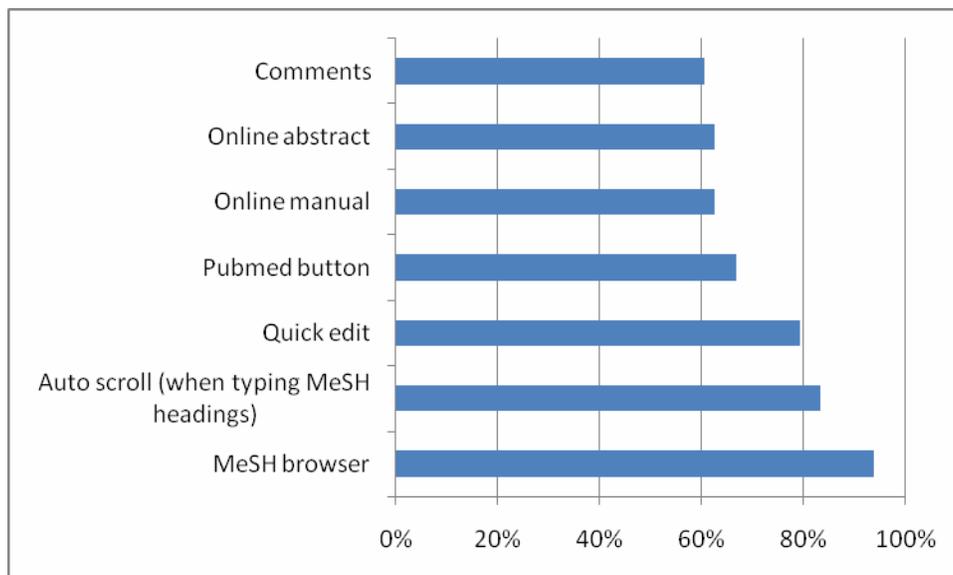


Figure 9 Percentage of users that rated the usefulness of these tools as "above average" or "very useful"

MTI related questions:

Since one of the main goals of the study was to understand how indexers use and perceived the MTI recommendations, the survey included several sets of questions targeted to measure the following aspects:

- Self reported usage of MTI (Frequency, % production)

- Evaluation of 16 statements that address the following aspects for MTI (same as 2002 study):
 - Perception of performance
 - List size
 - Completeness
 - Confidence
 - Overall performance
 - Usability
 - Impact on their workflow
- Ways in which they use MTI recommendations.

MTI self reported usage:

We included 2 questions targeted to find out more about the level of usage of MTI among indexers. 54% of responders report using MTI daily and 58% of responders report using MTI recommendations for 50% or more of the articles that they index (31% of responders use MTI recommendation for all the articles they index.)

2) MTI(How often do you use the tools from the "Related" tab in the Indexing interface?)

Mean = 2.23
 Median = 1.00
 Mode = 1
 Standard Deviation = 1.52

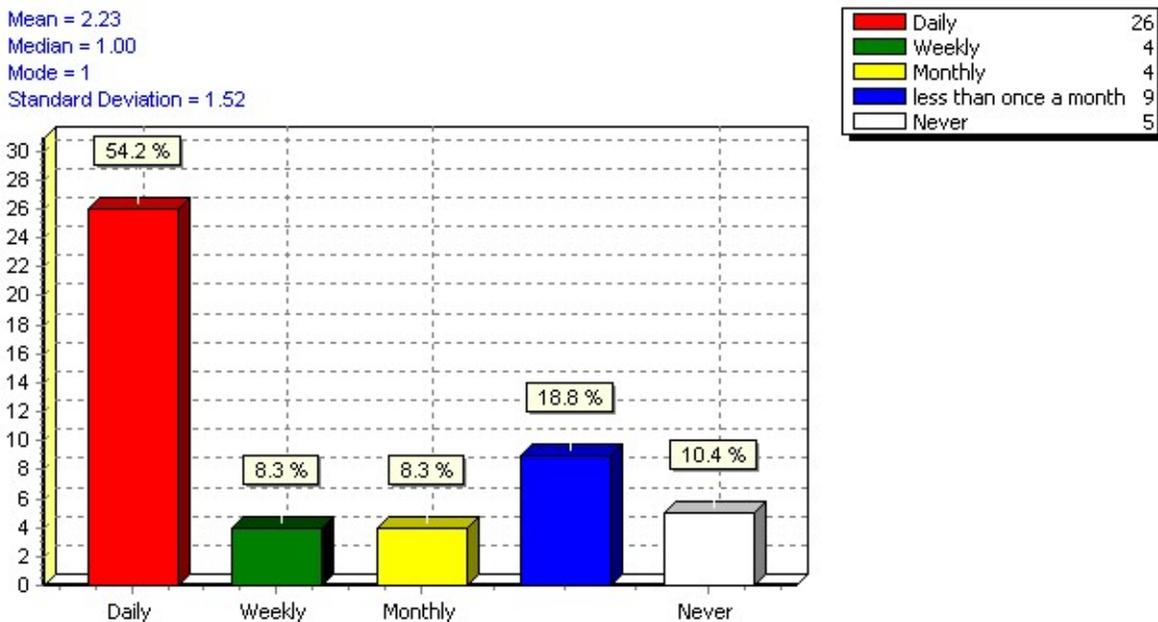


Figure 10

14) For what percentage of the English articles that you index do you look at the recommended ter

Mean = 5.56
 Median = 3.00
 Mode = 1
 Standard Deviation = 4.33

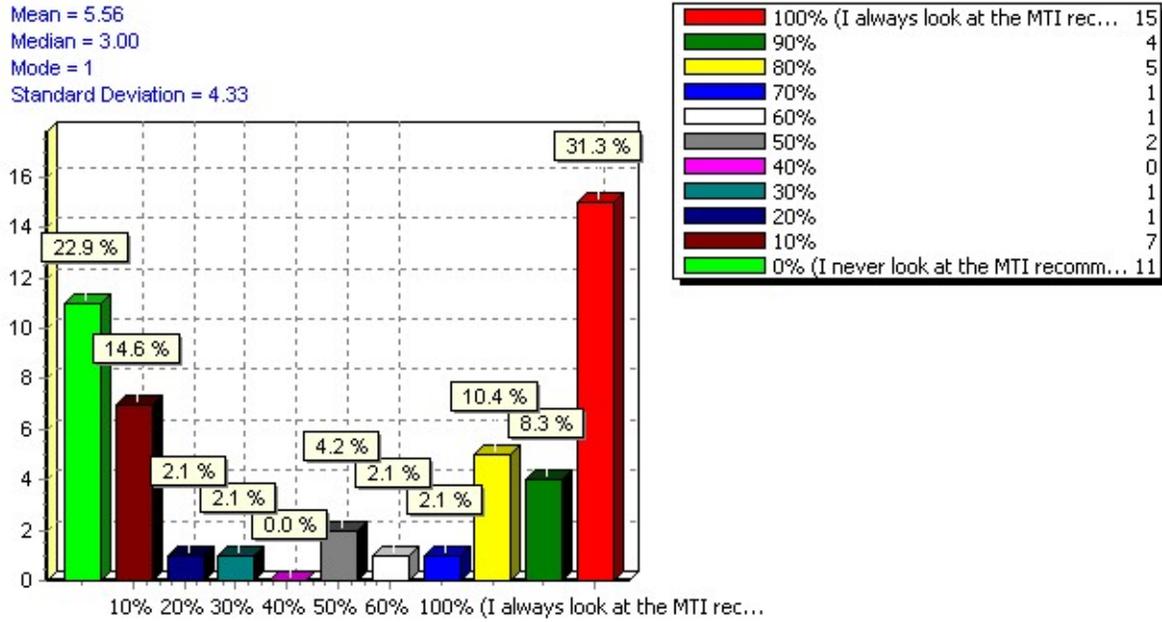


Figure 11

Perceptions of MTI:

We analyzed the results obtained from the degree of agreement (or disagreement) to each of the 16 statements presented to the users. Indexers were asked to rate the degree of agreement or disagreement with 16 statements that reflect different aspects of their perception of MTI as a tool for indexing. During the analysis of the data we found that there are clearly diverging opinions among users. However in most questions the average of their responses cancel each other and hence most of the opinions end up in the "neutral" area. Using the information regarding the percentage of production their production for which they use MTI we group the users' responses in two groups:

- MTI users: This group includes users that use MTI for 50% or more of their production. This accounts for 28 of the 48 responders.
- Non-MTI users: This group includes users that never use MTI or use it for a small fraction of their production (40% or less). This accounts for 20 of the 48 responders.

We aggregated the "strongly agree" and "agree" into a single level of agreement. Similarly, those responses in the "disagree" or "strongly disagree" levels were aggregated into a single level called "disagree". We computed the polarity of the opinion of the indexers in each of our two groups by computing the "ratio of agreement" as follows:

$$\text{ratio_of_agreement} = \frac{(\#agree - \#disagree)}{(\#agree + \#disagree)} \times 100$$

If this ration has a negative value it indicates that there is a larger number of users that disagree with the statement. Values closer to 1 or -1 indicate strong agreement or disagreement respectively. A value of 0 indicates a tie between the agreements and disagreements.

Table 1 shows the detailed results in terms of agreement and disagreement for each of the two groups. Interestingly, we can clearly see aspects in which the two groups of users have opposite opinions (marked with *) in terms of overall quality, quality of the recommendations, usefulness, and perceived utility. Figure 12 shows graphically these differences for all 16 statements.

As expected, the MTI users in general have a more positive perception of MTI than the Non-MTI users. There are several factors that merit attention from these results. On one hand, users are not confident of the recommendations made by MTI. During the individual interviews we explored this issue further and users did not like the fact that

some of the recommendations are not based on the actual contents of the article. These are recommendations that come from the related citations module. Although some of the recommended terms are certainly useful there are many cases in which the recommendation don't apply to the context of the specific article and hence the indexers have to check whether the recommended term actually applies or not to the article by reading more carefully the contents. Of the indexers interviewed only a few of them knew how MTI works and hence could tell whether a recommendation came probably from the related citation module. This seems support the idea of either separating these recommendations so that the indexers are aware of the source of that was used to recommend the term. Another possibility is to include some way of explaining how the system came up with the recommended term.

Table 1 Polarity of opinion between MTI and Non-MTI users

	MTI Users (28 users)			Non-MTI users (20 users)		
	Agree	Disagree	ratio of agreement	Agree	Disagree	ration of agreement
<i>Level of specificity of recommendations</i>			(+/-)			(-)
<i>1. Most of the suggested terms are too general</i>	5	9	-29%*	9	3	50%*
<i>2. Most of the suggested terms are too specific</i>	1	17	-89%	2	9	-64%
<i>Overall quality</i>			(+)			(-)
<i>3. The suggested terms help me to produce a high-quality result (a fully indexed article with the correct terms)</i>	17	5	55%*	0	13	-100%*
<i>4. I think the overall quality of suggested terms is unacceptable</i>	6	15	-43%*	14	1	87%*
<i>Term quality</i>			(-)			(-)
<i>5. The suggested terms encourage me to use extraneous terms in my indexing</i>	12	8	20%	7	6	8%
<i>Completeness / coverage</i>			(+/-)			(-)
<i>6. MTI coverage of significant topics is good</i>	12	5	41%*	1	12	-85%*
<i>7. Important subject areas are sometimes missing from the list of suggested terms</i>	20	3	74%	16	0	100%
<i>Usefulness</i>			(+)			(-)
<i>8. The MTI pane is a useful tool in indexing</i>	23	1	92%*	2	12	-71%*
<i>Confidence in recommendations</i>			(-)			(-)
<i>9. I have confidence in the accuracy of suggested terms from MTI</i>	6	14	-40%	0	16	-100%
<i>10. I am apprehensive about accepting subject headings recommended by MTI</i>	9	7	13%	13	2	73%

Usability			(+)			(+)
11. I find the MTI pane difficult to use	1	23	-92%	2	8	-60%
Length of the list of recommendations			(+)			(+)
12. I would rather see a longer list of suggested terms	6	14	-40%	1	11	-83%
13. For most articles the list of terms is too long	3	17	-70%*	5	5	0%*
Perceived utility			(+)			(-)
14. Using MTI increases my productivity as indexer	17	3	70%*	0	14	-100%*
15. Regular use of the MTI pane slows down indexing	5	19	-58%*	10	1	82%*
16. Using the MTI suggested terms has improved my skills as an indexer	19	2	81%*	0	17	-100%*

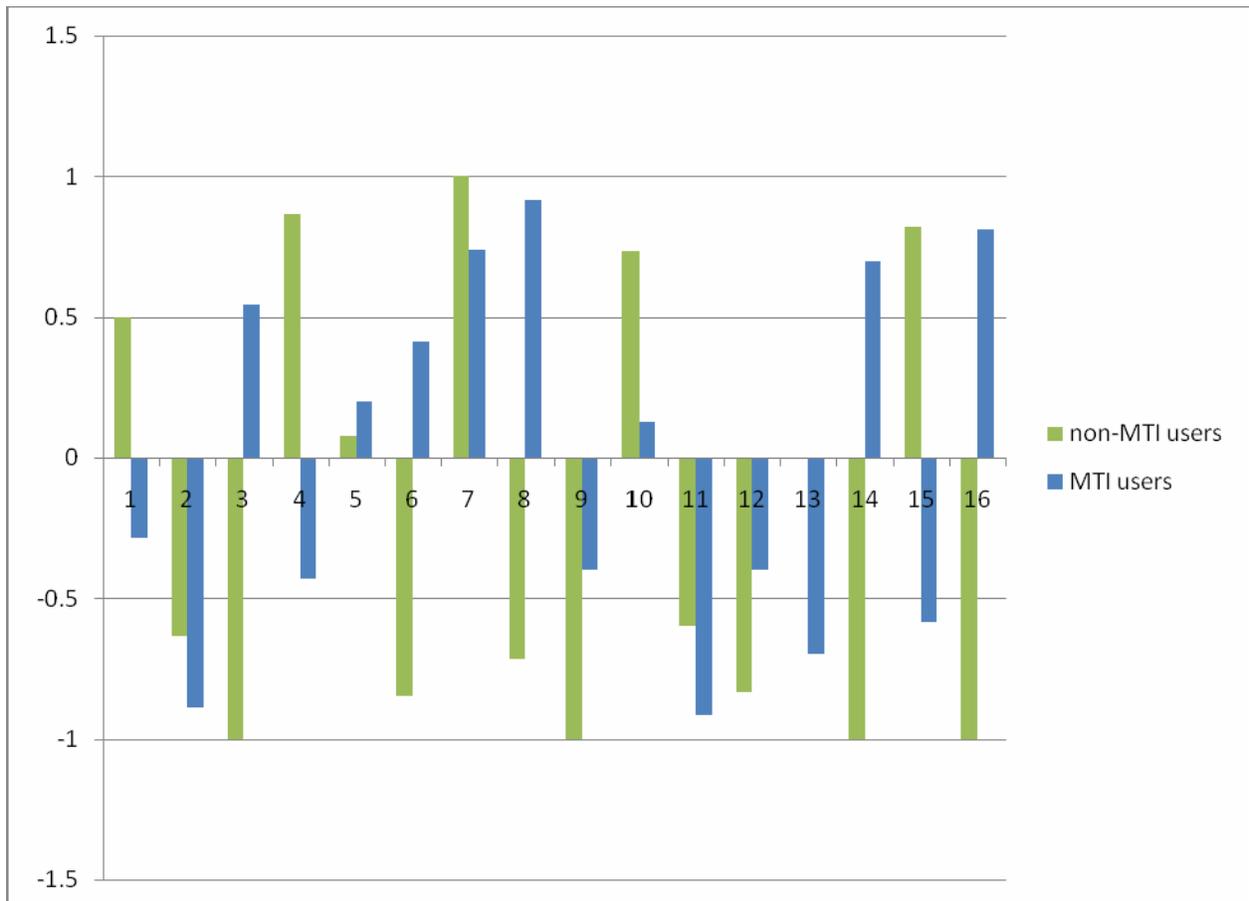


Figure 12 Comparison of polarity of opinion between the MTI and Non-MTI users

Ways in which indexers use MTI:

The survey included a set of questions to try to determine the way indexers use MTI. According to the responses of the MTI users (as defined above) most of them use the MTI recommendations as a quick typing tool, and to double check missing terms. Most of the indexers use MTI at the beginning of the indexing and in some cases at the end of their indexing process. When asked what other users they have for MTI some responders said that they use it to check if indexers that they supervise are relying to heavily in the MTI recommendations, as a tool for easy connection to the MeSH browser and to familiarize themselves with categories or terms that they rarely use.

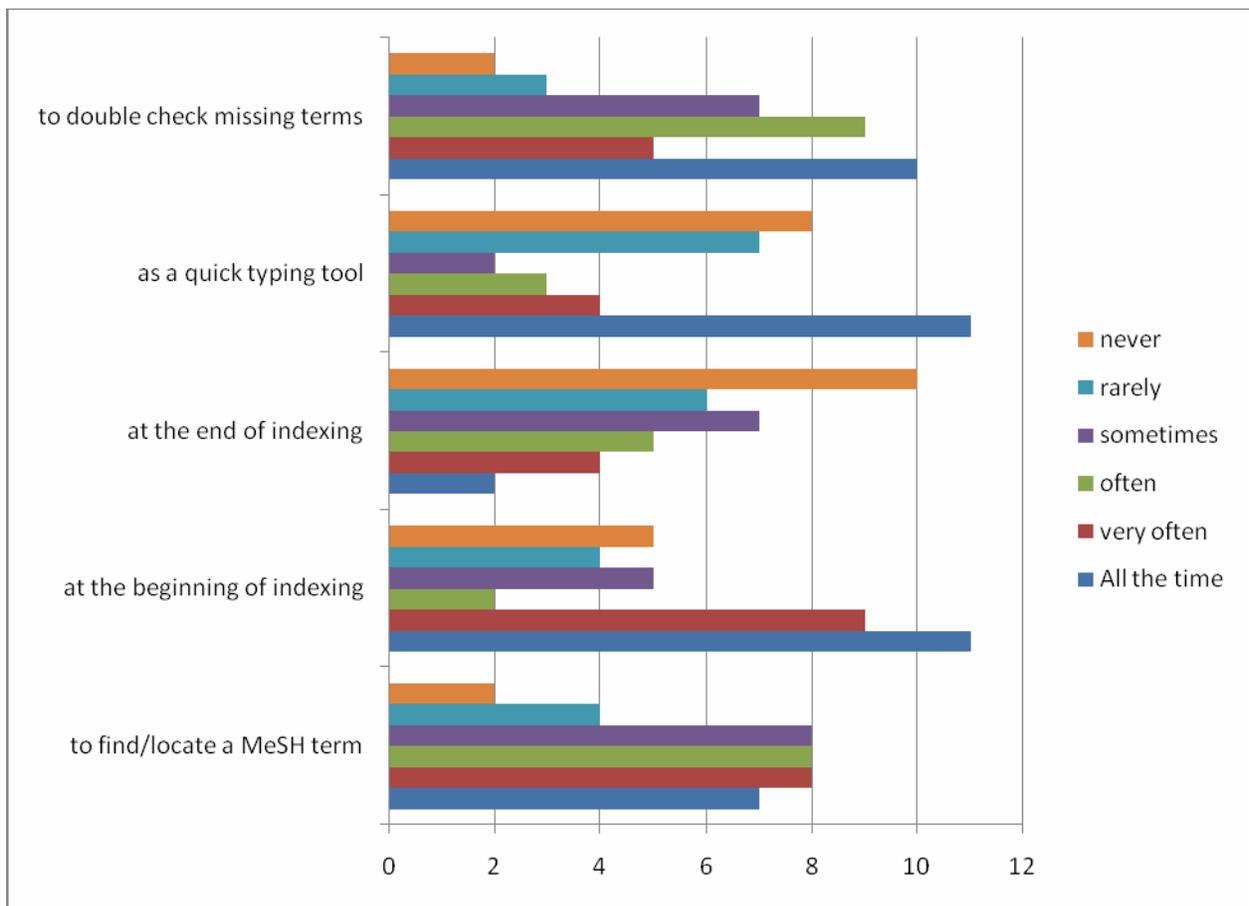


Figure 13 Usage of MTI by indexers

Evaluation of potential improvements to MTI/DCMS:

We included two sets of questions to gather the opinion of the indexers regarding possible improvements to MTI. The first set of questions asked the indexers to rate the importance of four possible improvements:

- Subheadings recommendations
- Explanation of where the MTI terms came from
- MTI recommendations based on the full text of the article
- Improvements to the look and feel of the MTI/DCMS interface

The first two improvements have already been development by the team of the Indexing Initiative, the full text MTI recommendations has been studied also by the Indexing Initiative and the forth one came up after reviewing the DCMS system during this study. For the first two improvements we had prepared a prototype web-based demo to help the indexers get a better idea of the proposed functionality.

The indexers were asked to rate the importance of each improvement using a likert scale that included 6 levels ("extremely important", "very important", "somewhat important", "important", "not very important", and "not important at all". We grouped the responses of the first four levels as "important" and the last two levels as "not important".

According to the responders the most important improvement is the MTI recommendations based on the full text of the article (78.9% of the users rate this as important), in second place is the changes to the look and feel of MTI and its integration to other DCMS features (72%), in third place was the explanation of where the MTI terms came from (70%) and the subheading recommendation was ranked by 63.8% of responders as important. During the user interviews we further explored the opinion of the users regarding these improvements. One thing that we discovered during the interviews is that some users did not understand the way the demos worked. After explaining and showing them the functionality 7 out of 8 users expressed that they would find the subheading recommendations very useful. The users interviewed also express that they see the explanation tool combined with the full text recommendation as a tool that can potentially help them to scan the contents of the full text article faster.

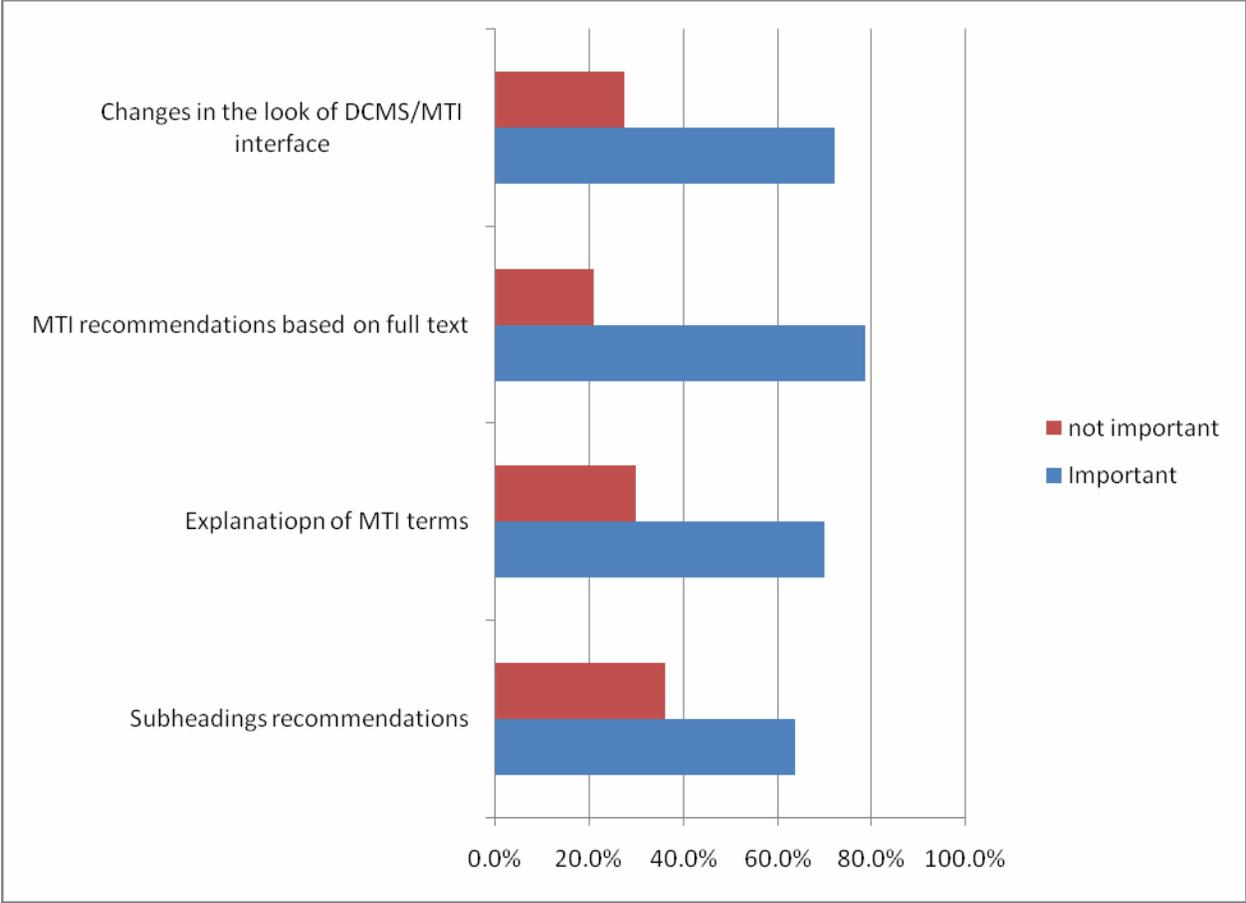


Figure 14 Rating of importance of proposed improvements

The second set of questions in this group asked the users the likelihood that they would use a good implementation of the three proposed functionalities (Subheading recommendations, explanation of MTI recommendations, and MTI suggestions from full text). 68% of the users said that they would likely use the recommendations from full text, 54% said that they would likely use the subheading recommendations and 53% said that they would likely use the explanation of where the MTI term comes from.

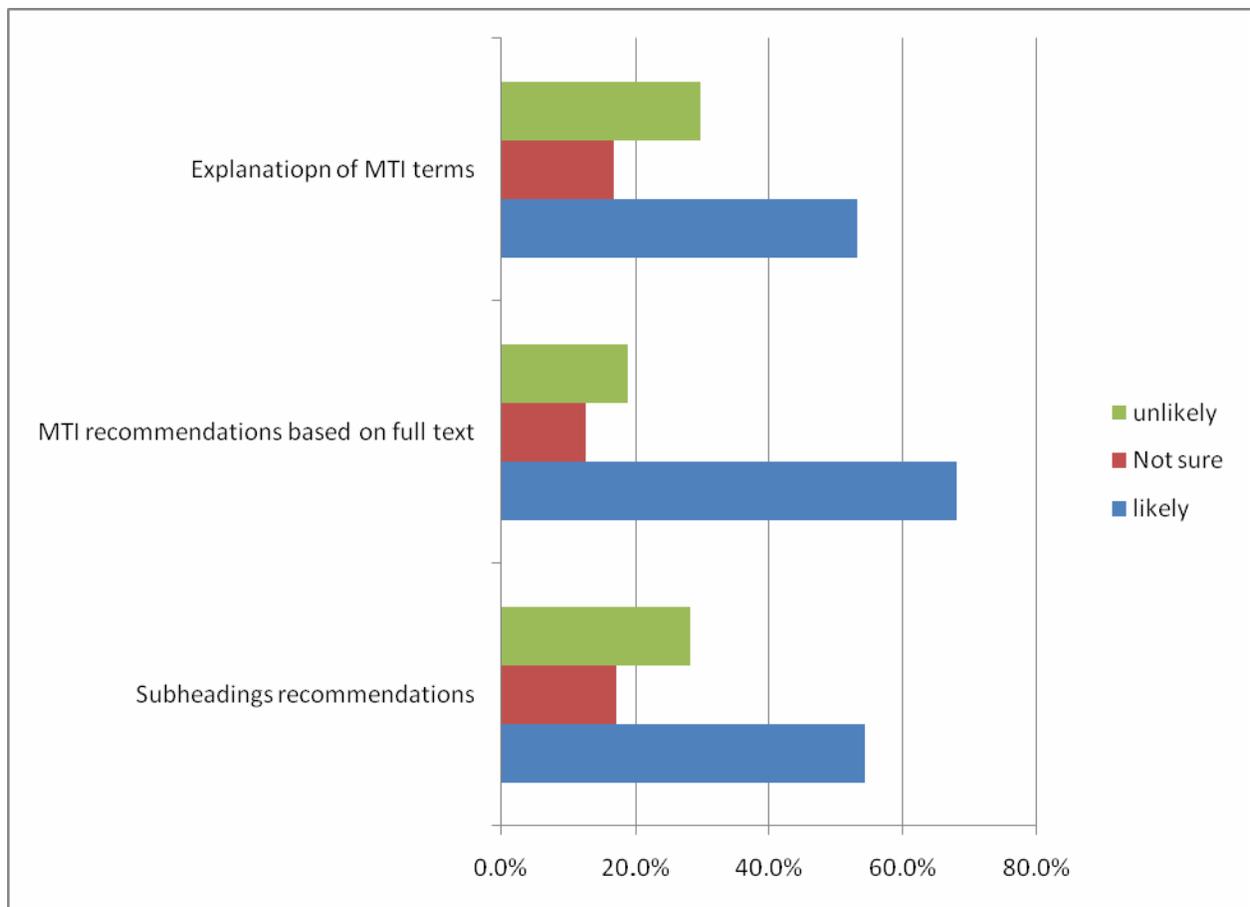


Figure 15 Percentage of users responses regarding the likelihood that they would use one of the proposed improvements

Other recommendations from the users:

The last question of the survey asked indexers to tell us more about any improvements to MTI and/or DCMS that would help them improve their productivity. 27 users gave feedback through this question. We edited these comments slightly and organize them in four groups:

- Opinions expressed (positive as well as negatives)
- MTI related comments
- DCMS behavior/features
- Features for revisors

The complete list of comments is presented in the following sub sections:

Opinions:

1. MTI may be much more helpful to a new Medline index who doesn't know what Mesh terms we have. A proficient indexer already knows what to look for and where to find it quickly, so MTI may be more of a hindrance.
2. I never use MTI. I find that the results are totally useless in my indexing.
3. MTI has definitely helped make me a more productive and more thorough indexer.
4. I like all the examples you've presented as a new improvements. I will wait for them. All of that would be extremally important and useful, and helpful for the new indexers, and quite useful for the experienced ones.
5. I've used MeSH for many years as a cataloger, so I don't need a lot of help with the vocabulary but I wasn't introduced to and haven't used the MTI. I will try it and do a better job with the next survey.
6. What I would like to indicate is that I always use MTI for quick edit spelling and some recommended headings, but I would not rely on MTI as a complete, accurate listing at all. There are many, many extraneous entries in MTI, but I do find the related entries to be helpful.

MTI related comments:

1. an understanding of the organization of the MTI terms.
2. I use MTI to save typing. If the MTI list were in alphabetical order, I could locate terms I want quickly.
3. a way to pick IM when using MTI terms would be nice
4. much too general terms in MTI to be useful to a good indexer
5. The checktags "pregnancy" and "female" can be automatically added to all records when a pregnancy complications term is input.
6. I would like an indicator for MTI that reflects the accuracy of terms mapped to the title.
7. Checktags and the term "random" would be most helpful from full text, and having them all listed at the top of the MTI record would be useful.
8. MTI lists synonyms of terms that I have already used and shows them as unused. This feature is particularly time consuming because a lot of times I will see a term that I think is great only to find it is the same term that I have already selected but it is not marked as so.
9. Articles that are editorials or have abstract titles are not indexed properly with MTI -- neighbor does not tend to index them any better.
10. I would appreciate if some of the chemical terms would be included on the MTI suggestion list... since I have to look most of them up anyway to confirm that I have the right one or to look up the PA, it would save a step if I could click directly on the suggested chemical instead of typing it in to the MeSH search box myself.
11. In the new, improved MTI: a tool which would allow to mark a selected subheading IM (if applicable) in one click (maybe with an extra button on the keyboard at the same time, or for example double click...)
12. I think relevant terms should also be taken from the journal title.

13. Place it somewhere other than in related records. This would remove a step in using MTI

DCMS behavior/features:

1. Have the program return to "Term" after updating "Flags" (save time)
2. Have the program clear the term entry box (without my having to click on "clear") after going to MeSH data. (Currently the cursor goes there but when a term is typed the autoscroll does not work unless you click on "clear.") This would save time and frustration.
3. Have a German-English, French-English, etc., dictionary (including medical terms) capacity that could be easily accessed.
4. Get rid of the background which takes too long to load;
5. speed up the refresh after each checktag selection or delay it until the indexer requests it;
6. improve the Gene Link interface so that the DCMS link will work every time
7. Assistance with Publication Type choices, especially when using the abstract is required.
8. A warning message is needed when the number of IM terms is greater than 7 and an error message is needed for an IM star upfront combined with an IM star on a qualifier and if more than two IM stars exist on one term.
9. When in 'edit mode', addition/updating of checktags should not arbitrarily (sometimes) delete all indexing terms.
10. Mesh browser should persist after selecting term from it. At present, when Mesh Browser is invoked and a term 'selected from it', the browser automatically closes afterward.
11. Permit all the functions to be accessed from Quick Edit so I don't have to keep hitting Update and going back to the main indexing panel in order to add a Chem Flag, PTetc. This wastes a great deal of time and often has to be done several times per article.
12. Have full title appear on the Index panel so I don't have to click back to check it. People are missing capitalization and typos in last portion of many titles that make it into PubMed.
13. Fix whatever glitch intermittently prevents using the Term function from the main Index panel (not Quick Edit).
14. Add a Quality Control flag to the list of Flags. Not possible to flag online articles for QC.
15. Add a function for suggesting new MeSH terms or changes to existing MeSH terms apropos of particular articles. It is currently not possible to append a yellow or green form to online journal articles and if the term in question is extensively discussed in the article (or even several articles in a series), it would be nice to be able to connect them so MeSH doesn't have to try to hunt down the article later.
16. Put the rest of the Manual online.

17. Easier access to the MTI terms, now we have to click multiple times and there's a lag period before the terms appear.
18. A "back" button and "re-do" function when in Quick Edit table during indexing.
19. Please arrange the list of subheadings in alphabetical order going down one column, then down the other as opposed to the current side to side. It is much faster to scan down a list than it is to go back and forth.
20. Ability to import a term from MeSH w/o having to type/copy it (perhaps a button that would import term to MTI list?).
21. A splashy blurb on the DCMS search page about new terms w/ links to them.
22. Having the links to the online manual be to the current version, not the old one (some sections of the manual no longer exist).
23. Drop down menus are not always intuitive, & having 2 pub types be only in the check tags menu "because folks are used to it" is silly, wish those terms were also in pub types menu.
24. Mini online courses for new features of DCMS & MTI, as well as a short email about them.
25. An online suggestion box for software & MeSH term ideas.
26. I would like to have a dot line between headings and "D". Sometimes I click wrong "D".
27. Also, the Drag and Paste feature could be useful - especially between MESH window and DCMS.
28. I think it would be useful, especially for new indexers, to have a direct "question mark" link to mesh inside the subheadings selection box so that you can directly link to the mesh description of the subheadings from within DCMS rather than having to go through a main term and then click on the link within Mesh.
29. Likewise, perhaps direct links to the manual for descriptions of each subtype and their correct usage from within the subtype page in DCMS.
30. My productivity would increase if, a) given the opportunity to select the journals in the area of my expertise. b) When assigned journals outside of my field of knowledge, allowed to list the "NLM unique ID" on a request that my index number be deleted from the list of potential indexer...and not be given than journal again.
31. Fonts in the current DCMS abstract (indexing/quick edit screen) need to be changed and improved. Fonts are a sort of "granulated" and hard to read!
32. Remove "cancel" button from under QuickEdit window - it serves no purpose, but can erase work done if pressed accidentally.
33. Eliminate "auto scroll" checkbox and "mesh", "chem" and "both" radio buttons - or at least default to "autoscroll" and "both" - I dont know why anyone would want any other setting. - or at least move the "autoscroll" checkbox away from the "add" button since the button is pressed constantly and the checkbox never (thus setting up an accidental removal of the scroll feature).

Features for revisors:

1. For revisors, on the queue tab, I would like to be able to see a menu of indexer names only. By clicking on the name, I would like to see a list of journals indexed by only that indexer. When I have 5 productive indexers, the journal list is very long and quite a lot of time is used for scrolling to find a particular journal name.
2. To include the electronic journal tracking numbers on the queue, to facilitate filling out of the stat sheet where recording the tracking number is required.
3. More timekeeping features for in house revisors would be useful. Distinctions could be made for revision, scanning and forwarding functions.

Recommendations:

The following is a set of recommendations based on the results from this study. Most of the requests from the users that participated in this study are relatively simple fixes to MTI and its DCMS interface that can go a long way in improving usability and acceptance of the system by a larger number of users. Among these short term fixes are:

- Fixing the problem with synonym entry terms.
- Arrange list of terms alphabetically
- Add indication of "confidence"
- Add subheadings recommendations
- Provide explanation of MTI recommendations.
- Separate terms that come from the related citations from those that come from MetaMap. This might help the user to have a better understanding of the kind of recommendation that they are looking at.

One of the recurring themes that came up during the interviews is the need for the indexers to have a channel of communication to provide feedback and to access online materials that could help them to learn or understand better DCMS and all the options that are available to them. For this reason we recommend the following improvements to the current user support available online:

- Update online manual
- Provide an area with tutorials and online training materials.

Most of the comments that we received from the indexers are related to the DCMS interface. During our study we learn that although the indexing process is very similar among indexers, the way they use the available tools varies from one indexer to another. It would be a good idea to consider adding some form of customization so

that each user will have a default set of settings. For example, if the user prefers to use the MTI recommendations from the Related tab, then he/she can set this as the default tool and have the system show the MTI recommendations as soon as the click on the related tab. Similarly, it seems that the majority of the indexers use the autoscroll function so this could be the default for them instead of having to set it every time they work at an article. There are also some other features that are more targeted to specific groups of users such as revisors who would benefit from having an interface that allows them to collapse or expand groups of articles indexed by the indexers they revise. It would be also a good idea to add links to resources that could help indexers who work with materials in languages other than English. This is the short list of possible improvements to DCMS

- Customization based on user profiles
- Adding revisors features
- Drag and paste from MeSH browser
- Add link to French-English German-English MeSH browsers

Acknowledgment

We would like to thank all the indexers that participated in the survey and individual interviews for their enthusiasm and valuable feedback that made possible this study. We also would like to thank James Marcetich and Joe Thomas for their input and support to this study.

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Annex A: Questionnaire

DCMS/MTI Evaluation Survey

This survey is intended to gather information about the use and adoption of the Medical Text Indexer (MTI) recommendations which are available through the DCMS system.

1)

Informed Consent Form

UNIVERSITY AT BUFFALO, THE STATE UNIVERSITY OF NEW YORK

RESEARCH TITLE: User-centered Evaluation of the Medical Text Indexing (MTI) System at the National Library of Medicine

You have been invited to participate in this study that will evaluate the Medical Text Indexer system (MTI) and its integration to DCMS. In order to decide whether or not you want to be part of this study, you should understand enough about its risks and benefits to make an informed judgment.

PURPOSE: The main goals of this project include the evaluation of the MTI system and its integration into the DCMS, the identification of factors that affect the use and adoption of this system and to identify areas or features that you as a user would like to see incorporated or improved.

PROCEDURES: For this purpose we have built an online survey which has a set of 20 questions designed to gather your opinion and to understand the way in which you use the system.

CONFIDENTIALITY: The information collected with this survey will be kept strictly confidential. None of the data will be used to identify individuals or companies. All the data will be presented in aggregate form only. The raw data obtained from the study will be accessible to the main researchers only. However, a summarized version of the data will be reported to the NLM.

RISKS: There are no known risks to participating in this study.

BENEFITS: Although there are no benefits to you directly, your participation will help identify potential improvements to DCMS and MTI and will help the NLM to plan for future

development of tools that could be extremely useful in increasing your productivity as an indexer and to create tools that could improve your daily work with the system.

VOLUNTERING FOR THE STUDY: Please note that participation in this study is completely voluntary. If you do not want to participate, you can refuse to participate without any penalty and can refuse to answer any questions.

FOR QUESTIONS ABOUT THIS RESEARCH, CONTACT: If you have any questions regarding this research please feel free to contact Miguel E Ruiz (meruiz@buffalo.edu or ruizmi@mail.nih.gov) who is the principal investigator of this project or Alan Aronson (alan_aronson@mail.nih.gov).

Miguel E. Ruiz: Dept. of Library and Information Studies / University at Buffalo, State University of New York/ 534 Baldy Hall / Buffalo, NY 14260-1020 Phone: (301) 435-3152 (in NIH), Email: meruiz@buffalo.edu or ruizmi@mail.nih.gov.

Alan Aronson: LHNCBC/ National Library of Medicine / MSC 3826 / 9000 Rockville Pike /Bethesda, MD 20894-2826 Phone: (301) 435-3162 Email: alan_aronson@mail.nih.gov

The Social and Behavioral Sciences Institute Review Board (SBSIRB), SUNY at Buffalo, has reviewed this research project. For questions regarding the rights of participating in the research, contact Social and Behavioral Sciences Institutes Review Board at (716) 645-6474. Participants can call SBSIRB anonymously.

PARTICIPANT STATEMENT:

By selecting the check box of the "I agree" option and clicking in the "Next Page" button you are accepting to participate in this study.

- I Agree
- I Do not Agree

Demographics

2) Have you received any formal computer training?

- Yes
- No

3) If you answer "Yes" to the previous question, please explain briefly the kind of training that you received in this space:

4) Which areas of knowledge would you choose as the most representative of your background?

- Foreign Language and Cross-Cultural Studies
- Historical and Philosophical Studies
- Life and Health Sciences
- Literature and the Arts
- Physical and Mathematical Sciences & Technology
- Social and Behavioral Sciences

5) Select your areas of specialization: (Select all that apply)

- Allergy
- Anatomy (including cytology, embryology and histology)
- Anesthesiology
- Biochemistry (including biophysics and chemistry)
- Biomedical engineering (including medical technology)
- Biotechnology
- Botany
- Cancer
- Cancer, experimental
- Cardiology (including blood circulation and vascular diseases)
- Critical Care (Including emergency medicine and traumatology)
- Dentistry
- Dermatology
- Drug Therapy (including pharmacy)
- Gastroenterology
- Genetics (including hereditary diseases)
- Geriatrics
- Health Care (including health services, hospitals and public health)
- Hematology (Including blood diseases)
- Infectious diseases (including tropical medicine)
- Immunology
- Metabolism (including metabolic diseases)
- Microbiology (including bacteriology, virology and parasitology)
- Molecular biology
- Neurosciences (including neuron chemistry)

- Neurology (including neurological diseases, neuroradiography and neurosurgery)
- Nursing
- Obstetrics and gynecology
- Ophthalmology
- Otolaryngology
- Pathology
- Pediatrics
- Pharmacology (including toxicology)
- Physiology (including endocrinology)
- Psychiatry (including Psychology and substance dependence)
- Radiology (Including nuclear medicine, radiography, magnetic resonance imaging and ultrasonics)
- Rheumatology
- Space medicine and biology
- Sports Medicine
- Surgery
- Thoracic diseases
- Urology
- Veterinary medicine
- Zoology (including comparative biology and primatology)
- Other (please specify)

If you selected other please specify:

Indexing Experience

6) Number of years working as a MEDLINE indexer

7) What would you estimate have been your weekly maximum, minimum and average number of articles indexed in the past six months? (excluding time off)

	Less than 25	25 - 49	50 - 99	100 - 149	150 - 199	200 - 249	250 - 299	300 - 349	350 - 399	400 - 449	450 or more
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Article selection	<input type="radio"/>											
Reading II notes	<input type="radio"/>											
Finding online articles	<input type="radio"/>											
Reading / understanding the article	<input type="radio"/>											
Translating the title (if it is not in English)	<input type="radio"/>											
Assigning MeSH headings	<input type="radio"/>											
Reading annotations	<input type="radio"/>											
Assigning subheadings	<input type="radio"/>											
Adding/checking Publication Type	<input type="radio"/>											
Adding/checking Check Tags	<input type="radio"/>											
Adding messages or comments	<input type="radio"/>											
Adding Gene RIF information	<input type="radio"/>											
Adding/checking Chem and other Flags	<input type="radio"/>											
Reading/clearing errors and warnings	<input type="radio"/>											
Preparing statistics sheets	<input type="radio"/>											

11) For each of the following aspects please rate from 0 to 10 the amount of time that each of these activities represent during indexing: (Select N/A for those that you don't do)

	Time											N/A
	0 (Minimal time needed)	1	2	3	4	5	6	7	8	9	10 (Extremely time consuming)	
Acquiring and shipping journals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Article selection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reading II notes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Finding online articles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Reading / understanding the article	<input type="radio"/>											
Translating the title (if it is not in English)	<input type="radio"/>											
Assigning MeSH headings	<input type="radio"/>											
Reading annotations	<input type="radio"/>											
Assigning subheadings	<input type="radio"/>											
Adding/checking Publication Type	<input type="radio"/>											
Adding/checking Check Tags	<input type="radio"/>											
Adding messages or comments	<input type="radio"/>											
Adding Gene RIF information	<input type="radio"/>											
Adding/checking Chem and other Flags	<input type="radio"/>											
Reading/clearing errors and warnings	<input type="radio"/>											
Preparing statistics sheets	<input type="radio"/>											

12) How often do you use the tools from the "Related" tab in the Indexing interface?

	Daily	Weekly	Monthly	less than once a month	Never
Comments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
MTI	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Neighbor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PubMed ID	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Text	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Title	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13) In terms of usefulness to your work as indexer, How would you rate each of the DCMS tools to support indexing?

	Very useful	Above Average	Average	Below Average	I never use it
Comments (in Related tab)	<input type="radio"/>				
MTI suggestions (in Related tab)	<input type="radio"/>				
Neighbor (in Related tab)	<input type="radio"/>				
Pubmed ID (in Related tab)	<input type="radio"/>				
Text search (in Related tab)	<input type="radio"/>				
Title search (in Related tab)	<input type="radio"/>				
Quick edit	<input type="radio"/>				
Pubmed button	<input type="radio"/>				
Online manual	<input type="radio"/>				
Auto scroll (when typing MeSH headings)	<input type="radio"/>				
MeSH browser	<input type="radio"/>				
Online abstract	<input type="radio"/>				

14) For what percentage of the English articles that you index do you look at the recommended terms from MTI?

- 100% (I always look at the MTI recommendations)
- 90%
- 80%
- 70%
- 60%
- 50%
- 40%
- 30%
- 20%
- 10%
- 0% (I never look at the MTI recommendations)

15) How do you use the suggested MTI terms?

	All the time	Very often	Often	Sometimes	Rarely	Never
to find/locate a MeSH term	<input type="radio"/>					
at the beginning of indexing	<input type="radio"/>					
at the end of indexing	<input type="radio"/>					
as a quick typing tool	<input type="radio"/>					
to double check missing terms	<input type="radio"/>					

16) Besides the suggested uses above, can you think of any other way in which you use the MTI recommendations?

17) For each of the following statements rate your degree of agreement (or disagreement) based on your experience with the MTI pane:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Most of the suggested terms are too general	<input type="radio"/>				
Most of the suggested terms are too specific	<input type="radio"/>				
The suggested terms help me to produce a high-quality result (a fully indexed article with the correct terms)	<input type="radio"/>				
I think the overall quality of suggested terms is unacceptable	<input type="radio"/>				
The suggested terms encourage me to use extraneous terms in my indexing	<input type="radio"/>				
MTI coverage of significant topics is good	<input type="radio"/>				
Important subject areas are sometimes missing from the	<input type="radio"/>				

list of suggested terms					
The MTI pane is a useful tool in indexing	<input type="radio"/>				
I have confidence in the accuracy of suggested terms from MTI	<input type="radio"/>				
I am apprehensive about accepting subject headings recommended by MTI	<input type="radio"/>				
I find the MTI pane difficult to use	<input type="radio"/>				
I would rather see a longer list of suggested terms	<input type="radio"/>				
For most articles the list of terms is too long	<input type="radio"/>				
Using MTI increases my productivity as indexer	<input type="radio"/>				
Regular use of the MTI pane slows down indexing	<input type="radio"/>				
Using the MTI suggested terms has improved my skills as an indexer	<input type="radio"/>				

18) Please rate the following statements:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I am dissatisfied with the current implementation of the MTI recommendations	<input type="radio"/>				
In general, I am among the last in my circle of friends that work in NLM to know about a new feature of DCMS when it comes out.	<input type="radio"/>				
If I heard that a new DCMS feature was available, I would not be interested enough to try it.	<input type="radio"/>				
Compared to my fellow indexers, I don't know much about new DCMS features	<input type="radio"/>				
I am willing to try a new DCMS feature even if it has not been released yet.	<input type="radio"/>				
I do not know the names of new DCMS features before	<input type="radio"/>				

trigger the MTI recommendation						
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21) Can you think of any improvements to MTI and/or DCMS that would help you to increase your productivity as an indexer?

We are also recruiting participants that are willing to be part of a face-to-face or phone interviews with the main investigator (Miguel E. Ruiz) who is currently conducting a user-centered study of the DCMS and MTI interface. Again participation is voluntary and it will only take about 1 hour of your time. If you are willing to participate please contact Miguel Ruiz to set up an appointment. You can contact him by replying to the email invitation that you received or by sending an e-mail to ruizmi@mail.nih.gov or to meruiz@buffalo.edu

Thanks for your participation!