

Creating an Online Arabic/English Thesaurus Based on Linked Data

Magda El Sherbini

Introduction

Many North American library catalogs support title, author, and keyword searching in multiple scripts. When it comes to subject searching, however, these systems provide access primarily to controlled English-language subject headings and thesauri, such as the Library of Congress Subject Headings (LCSH). In much of the cataloging for items in languages not written in Roman script, English-language subject access provides insufficient description of the content to ensure the retrieval of the item. Some concepts that function in other languages or cultures do not have English equivalents. In such cases, catalogers are instructed to select a controlled vocabulary subject heading that is “close enough” or “broader.” On the other hand, a user searching for a book written in a specific language about a specific subject should be able to conduct a subject search in that language if preferred. The need for multilingual information access has been addressed in many forums for several years. The Association for Library Collections and Technical Services (ALCTS) Non-English Access Committee indicated that research around assigning subject headings in the language of the script would enable users and scholars to find library materials more efficiently. That committee also found that LCSH does not sufficiently represent the cultures of the non-English-speaking countries and, subsequently, the non-English collections. Several examples of the deficiency of LCSH coverage in these areas illustrate the need to use subject headings in the language of the script. In this Communications on Practice piece, I address three issues: LCSH and its coverage of subjects; enhancing the discoverability of foreign language materials, specifically Arabic materials, by adding non-English subject headings; and enabling users to access the Library of Congress (LC) Subject Authority File to access “See” and “See also” cross-references through linked data.

Literature Review

A rich body of literature addresses LCSH coverage of non-Roman subjects. A good number of these scholarly works call for applying subject headings in the language of the script, as well as adding subject headings from another thesaurus when available.

Many North American library catalogs support title, author, and keyword searching in scripts. When it comes to subject searching, however, these systems provide access primarily to controlled English-language subject headings and thesauri, such as the LCSH. For items written in non-Roman script,

Magda El Sherbini (el-sherbini.1@osu.edu) is Professor and Head, Middle East & Islamic Studies Library at The Ohio State University Library.

English-language subject access often provides an insufficient description of the content to ensure the retrieval of the item. Some concepts in other languages or cultures do not have English equivalents. In such cases, catalogers typically select a controlled vocabulary subject heading that is “close enough” or “broader.” On the other hand, a user searching for a book written in a specific language about a specific subject should be able to conduct a subject search in that language if preferred. Several authors addressed the issues of providing access to the catalog by subject in multiple languages. James Agenbroad offered an extensive historical overview of Romanization in library catalogs.¹ He identified institutional policy and cataloging standards, not technical feasibility, as the major obstacles to implementing script access points. Joan M. Aliprand also pointed out that Romanization is inadequate for providing access to materials in scripts. Romanization is “Information distortion.”² Aliprand pointed to the need for “locale-specific” access points, determined by the user’s preferred language and written in the proper script. She also advised that authority files present multiple script access points.³

Researchers continued to identify opportunities to use script subject headings in addition to using LCSH. In “Models for Multilingual Subject Access in Online Library Catalogues,” Ron Davies described the two models used by the International Labor Organization (ILO) to provide users with subject access in languages of their choice.⁴ In the first model, subject terms were translated on the fly when catalog records were accessed during search, display, or export. In the second model, descriptors were translated into a batch process after being entered into the bibliographic record and the equivalent descriptors in other languages were entered into the bibliographic record. Each of these models has advantages and disadvantages in terms of data storage, indexing, and translating. Jung-ran Park addressed name and subject access across languages and cultures.⁵ She examined current mechanisms for cross-lingual name and subject access, and identified major factors that hinder cross-lingual information access. For example, the author looked at converting concepts expressed in Korean into English LCSH subject headings. She pointed out that mapping Korean names and subjects to their English counterparts is exceedingly difficult due to different linguistic structures and sociocultural norms. In the case of English and Korean, these structural differences are considerable, unlike those between English and other Western languages, because English and Korean are unrelated languages. Moreover, “word segmentation and transliteration schemes dealing with scripts also play a part in limiting access to cross-lingual and cross-cultural resources.”⁶ Patrice Landry discussed this issue in “Multilingual Subject Access: The Linking Approach of MACS” by exploring solutions to multilingual subject access to online catalogs.⁷ The strategy was to develop a web-based link and search interface through which equivalents between three controlled vocabularies for subject headings—SWD/RSWK (Schlagwortnormdatei/Regeln für den Schlagwortkatalog) for German, RAMEAU (Répertoire d’Autorité-Matière Encyclopédique et Alphabétique Unifié) for French, and LCSH for English—allow users to access online databases in the language of their choice.⁸

Providing simultaneous access to multiscript subject headings has been recognized as an issue to be solved by the ALCTS Task Force on non-English Access as far back as March 2007.⁹ Although many libraries developed substantial foreign language collections, the language of the library catalog and

its subject access points has nonetheless remained English.¹⁰ I began to study this topic in 2010 after being appointed to serve as Chair of the ALCTS Steering Committee to Oversee the Implementation of the “Recommendations Contained in the Report of the ALCTS Task Force on non-English Access 2007-2009.”¹¹ The report included eleven recommendations. The Steering Committee was successful in implementing ten of the recommendations, but recommendation number eleven, “Assign the ALCTS Subject Analysis Committee (SAC) working with appropriate library organizations to study the needs of library users for multilingual subject access in the appropriate script(s), and to propose steps to address those needs,” was not implemented.¹² The ALCTS Steering Committee members explained the reasons for not implementing recommendation eleven in these terms: “this recommendation was extremely vague and broad; a research project that might never be completed; is outside SAC’s scope; SAC doesn’t do much research on end users or their needs,” and finally, “more research is needed.”¹³

In a survey conducted in 2011, the authors assessed the need to provide multilingual subject access to online library catalogs.¹⁴ The results of the survey indicated that end users were not completely dissatisfied with the current library catalog, but end users and librarians wanted a system that is more open to multilingual subject headings. The findings highlighted areas of opportunity for libraries to make significant improvements to the catalog. Following this research, the author received a grant to study the Bibliotheca Alexandrina (BA) multilingual catalog, which provides access to their collections in three languages (Arabic, English, and French).¹⁵ This research revealed that the BA is using the LC MARC 21 Model B, where the transcribed text in the bibliographic record is entered only in the script in which it appears. Subject access is recorded based on the authorized thesaurus in each language. For example, the French thesaurus “RAMEAU” would be used for assigning subject headings for a book in the French language.¹⁶

Enhance the Discoverability of Non-Roman Materials by Adding Non-Roman Subject Headings

Information gathered from the work on the ALCTS Steering Committee and the author’s research in this area gave birth to the idea of internationalizing The Ohio State University Library (OSUL) catalog. Three factors made this development possible:

- RDA (Resource Description and Access) was written with internationalization in mind
- The OCLC FAST (Faceted Application of Subject Terminology), which is derived from the LCSH but applies a simpler syntax while retaining the richness of the LCSH vocabulary
- Users’ desire to search the library catalog by subject terms in their preferred language (e.g., Arabic, Chinese, or Japanese)

A detailed description of the pilot project can be found in a paper presented at the 2016 International Federation of Library Associations (IFLA) conference.¹⁷ The pilot project allowed users to access the

catalog by subject in their preferred languages. The subject terms were taken from international open source-controlled vocabularies, including:

- Chinese Subject Headings Standard¹⁸
- Ndlsh: governed by Japan National Diet Library and freely available¹⁹
- Qā'imāt rū'ūs al-mawdū'āt al-'Arabīyah al-qiyāsīyah lil-maktabāt wa-marākiz al-'ulūmāt wa-qawā'id—print thesaurus²⁰
- *Sharing Linked Open Data*²¹

In this process, the cataloger assigns the LCSH terms as normal, converts them to FAST, and then finds the equivalents of FAST terms in the International Thesaurus. The following examples illustrate this process.

This process enables OSUL to record subject terms from international, online controlled vocabularies. There is no online Arabic thesaurus, however. Arabic catalogers used the terms from a print Arabic subject headings list, such as Qā'imāt rū'ūs al-mawdū'āt al-'Arabīyah al-qiyāsīyah lil-maktabāt wa-marākiz al-'ulūmāt wa-qawā'id. This process is exceedingly difficult and time-consuming for the cataloger and resulted in slower processes and gradual accumulation of backlogs. In some cases, mapping of Arabic subjects to their English counterparts is difficult, because the two languages reflect distinct and unique cultures and traditions. In the case of English and Arabic, these structural differences are considerable. For example, the term “Amazigh” (أمازيغ) does not exist in LCSH; instead, the term “**Berbers**” was used. LCSH does not provide the term “**Du'a**” – دعاء; the term “**Prayers - صلاة**” was used instead. Even with the term “**Du'a**” – دعاء there are several variations in the Arabic language. For example, there is Du'a' al-Baha ، دعاء البهاء ، Du'a' al-Faraj ، دعاء الفرج etc. LCSH used God (Islam), but the Arabic language used “Allah” instead. Another Arabic term that does not have an equivalent in LCSH is the term “Ashūrā,” which is unsatisfactorily represented in LCSH as “Tenth of Muharram.”

Developing the Arabic Thesaurus Based on Linked Data Approaches

Philosophy of Designing an Arabic–English Thesaurus

The development of an Arabic–English thesaurus is guided by principles of equity, cultural sensitivity, and conceptual clarity. This work goes beyond mere translation, treating Arabic and English as equal partners in representing knowledge. It is concept centered rather than word centered, emphasizing the accurate expression of ideas over literal equivalence. When exact matches are unavailable, the thesaurus employs broader, narrower, or related terms, accompanied by scope notes and explanatory references, to preserve transparency and acknowledge cultural and linguistic uniqueness.

Structurally, the thesaurus is designed to maintain semantic parity between both languages. Hierarchical, associative, and equivalent relationships are preserved, enabling users to navigate concepts across cultural frameworks. Controlled vocabulary such as the LCSH serves as a starting point but is critically adapted and expanded to incorporate culturally specific concepts unique to the Arabic

tradition.²² Additional resources, including FAST and the Art & Architecture Thesaurus, provide models for faceted classification and culturally precise terminology, guiding the structure and design of this thesaurus.²³

This work is conceived as a dynamic and evolving resource. As languages and societies change, the thesaurus integrates contemporary terminology while honoring the rich intellectual and lexicographic heritage of Arabic. By adhering to international standards such as ISO 25964 for thesaurus construction (International Organization for Standardization 2011, 2013) and the Simple Knowledge Organization System (SKOS) for linked data (World Wide Web Consortium 2009), the thesaurus ensures interoperability with library catalogs, digital repositories, and global knowledge systems.²⁴

This Arabic–English thesaurus functions as more than a retrieval tool. It serves as a cultural bridge, fostering meaningful exchange between linguistic traditions and enabling more inclusive participation in the global flow of knowledge. By blending tradition with innovation, it exemplifies the enduring value of multilingualism in organizing and sharing human understanding.

The author created the digital Arabic Thesaurus to enhance access to Arabic library materials by subject, make the thesaurus available globally, and facilitate active community participation in suggesting terms.

Methodology

The project began by researching how to create a thesaurus. Several articles provided guidance on this process, including “Guidelines on How to Create Effective Thesaurus Concepts” by Martin Doerr, Maria Daskalaki, and Lida Harami.²⁵ In this work, the authors discussed target terms, broader terms, narrower terms, good and bad terms, as well as source terms. The recommendations presented in the paper were helpful, especially the discussion of term selection and the list of sources.

The project started with the decision to use English authority words as the foundation. When Arabic terms could be matched to English terms, they were linked to the English authority records. For this purpose, LCSH, OCLC FAST, and Wikipedia were used as authority sources, with OCLC FAST serving as the primary tool for searching and selecting subject terms appropriate for the Arabic collection.²⁶ This strategy was adopted for three reasons: (1) FAST is postcoordinated, providing simple subject terms ready for cataloger use; (2) it offers “See also” references to related subjects; and (3) each FAST term is linked to the LC Authority File, which typically contains variants, broader, narrower, and related terms. Many FAST terms are also connected to Wikipedia when available.²⁷

A key objective was to construct a thesaurus that is both comprehensive and detailed. To achieve this, broad categories of knowledge were identified and defined. A review of existing printed Arabic subject thesauri was also conducted. The initial stage of the project focused on essential fields of knowledge, including Islam, the Qur'an, politics, history, social studies, education, birds, fish, languages, sociology, philosophy, family, diseases, and agriculture.

Programming

The technical design of the thesaurus required careful selection of programming languages that would support efficient loading, updating, and searching of the database. Flexibility was a major requirement to ensure that the program could meet long-term objectives. Another important decision was to make the thesaurus globally accessible, which required the identification of a reliable cloud storage service and the selection of a commercial hosting domain. GoDaddy was chosen as the hosting provider because of its flexibility, ease of use, security, and immediate technical support.²⁸

In developing the thesaurus, consulting Arabic subject lists was an essential step. Several authoritative resources were reviewed and integrated, including *al-Maknaz al-Kabīr: Mu'jam Shāmil lil-Majālāt wa-al-Mutarādīfāt wa-al-Mutadāddāt* by Dr. Ahmad Mukhtār 'Umar and his team; *Qā'iimat Ru'ūs al-Mawdū'āt al-'Arabīyah al-Qiyāsīyah lil-Maktabāt wa-Marākiz al-'Ulūmāt wa-Qawā'id al-Bayānāt* compiled by Sha'bān 'Abd al-'Azīz Khalīfah; *Ru'ūs al-Mawdū'āt al-'Arabīyah* prepared by the Cataloging and Classification Department under the supervision of Nāṣir Muḥammad al-Suwaydān; *Oxford Dictionaries: Arabic*; and *Qā'iimat Ru'ūs al-Mawdū'āt al-'Arabīyah* by Ibrāhīm Ahmad al-Khzindar. Additional subject resources included the University of Wisconsin's *Arabic Vocab: Politics*, the *English to Arabic Government* glossary, and the *Encyclopedia of Islam and the Muslim World*.

Design and Content of the Multilingual Thesaurus

The following points outline the design principles and content features of the Multilingual Thesaurus:

- **Arabic term integration:** Each Arabic term is linked to one or both LCSH and OCLC FAST authority records, as well as Wikipedia entries when available.
- **Boolean search capability:** Users can refine and combine search results through Boolean operators.
- **Multilingual scope:** Terms are currently provided in both English and Arabic, with future plans to include Persian and Turkish.
- **Bilingual search:** Users can search in either English or Arabic and retrieve the corresponding equivalent term.
- **Partial authority coverage:** Many terms may not have an equivalent in LCSH, FAST, or Wikipedia.
- **Semantic distinctions:** In cases where an English term has multiple meanings in Arabic, all relevant meanings are recorded, following the VIAF (Virtual International Authority File) model.
- **Exclusions:** The database does not include corporate bodies or personal names.
- **Cross-reference policy:** Cross-references are not provided at this stage.

- **Community contribution:** Users can suggest or modify terms through built-in participation features.
- **Technical infrastructure:** Reliable cloud storage will be selected and purchased to ensure secure hosting.
- **Software and processing tools:** A commercial platform will host the database. Python, a general-purpose programming language, will be used to deduplicate terms and merge supplementary files with the primary database.

The Arabic Thesaurus—Key Highlights

The following images provide a demonstration of the Arabic Thesaurus in action. They illustrate searching Arabic subject terms and retrieving their English equivalents (when available in LCSH), and viewing links from subject entries to LCSH, OCLC FAST, and Wikipedia to enhance research possibilities.

The Thesaurus address is <http://multilangthesaurus.com>. As shown in figure 1, a username and password are required to log in to the thesaurus.

When users log in, they are directed to the main searching page (see figure 2). This page is divided into two parts: part 1 is searching the thesaurus, and part 2 is for users to suggest a new term or modify or delete an existing term.

Users can search by the preferred term using the drop-down menu (figure 3). For example, users can search by either English or Arabic topical subject terms to find the equivalent. Users can search by

Figure 1. Log in page.

Figure 2. Main page.



Search

General search:

Advanced search:

Search As Keyword (Unchecked the box would require entering exactly same words to get a match.)

Subjects
Genre/Forms

submit

If you have suggestion to add or edit terms, please leave message below.

Your Name
Your E-mail

Leave your message here

Send
Thank you!

Figure 3. Drop-down menu.

genre terms in Arabic or English to find the equivalent. All the subdivisions and the qualifiers of the topical subject headings are searchable from the same directory.

Figure 4 shows the searched term “Caricatures and cartoons” with Subject Directory selected in the drop-down menu. The search retrieved the English and Arabic equivalents of this term. It shows the first ten subjects. It also shows that there are eighty-one pages (810 terms) associated with this subject. Users can display all 810 terms if needed.

Because searching “Caricatures and cartoons” retrieved more than 810 hits, users can qualify the search by selecting one of the appropriate Boolean operators—and, or, not. In this search, the term “Caricatures and cartoons” was qualified by “and” the term “Friendship.” As a result, the search retrieved only one hit (see figure 5).

Boolean operators—and, or, and not—are available to construct searches. Searching using the Arabic term is the same as searching in English. Figure 6 shows searching for the Arabic term “سمك السلمون” (Salmon). Because this term will retrieve about 160 hits, the search was qualified by “and” and “النحو” (Grammar) and the equivalent in Arabic and English.

Search

General search:

Advanced search:

Search As Keyword (Unchecked the box would require entering exactly same words to get a match.)

submit

Search Result:
Go to page: 1 | Previous Page | 1/81 | Next Page | Rows per page: 10 | 20 | 50 | 100 | All

English	Arabic
Administrative agencies--Corrupt practices-- Bangladesh--Caricatures and cartoons	الوكالات الإدارية - الممارسات الفاسدة - بنغلاديش - الكاركاتير والرسوم المتحركة
Adulthood--Caricatures and cartoons	مرحلة البلوغ - الكاريكاتير والرسوم المتحركة
Aeronautics in forest fire control--Caricatures and cartoons	الملاحة الجوية في مكافحة حرائق الغابات - الكاريكاتير والرسوم المتحركة
Aeronautics--Caricatures and cartoons	الملاحة الجوية - الكاريكاتير والرسوم المتحركة
Afghanistan--History--Soviet occupation, 1979-1989-- Caricatures and cartoons	أفغانستان - التاريخ - الاحتلال السوفيتي، 1979-1989 - الكاركاتير والرسوم المتحركة
Afghanistan--Politics and government--1989-2001-- Caricatures and cartoons	أفغانستان - السياسة والحكومة - 1989-2001 - الكاركاتير والرسوم المتحركة
Afghanistan--Politics and government--1989-2001-- Caricatures and cartoons--Periodicals	أفغانستان - السياسة والحكومة - 1989-2001 - الكاركاتير والرسوم المتحركة - دوريات

Figure 4. Searching the term “Caricatures and cartoons.”


Search

General search:

Advanced search:

Search As Keyword (Unchecked the box would require entering exactly same words to get a match.)

submit

Search Result:
10 | 20 | 50 | 100 | All

English	Arabic
Friendship--Caricatures and cartoons	الصداقة - الكاريكاتير والرسوم المتحركة

Figure 5. Using qualifiers.

The screenshot shows the search interface for the Multilingual Thesaurus. The search term 'سمك السلمون' (Salmon) is entered in the 'General search' field under 'Subjects'. The results table has two columns: 'English' and 'Arabic'. The results are as follows:

English	Arabic
Brown trout--Growth	سمك السلمون المرقط النبي - التمو
Lake trout--Growth	سمك السلمون المرقط النجيري - التمو
Rainbow trout--Growth	سمك السلمون قوس قزح - التمو
Trout--Growth	سمك السلمون المرقط - التمو

At the bottom of the interface, there are buttons for 'Go to page: 1', 'Previous Page', 'Next Page', and 'Rows per page: 10 | 20 | 50 | 100 | All'.

Figure 6. Searching the term in Arabic.

The screenshot shows the search interface for the Multilingual Thesaurus. The search term 'Arabic language' is entered in the 'General search' field under 'Subjects'. The results table has two columns: 'English' and 'Arabic'. The results are as follows:

English	Arabic
Arabic language--Dialects--Phonetics	اللغة العربية - اللهجات - علم الصوتيات
Arabic language--Phonetics	اللغة العربية - علم الصوتيات

Below the table, there are three buttons: 'Link to LCSH', 'Link to FAST', and 'Link to WIKI'. At the bottom, there are buttons for 'Go to page: 1', 'Previous Page', 'Next Page', and 'Rows per page: 10 | 20 | 50 | 100 | All'.

Figure 7. LCSH, FAST, and Wikipedia links.

specific term (see figure 10). Using the “Go to Pages” icon, the user can select which page can be viewed. In this example, page 3 was selected for demonstration. Users can also display all 76,930 subjects.

The purpose of linking Arabic terms to LCSH and FAST is to give users access to the cross-references created by the LC and OCLC. This enables users to identify broader and narrower terms associated with a concept. Linking to a Wikipedia article is also valuable, because it allows users to learn more about the term, its definitions, and its usage. In many Wikipedia articles, the author includes “See” and

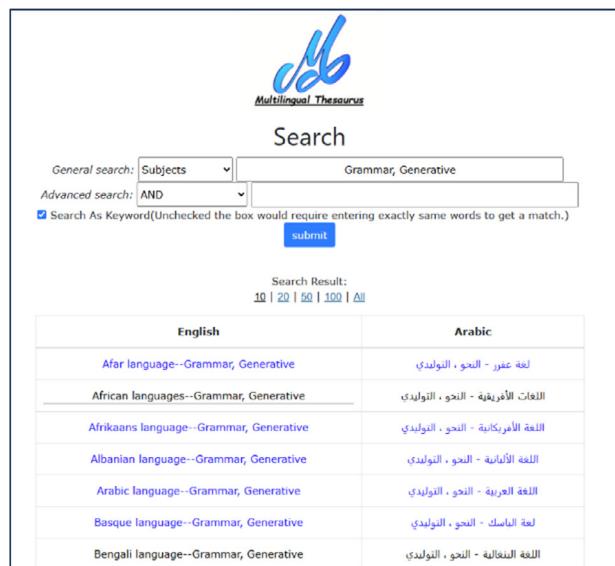
Each term in English or Arabic is linked to LCSH, FAST, and Wikipedia articles when available. This feature provides the cataloger with more information about the usage of the term, as well as all cross-references.

Wikipedia provides an article about the term that will enrich the user’s knowledge about the subject, as well as providing the *see also with features*. The Wikipedia link can be added to the bibliographic record without having the cataloger search for it. To access the authority record, simply move the cursor above the terms and click on the link to LCSH, FAST, or Wikipedia (see figure 7).

Because this thesaurus is intended for Arabic cataloging and includes many terms created by the author, it will not have equivalents in LCSH or in the LC Authority file. Sometimes, records link only to Wikipedia or have no link at all.

Figure 8 shows the term “African Language—Grammar, Generative” that was created by the author and does not have a link to any authority file or Wikipedia. These terms are highlighted by two faded lines under the term. Figure 9 shows only the link to Wikipedia.

Searching the term “Education” in the by keyword directories results in 7,693 pages; each page displays ten hits for a total of 76,930 subjects. It provides any subject associated with the term “Education.” This search facilitates browsing the entire database under a



The screenshot shows the search interface for the Multilingual Thesaurus. The search term 'Grammar, Generative' is entered in the 'General search: Subjects' field. The results table has two columns: English and Arabic. The results are as follows:

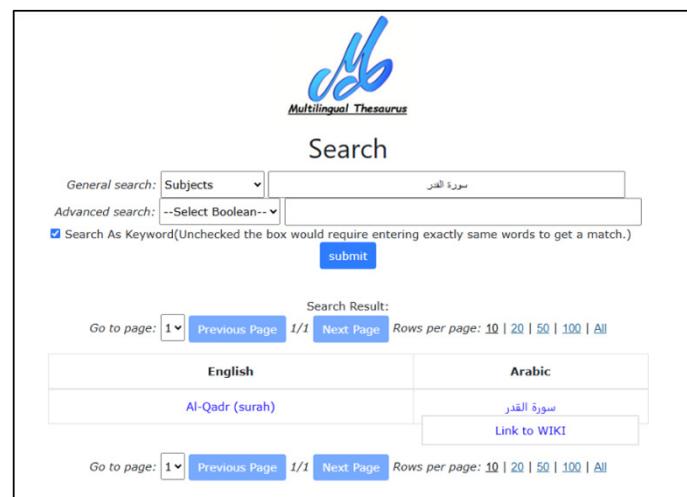
English	Arabic
Afar language--Grammar, Generative	لغة عفر - النحو ، التوليدى
African languages--Grammar, Generative	اللغات الأفريقية - النحو ، التوليدى
Afrikaans language--Grammar, Generative	اللغة الأفریکانیة - النحو ، التوليدى
Albanian language--Grammar, Generative	اللغة الألبانية - النحو ، التوليدى
Arabic language--Grammar, Generative	اللغة العربية - النحو ، التوليدى
Basque language--Grammar, Generative	لغة الباسك - النحو ، التوليدى
Bengali language--Grammar, Generative	اللغة البنغالية - النحو ، التوليدى

Figure 8. No link to LCSH, FAST, or Wikipedia.

“See also” references, which can serve as potential sources for creating new authority records and contributing them to the LC.

In the future, the link to Wikipedia could be embedded directly into the bibliographic record as an additional resource for users. Figure 11 shows the result of browsing OCLC FAST by the general keyword term “Agriculture.” This search yielded 2,051 associated terms. When using this term in traditional cataloging, the cross-references “See” and “See also” are not carried over, nor are the LC Authority records, which include broader and narrower terminology related to the term “Agriculture” (see figure 12). When selecting the term from this thesaurus, however, the associated cross-references are included. Clicking on “Agriculture” displays these cross-references, which do not appear in the regular catalog.

Enabled URLs in figure 11 lead to the LC Authority file, which contains broader and narrower terms for each subject. For example, the DLC link (cataloging produced and input by the LC) for “Agriculture” contains broader and narrower terms (see figure 12) (<https://id.loc.gov/authorities/subjects/sh85002415.html>).

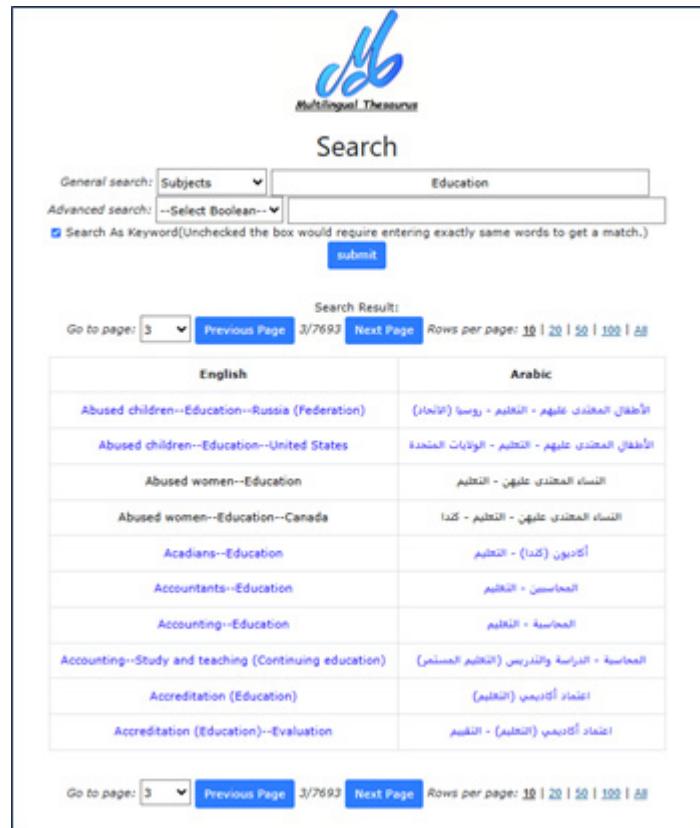


The screenshot shows the search interface for the Multilingual Thesaurus. The search term 'Surah Al-Qadr' is entered in the 'General search: Subjects' field. The results table has two columns: English and Arabic. The results are as follows:

English	Arabic
Al-Qadr (surah)	سورة القدر

Below the table, there is a link labeled 'Link to WIKI'.

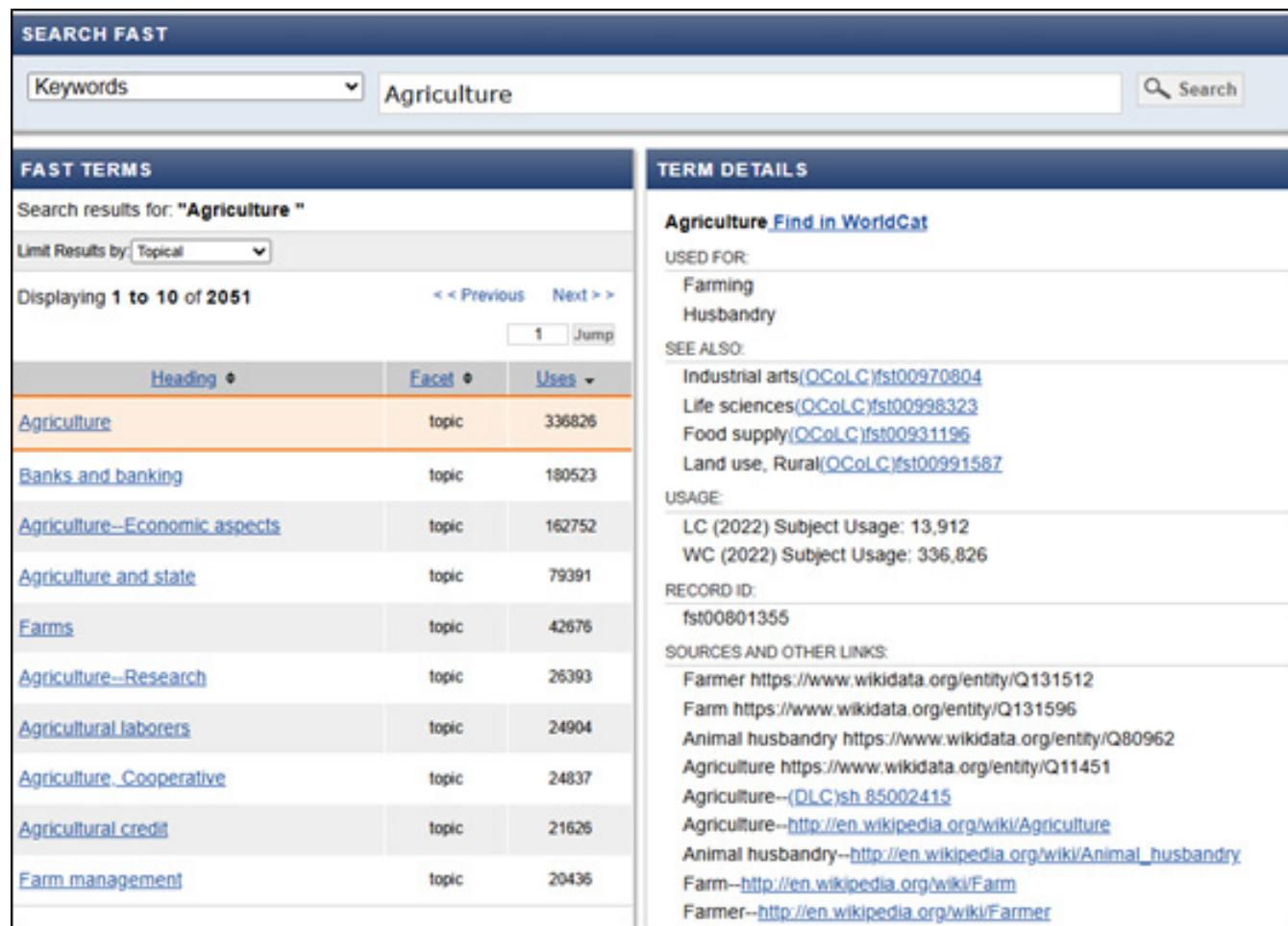
Figure 9. Only the link to a Wikipedia article is shown.



The screenshot shows the browse interface for the Multilingual Thesaurus. The keyword 'Education' is entered in the 'General search: Subjects' field. The results table has two columns: English and Arabic. The results are as follows:

English	Arabic
Abused children--Education--Russia (Federation)	الأطفال المعذبون عليهم - التعليم - روسيا (المشمار)
Abused children--Education--United States	الأطفال المعذبون عليهم - التعليم - الولايات المتحدة
Abused women--Education	النساء المعذبون عليهن - التعليم
Abused women--Education--Canada	النساء المعذبون عليهن - التعليم - كندا
Acadians--Education	أكاديون (كندا) - التعليم
Accountants--Education	المحاسبين - التعليم
Accounting--Education	المحاسبة - التعليم
Accounting--Study and teaching (Continuing education)	المحاسبة - الدراسة والتدريس (التعليم المستمر)
Accreditation (Education)	اعتماد أكاديمي (التعليم)
Accreditation (Education)--Evaluation	اعتماد أكاديمي (التدريس) - التقييم

Figure 10. Browsing by keyword.



The screenshot shows a search interface for the FAST (Faceted Application of Subject Terminology) database. The search term 'Agriculture' is entered in the 'Keywords' field. The results are displayed in a table with columns for 'Heading', 'Facet', and 'Uses'. The results are filtered by 'Topical'. The table shows 10 results out of 2051, with the first result being 'Agriculture' (topic, 336826). Other results include 'Banks and banking', 'Agriculture--Economic aspects', 'Agriculture and state', 'Farms', 'Agriculture--Research', 'Agricultural laborers', 'Agriculture Cooperative', 'Agricultural credit', and 'Farm management'. The 'TERM DETAILS' panel on the right provides links to 'Find in WorldCat', 'Used for' terms (Farming, Husbandry), 'See also' terms (Industrial arts, Life sciences, Food supply, Land use, Rural), 'Usage' statistics (LC 2022: 13,912, WC 2022: 336,826), the 'Record ID' (fst00801355), and 'Sources and other links' to various Wikipedia pages and Wikidata entities.

Heading	Facet	Uses
Agriculture	topic	336826
Banks and banking	topic	180523
Agriculture--Economic aspects	topic	162752
Agriculture and state	topic	79391
Farms	topic	42676
Agriculture--Research	topic	26393
Agricultural laborers	topic	24904
Agriculture Cooperative	topic	24837
Agricultural credit	topic	21626
Farm management	topic	20436

Figure 11. Links to cross-references and Wikipedia.

If the user would like to suggest the addition, modification, or removal of a term, they can send an email using the box shown in figure 13. This helps the community further enhance the usability of the thesaurus, making it truly international.

The Arabic subject thesaurus was created in response to a need that was articulated by ALCTS and will eventually cover all fields of knowledge. The user interface designed for this purpose allows users to search terms in Arabic and find links to English terms from LCSH, FAST, and Wikipedia. Arabic terms are drawn either from existing print thesauri or are created where no existing terms are available. The English-language user of the database will be able to search in English to find the matching terms in Arabic. An important feature of the database is its adaptability and flexibility. Users will be able to recommend additions or corrections to terms. As the database grows, it will become more comprehensive. The thesaurus will be available universally for the users of Arabic, English, and other languages.



[The Library of Congress](#) > [Linked Data Service](#) > [LC Subject Headings \(LCSH\)](#)

Agriculture

URI(s)

- <http://id.loc.gov/authorities/subjects/sh85002415> 
- <http://id.loc.gov/authorities/sh85002415#concept>

Variants

- Farming
- Husbandry

Broader Terms

- Industrial arts
- Life sciences

Narrower Terms

- Aerial photography in agriculture
- Aeronautics in agriculture
- Agricultural conservation
- Agricultural diversification
- Agricultural intensification
- Agricultural resources
- Agricultural services
- Agricultural virology
- Agroforestry
- Agronomy
- Antibiotics in agriculture
- Aquaculture
- Arid regions agriculture
- Artificial satellites in agriculture
- Astrology and agriculture
- Boron in agriculture
- Botany, Economic

Figure 12. Library of Congress Authority record.

If you have suggestion to add or edit terms, please leave message below.

Your Name

Your E-mail

Add Term

Leave your message here

Send

Thank you!

Figure 13. Suggestions box.

Notes

1. James E. Agenbroad, “Romanization Is Not Enough,” *Cataloging & Classification Quarterly* 42, no. 2 (June 5, 2006): 21–34, https://doi.org/10.1300/j104v42n02_03.
2. Joan M. Aliprand, “The Structure and Content of MARC 21 Records in the Unicode Environment,” *Information Technology and Libraries* 24, no. 4 (December 1, 2005): 170–9, <https://doi.org/10.6017/ital.v24i4.3381>.
3. Aliprand, “The Structure and Content of MARC 21 Records in the Unicode Environment.”
4. Ron Davies, “Models for Multilingual Subject Access in Online Library Catalogues: The ILO Experience,” Paper presented at the annual conference of the European Library Automation Group, Bern, Switzerland, April 2–4, 2003.
5. Jung-ran Park, “Cross-Lingual Name and Subject Access: Mechanisms and Challenges,” *Library Resources & Technical Services* 51, no. 3 (July 2007): 186. <https://doi.org/10.5860/lrts.51n3.180>.
6. Park, “Cross-Lingual Name and Subject Access,” 186.
7. Patrice Landry, “Multilingual Subject Access: The Linking Approach of MACS,” *Cataloging & Classification Quarterly* 37, no. 3–4 (2004): 177–91, https://doi.org/10.1300/J104v37n03_11.
8. Landry, “Multilingual Subject Access.”
9. Association for Library Collections and Technical Services, “Task Force on Non-English Access Report,” March 2007, <http://www.ala.org/alcts/sites/ala.org.alcts/files/content/ianda/nonenglish/07marchrpt.pdf>.
10. Association for Library Collections and Technical Services, “Steering Committee to Oversee the Implementation of the Recommendations Contained in the Report of the ALCTS Task Force on Non-English Access, 2007–2009 (‘Improving Resource Discoverability for Non-Roman Language Collections’),” 2009, <https://docs.google.com/document/d/1Kf3IGqP6-HZnRqoWpxK2yOyFtAPpmnYsK7u8wuUHIMM/edit?usp=sharing>.

11. Magda El-Sherbini and Sherab Chen, “An Assessment of the Need to Provide Non-Roman Subject Access to the Library Online Catalog,” *Cataloging & Classification Quarterly* 49, no. 6 (2011): 457–83, <https://doi.org/10.1080/01639374.2011.603108>.
12. ALCTS, “Task Force on Non-English Access, 2007-2009.”
13. Magda El-Sherbini, “Improving Resource Discoverability for Language Collections,” 2017, <http://library.ifla.org/1982/1/S12-2016-el-sherbi-en.pdf>.
14. Magda El-Sherbini, “Multilingual Subject Retrieval: Bibliotheca Alexandrina’s Subject Authority File and Linked Subject Data.” in *Data Science, Learning by Latent Structures, and Knowledge Discovery*, eds. B. Lausen, S. Krolak-Schwerdt, and M. Böhmer (Berlin: Springer, 2015), 535–46, https://doi.org/10.1007/978-3-662-44983-7_47.
15. El-Sherbini, “Improving Resource Discoverability for Language Collections.”
16. El-Sherbini, “Improving Resource Discoverability for Language Collections.”
17. El-Sherbini, “Multilingual Subject Retrieval.”
18. 國家圖書館鏈結資源 = National Diet Library, <https://data.gov.tw/en> and <https://data.gov.tw/en/datasets/27190>
19. Ndlsh: governed by Japan National Diet Library and freely available (<http://id.ndl.go.jp/auth/ndla>).
20. Qā’imat ru’ūs al-mawdū‘at al-‘Arabīyah al-qiyāsiyah lil-maktabāt wa-marākiz al-‘ulūmāt wa-qawā‘id—print thesaurus.
21. Sharing 국가서지:도서(서지), 온라인 자료, 기사 색인 및 주제명, 저자명, 그리고 도서관 정보 Linked Open Data에 대한 탐색 서비스를 만나보세요!
22. Library of Congress Subject Headings.
23. OCLC (n.d.), Faceted Application of Subject Terminology (FAST), <https://www.oclc.org/en/fast.html>; The Getty Research Institute (n.d.), Art & Architecture Thesaurus (AAT), <https://www.getty.edu/research/tools/vocabularies/aat/>.
24. International Organization for Standardization, “ISO 25964-1: Information and Documentation—Thesauri and Interoperability with Other Vocabularies—Part 1: Thesauri for Information Retrieval (2011), ISO, <https://www.iso.org/standard/53657.html>; Alistair Miles and Sean Bechhofer, eds., SKOS Simple Knowledge Organization System Reference (2009), W3C, <https://www.w3.org/TR/skos-reference>.
25. Martin Doerr, Maria Daskalaki, and Lida Harami, “Guidelines on How to Create Effective Thesaurus Concepts” (Heraklion, Crete: FORTH-ICS).
26. OCLC, “FAST (Faceted Application of Subject Terminology),” <https://www.oclc.org/en/fast.html>.
27. OCLC, “FAST.”
28. GoDaddy, <https://www.godaddy.com>.