

**GEORGIA DOT RESEARCH PROJECT 18-20**

Final Report

**A New Digital Archive and Search Platform  
for GDOT R&D Projects**

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16. Abstract:  Over time, the Georgia Department of Transportation (GDOT) research database had grown out-of-date, difficult to search, and impossible to integrate with other state and national library databases. GDOT personnel, from management to support staff, found it difficult to locate specific projects and create customized annotated bibliographies for research and reporting purposes. During the four phases of this project, investigators conducted an in-depth analysis of current GDOT repository practices and needs, assessed GDOT needs for search criteria and taxonomy development, and analyzed GDOT needs for annotated bibliography content. Then, they customized software and created an indexing strategy for the new digital repository, recorded the process, and piloted the loading of the repository with digital records. Before final implementation, they tested the usability of the system updates and implemented changes based on the usability needs of GDOT employees. Finally, the research team provided face-to face training on the new system as well as a user guide and video training. During this project, the research team delivered an integrated, easily-maintained, digital repository that can house digital reports and other artifacts, while also providing relevant, reliable, and usable search functions that all GDOT employees can use to effectively access the reports and then generate customized annotated bibliographies.			
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GDOT Research Project 18-20

Final Report

# A New Digital Archive and Search Platform for GDOT R&D Projects

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## Executive Summary

The Georgia Department of Transportation (GDOT) funds a large research and development program that develops, conducts, and implements research aligned with GDOT's strategic agency goals. The number of research and technical reports generated from the program is increasing, and the reports need to be properly catalogued for quick searching and dissemination by GDOT management and staff. Existing search tools are segmented and do not provide a comprehensive set of relevant, user-friendly search parameters. Annotated bibliographies, used for research and reporting purposes at GDOT, are extremely hard to customize, and the most recently compiled version of all GDOT research projects is severely out of date (c. 1990). Processes and standards for entering research report data into the research database have varied over the years, creating a system that is inconsistent and impossible to integrate with other state and national library databases. As a result of these contributing factors, GDOT personnel, from management to support staff, find it difficult to locate specific projects and create customized annotated bibliographies for research and reporting purposes. Based on needs assessment research and GDOT interviews, the research team identified the following problems and/or issues:

1. The need for a robust archival system (database) for storing and retrieving library records.
2. The non-adherence of existing library records to Library of Congress standards.
3. The absence of a standard taxonomy for sorting and retrieving library records.
4. The absence of standardized procedures for record formation, entry, recall, sorting, and exporting.
5. The inability to export the system to other libraries.
6. The lack of general knowledge in GDOT on how to best execute an archival system.
7. The inability to train future GDOT staff on using the archival system properly.
8. The absence of an up-to-date annotated bibliography.
9. The inability to customize annotated bibliographies based on select search criteria.

In response, the research team recommends that GDOT:

1. Maintain the existing EOS.Web system (by SirsiDynex) already in use at GDOT (see 3.2 *Design*).

2. Standardize the record entries to Library of Congress protocols (see 2.2 *The Importance of a Taxonomy*).
3. Create a new classification standard (taxonomy) that can limit searches to a set number of possible categories (see 2.2 *The Importance of a Taxonomy*, 4 *Description of Solutions*, 5.1 *New Keyword Taxonomy (GDOT Subjects)*, Appendix A: *GDOT Subjects (New Taxonomy)*).
4. Create a standardized set of procedures for creating, entering, and searching research records (see 2.4 *Training Users to Use the Catalog*, 3.4 *Training and Transfer of Findings*, 5.5 *EOS.Web User Guide*).
5. Streamline the standardized taxonomy and procedure in preparation for integrating all other technical reports from various offices (see 5.5 *EOS.Web User Guide*).
6. Create a process for exporting the database records for sharing with other libraries (see 5.5 *EOS.Web User Guide*).
7. Test the newly created processes with actual GDOT staff members (see 3.3 *Usability Testing*, 5.4 *Usability Assessment*, Appendix D: *Usability Report*).
8. Develop a set of printable procedures to guide GDOT staff in record creation, entry, search, and export (see 5.5 *EOS.Web User Guide*).
9. Train existing GDOT library staff and GDOT leadership on best practices for creating, entering, searching, and exporting research records (see 5.6 *In-Person Training*).
10. Create a training video on best practices for creating, entering, searching, and exporting research records that can be shared with other (or future) GDOT employees (see 5.7 *Training Video*).
11. Create a tool that enables exporting of selected research records into a customizable bibliography, further editable in Word (see 5.3 *Customized Citation JavaScript*, Appendix B: *Customized Citation JavaScript*, Appendix C: *JavaScript Code Installation Instructions*).
12. Deliver the capability to produce a comprehensive, updated annotated bibliography containing all GDOT research reports (see 5.8 *Annotated Bibliographies*).

As a result of this research, the authors delivered an integrated, easily-maintained, digital archive that can house digital reports and other artifacts, while also providing relevant, reliable, and usable search functions that all GDOT employees can use to effectively access the reports and then generate customized annotated bibliographies.

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## 1 Introduction

Since 1958, GDOT has developed research in support of its mission to “boost Georgia’s competitiveness via leadership in transportation” (“About Georgia DOT,” n.d.). Research reports resulting from these efforts began as internal documentation, but over time grew to support external researchers. Today, researchers from colleges and universities around the state of Georgia and beyond lend their expertise through a competitive bidding process to further GDOT’s strategic research capabilities. These partnerships seek to preserve and maintain GDOT’s current assets, plan and construct efficient and reliable mobility-focused projects, improve safety and reduce risk to passengers, and make GDOT a more productive and positive workplace (Jared, 2012, p. 5).

For several years, GDOT has used EOS.Web by SirsiDynix to catalog final research reports for these strategic research projects. EOS.Web has existed as an online public access catalog (OPAC) since 2000 (Breeding, 2013). As recently as 2016, GDOT employed a librarian to ensure accurate cataloging of items within the OPAC (Jared, 2012, p. 6). However, due to personnel changes, there has not been a librarian overseeing the entry of research reports into EOS.Web for some years. This has left data entry duties to employees with expertise in fields outside of librarianship. Further, cataloging standards have changed dramatically since 2012, and GDOT employee needs when searching reports have expanded. Over time, the current system for GDOT has become untenable, which led to a call in Spring 2018 for developing a digital repository that would meet current organizational needs.

## 2 Review of Literature

For this review, the research team conducted a thorough review of existing state DOT research related to information science standards and cataloging of research reports. Past research in these areas was extremely limited, so further research was reviewed in the areas of library cataloging standards and practice; the importance of a taxonomy; usability testing; and the implications of training users.

### 2.1 Library Cataloging Standards and Practice

Cataloging practice requires descriptive metadata and a container format for encoding the descriptive content. In traditional library OPACs like EOS.Web, the container format is Machine-Readable Cataloging (MARC) 21, a standard that has existed since the 1990s.



However, in 2013, the descriptive metadata standard that fits within the container format changed from Anglo-American Cataloging Rules II (AACR II) to Resource Description and Access (RDA).

AACR II was developed in the late 1970s, at a time when the majority of materials were in print. There was no need to have an expandable set of metadata for cataloging records because the ability to link to related objects and share metadata across institutions was not yet a reality. For twenty-five years, these standards suited the needs of librarians, library staff, and library users. However, with the rise in personal computing and the connectivity that the World Wide Web provided, these cataloging rules became increasingly outdated (“RDA Frequently Asked Questions,” 2018).

RDA was developed to be a flexible metadata standard that would serve to describe a variety of formats. This included both born-digital objects, those created on a computer, and digitized objects, those items transformed into digital form from a previous analog object through scanning (“A Glossary of Archival and Records Terminology,” n.d.).

GDOT reports exist in born-digital and digitized format, depending on their age. Most reports from the 1990s forward are born-digital, and reports from the 1980s and prior have been digitized. Yet, to the general user, there would be no distinction in form. RDA metadata standards seamlessly transition between the two forms so that catalog users would not see a difference. However, a librarian would have the option in the backend of an OPAC to denote the difference in formats if so desired.

RDA allows for expanded subjects and keywords, as well as the addition of full abstracts to records. This allows for more detailed searching for/of the reports. Additionally, RDA is concerned with making metadata reusable and linkable (“RDA Frequently Asked Questions”). Because the standards follow specific guidelines, records can be transferred from one system to another, so long as the fields are correctly ascribed. This makes sharing records with other library systems and other digital archives that use RDA quick and easy. There is no need for multiple librarians to create the same record as reports are shared. Their RDA metadata should attach to the object during transfer and allow for the record to be immediately accessible in a new system.

## 2.2 The Importance of a Taxonomy

“A taxonomy is the classification of terms within subject domains” (Kumbhar, 2012, p. 96).

Simply put, a taxonomy is a list of words that a group has agreed upon to describe and classify materials. Once materials are classified among the identified words, they can be searched by general topic, giving the user the ability to quickly sort and find materials of like kinds. These agreed-upon subjects make up a controlled vocabulary. In order to make a group of records searchable, users must agree to classify materials only by the controlled vocabulary.

The overall taxonomy needs to rely on grouping items by the agreed-upon subjects. In the past, GDOT has allowed report authors to generate their own keywords. Author keywords are incredibly useful for additional description of what a report might contain, but they are necessarily separate from subjects within the controlled vocabulary. Lacking a controlled vocabulary can create ambiguity when terms have more than one meaning, and it can also create synonymy, in which one concept can be represented by more than one term. This will lead to irrelevant returns in a search and the search also will not return all related items (Gómez and Cañadas, 2013).

Taxonomies can exist in any discipline, not just library science, though librarians do rely on taxonomies developed specifically for libraries for their catalogs (Kumbhar, 2012, p. 97). It became apparent in early discussions with GDOT employees that there had not been a taxonomy developed around the research reports and that developing one would be necessary for adequate retrieval of information from the OPAC.

In order for a taxonomy to remain useful, it requires regular maintenance. As terminology changes, the taxonomy must adapt so that it follows current industry practices. As technology continues to improve and new methods are developed, new categories should be added to the taxonomy. If the practices of today become obsolete, categories should likewise be deleted (Walli, 2014).

## 2.3 Usability Testing

As the design of the cataloging system shifted to user interaction, the research team had to consider the usability of the GDOT archival system interface. The system itself may be designed well, but the GDOT staff must also be able to use it effectively, efficiently, and accurately in order for it to be maintained and useful over time.

User experience (UX) assessment has gained a significant foothold in the design of product interfaces. Organizations engage in ongoing dialogs with today's users via social media, and organizations have learned that reliably assessing product interfaces with users can return significant value both in avoiding product problems and in increasing user satisfaction and productivity. One especially effective tool for assessing interface performance is usability testing, that is, observing users perform real tasks with the interface. Testing a product interface to determine a user's ability to effectively and efficiently perform tasks is known as usability testing. Usability further includes the user's overall satisfaction with the product ("Usability Evaluation Basics," n.d.). Researchers have conducted usability tests on library OPACs for over two decades and have found that these tests have improved user experiences on their systems (Swanson and Green, 2011, p. 224).

Nielsen found that multiple small tests of no more than five users give the best results for improving a system (2000). In fact, a well-designed test of 3 to 5 users, can identify more than 80% of usability problems with an interface (Barnum, 2011). In addition, testing small groups more than once allows the administrator to see improvements or setbacks during subsequent tests of the same individuals, giving the administrator a better picture of interface usability. Nielsen further notes that usability is a key factor in whether a user will stick with a system or whether he or she will get frustrated and abandon the system (2012).

#### 2.4 Training Users to Use the Catalog

In order to provide sufficient education on the revised archival system for current and future GDOT staff, the research team provided training in three modes: face-to-face training, a print/online User Guide, and video training. Using multiple training formats at multiple points in the project process (initial launch, ongoing reference, employee onboarding, etc.) has been shown to be particularly helpful when migrating to a new library system (Zhongqin and Venable, 2018).

According to Alexander, "when something is easy to learn or remember...the user is more likely to complete the task with greater accuracy and retention" (2013, p. 252.). Even "a little bit of training" has been shown to increase users' ability to navigate library OPACs (Kules and Capra, 2012, p. 134). In *The Patron-Driven Library*, Alison notes that training videos for databases and software products - whether created by librarians or vendors - both helped to introduce users

to new products and to solidify previous face-to-face trainings on them. In both cases, this increased patron satisfaction with the tools, increased the likelihood that they would continue using them (2013, p. 76). Since training videos can be self-paced and customized to meet user needs, they have been found to be one of the most cost-effective training tools available (McCulloch and Newnan, 2013, p. 139).

### 3 Discussion of Procedures

The objectives of this research project are to

1. Create a user-friendly, easily-maintained, digital archive for storing, searching, recalling, and preserving bibliographic entries and reports;
2. Establish a customized taxonomy and best practices for entering, tagging, and searching such bibliographic entries and reports;
3. Create customizable annotated bibliographies of GDOT research reports from this repository;
4. Implement formative usability testing of the system to ensure the repository is useful and usable; and
5. Train representatives of GDOT on the use and future expansion of the repository to house technical reports from other GDOT offices.

The project's activities were broken down into the following phases and tasks:

1. Phase 1: Needs Assessment
2. Phase 2: Design
  - a. Software Selection
  - b. Indexing Design
  - c. Archive Loading
  - d. Process Standardization
  - e. Process Documentation
3. Phase 3: Usability Testing
  - a. Usability Assessment
  - b. Software, Process, and Document Modification
4. Phase 4: Training and Transfer of Findings
  - a. User Guide Development

- b. Live (In-Person) Staff Training
- c. Recorded (Portable) Training
- d. Dissemination of Results

The following discussion describes the methods and procedures for each of these activities.

### 3.1 Needs Assessment

The objective of the needs assessment was to establish the specific needs GDOT has in relation to the research record repository and the ways in which it is used and maintained in day-to-day operations. The research team collected data for the needs assessment from GDOT staff via in-person interviews, live demonstrations, phone conferences, and emails. It also reviewed the GDOT project research needs statement (RNS) and project notes from the bidding process to draw additional insight to the current and desired states for the archiving system. The formal needs assessment reviewed:

- History and functionality of the current archiving system
- Frustrations and limitations of the existing system
- Desires and anticipated outcomes for a new archiving system
- Review of practices related to record management
- Interest in integrating the GDOT system with other library archiving systems across the state and nation
- Ideal format, uses, and features of a customized annotated bibliography
- Knowledge, skills, and abilities assessment of GDOT staff for archiving system use and maintenance

After assimilating notes from the data collection efforts for the needs assessment, the research team created a report of findings and submitted it to GDOT staff for review and approval.

### 3.2 Design

After assessing GDOT employees' needs, the research team signed into the current system, EOS.Web to review its capabilities. The existing system was deemed adequate for the archiving needs requested by GDOT staff. EOS.Web was further analyzed to show that the MARC 21 format was the best record format to coincide with GDOT needs, system limitations, and database information requirements.

The research team then asked the GDOT employees to come up with words to include in a taxonomy. It was decided that the best list already in use was the Transportation Research Board (TRB's) standing committees. This set of committees covered most – if not all – the topics that GDOT employees would need. Therefore, the taxonomy for this project is based almost completely on the TRB standing committees.

Team members created 10 sample catalog records outside of the EOS.Web system using input from the needs assessment and the agreed-upon taxonomy, which were then provided to GDOT employees for review and comment. The feedback on these samples was implemented as the team members updated research reports from 1958 to December 2018 inside the system to the new format.

The new records were more complete, containing all required fields (besides leader fields) for MARC 21. Further, the new cataloging standard for research records used the new taxonomy to organize reports into subject areas, but it maintained author-supplied keywords in a different part of the record to give a user additional information. Records also expanded to include full abstracts. Both the author-supplied keywords and abstracts are searchable fields, giving the user additional opportunities to locate specific reports.

GDOT employees desired the ability to generate annotated bibliographies within the system. Through conversations with SirsiDynix support staff, the research team learned this was not within the capabilities of the system. Library systems like EOS.Web will export some data. Most systems have the ability to generate and export citations in different formats, but this is done at the individual record level, meaning that if a user was searching for multiple reports on a topic, he or she could export citations, but only for a single record at a time.

As a result, Mercer systems librarian Jeremy Brown was brought in to create open source code that allows annotated bibliographies to be generated from a button embedded within EOS.Web. This code allows users to complete a search and then choose to add all or some of the reports to an annotated bibliography, which can then be exported to Microsoft (MS) Word via clipboard (see Appendices B and C).

### 3.3 Usability Testing

GDOT leaders run reports based on management queries and use reports to make new funding and research agenda decisions. GDOT managers and staff perform data entry and data

management. They are responsible for data accuracy, record classification, and searchability of records. The project team tested seven GDOT employees on these functions. Participants were recruited for their representation in these groups and for their roles in various units at GDOT.

The objectives for the usability assessment phase of the project were as follows:

- Assess the usability of the search function and the associated instructions for the updated EOS GDOT database—both public facing (front end) and proprietary (back end)
- Assess the usability of the data entry function and the associated instructions for the updated EOS GDOT database (back end)
- Assess the use of the new taxonomy for searching (front and back ends)

Data was collected via pre-test questionnaire, testing, post-test instructions usability scale, post-test system usability scale, and a brief final interview.

A final report on the usability assessment was provided to GDOT (see Appendix D), and those recommendations that were within the scope of the project were incorporated into the final interface.

### 3.4 Training and Transfer of Findings

Upon establishing and testing the design of the new system and its governing processes and best practices, the research team summarized and documented this information in three formats.

First, a printed EOS.Web User Guide was developed to document the step-by-step procedures for searching, creating, and exporting research records in EOS.Web, as well as for creating customizable annotated bibliographies. An early version of this user guide was the basis for the usability testing previously discussed. Once revised and re-tested, the final user guide was provided to GDOT staff as a reference for future work in EOS.Web.

Second, the research team delivered in-person training to select current GDOT staff, whereby attendees were presented a printed copy of the EOS.Web User Guide, shown a demonstration on each of its procedures, provided several opportunities for Q/A and discussion, and provided the opportunity to perform basic EOS.Web procedures on their own.

Finally, the research team developed a training video that summarized the demonstration and explanation portions of the in-person training session. This portable training enables other GDOT staff not in attendance, as well as future GDOT hires, to learn EOS.Web best practices and procedures. The video training was reviewed and tested by both the research team and GDOT staff members before broad distribution.

## 4 Description of Solutions

This research project resulted in an array of solutions that will facilitate the quality curation of GDOT research reports.

The research team created a **new keyword taxonomy** (“GDOT Subjects”; see Appendix A) in order to group like reports into a controlled vocabulary that would then allow these groups to become searchable. While like terms may exist for procedures or items, there is now a preferred term for classification and searchability.

The research team also created a **standardized record entry process** so that records could be instantaneously sharable amongst different libraries through a simple export. Because the record is in the acceptable formats for MARC 21 and RDA, there is no need for duplicate record creation in other databases and catalogs.

In addition, the team enhanced the EOS.Web system by creating and installing **customized citation JavaScript** (see Appendix B for code; Appendix C for code installation instructions) to enable selection and exporting of select record fields for inclusion in customizable annotated bibliographies. Because the code is attached to the live catalog, this allows users to quickly export sets of desired records to MS Word for the most up-to-date annotated bibliography possible, rather than the static reports of old.

A **usability assessment** was conducted January 30, 2019. Data was collected via pre-test questionnaire, testing, post-test instructions usability scale, post-test system usability scale, and a brief final interview. A final report on the usability assessment (see Appendix D) was provided to GDOT, and those recommendations that were within the scope of the project were incorporated into the final interface.

The research team created an **EOS.Web User Guide** to summarize procedures and best practices for using the EOS.Web system. Topics covered in the document include how to search



for records, how to enter a new record, and how to generate a customized bibliography. Additional references, such as the new GDOT Key Words list and a one-page quick reference, were also provided. The EOS.Web User Guide was provided in print and electronic (.docx) formats.

The research team conducted **in-person training** at the GDOT training facility. Library staff, as well as GDOT leadership, learned how to use the new system for searching for specific research records and generating a customized annotated bibliography of the results. Library staff were also trained in how to create new records, adhere to standardized procedures and library and information science protocols for data entry, and export database records for use in other library systems. Copies of the EOS.Web User Guide were provided to attendees.

The research team created a 17-minute **training video** of the EOS.Web search functionality and annotated bibliography creation. The video captured the highlights of the in-person training (for general GDOT staff) so that current and future GDOT employees can learn best practices and use the new features in the updated system. The training was delivered in electronic format (Mp4).

The research team created a new tool and process that can generate a **fully customizable annotated bibliography** based on any records search in the EOS.Web system. The tool is made possible by newly developed, original JavaScript code that has been embedded in GDOT's EOS.Web application. The tool also allows for an **updated cumulative annotated bibliography**, representing final research reports from 1958 to 2018. This cumulative annotated bibliography is made possible by the research team's efforts to standardize all existing library records in the previous database to the newly established standards for GDOT records.

## 5 Findings, Conclusions, and Recommendations

Each deliverable and area of project activity yielded a variety of findings, conclusions, and associated recommendations for the GDOT.

### 5.1 New Keyword Taxonomy (GDOT Subjects)

When the importance of a controlled vocabulary was explained to users, this helped them think about how research reports would be classified within the selected terms. Users were able to find reports based on what they knew to be similar or like terms.

The research team recommends that this newly developed taxonomy (see Appendix A for GDOT Subjects) be posted on the library homepage and made available throughout the organization to enhance research report search and retrieval efforts.

Further, the research team recommends that the taxonomy remain flexible. One suggestion was made in the second usability test that an additional subject be added. This suggestion was a concrete example of the importance of keeping the taxonomy relevant and useful. New subjects should be added and obsolete terms should be deleted from the list as necessary. It further demonstrated how the taxonomy should be, and is, adaptable and fluid, based on the specific needs of its users.

## 5.2 Standardized Record Entry Process

One of the initial issues discussed with the research team was GDOT user's desire to have catalog records copied to other libraries at a faster rate. In the past, the GDOT team has sent reports to the University of Georgia to be re-cataloged in the Georgia Library Learning Online (GALILEO) and WorldCat systems. The cataloging librarians at UGA would start new records from scratch, as they needed to use standardized MARC 21 and RDA formats. This could cause a delay for as long as six months until the records were cataloged and available on these online, worldwide-accessible systems.

By working with the SirsiDynix Help Forum team, the research team was able to better understand some of the previously-unused features in EOS.Web, including the record export option. This option exists to specifically load the files in a compressed, transportable file that can be imported into other library catalog systems. Because the catalog records for the research reports now use the current standards for MARC 21 and RDA, GDOT employees can export an electronic file of their newly-entered research reports and transmit that file directly to UGA for their catalogers.

The research team recommends that GDOT staff follow the new record-entry process precisely to ensure the standardization and searchability of all GDOT research records in the EOS.Web system. The process and data entered should be monitored closely in the event that a modification may need to be made at some point in the future. The research team further recommends that GDOT work with UGA to establish a process for faster release of GDOT records through the newly documented export process.

### 5.3 Customized Citation JavaScript

GDOT staff often pull research reports in preparation for future projects. During this phase of their data gathering, they prefer to have an annotated bibliography on hand. In the past, GDOT has periodically compiled static annotated bibliographies of every research report on every topic. These documents are large and become quickly outdated as subsequent reports are published.

With the open source JavaScript code that has been added to the live EOS.Web public user interface, a user can customize their annotated bibliography. It is still possible to pull together an annotated bibliography of every research report with this code, but it is now also possible to limit searches by date, subject, keyword, or author. The code runs in seconds, so it is possible to compile annotated bibliographies quickly. When the code has run to compile a list of selected reports, the user then opens MS Word to paste the contents of the clipboard. Data can then be further sorted according to the wishes of the user.

The research team recommends that GDOT staff use the newly developed record selection feature in EOS.Web to generate customizable annotated bibliographies. Further, the research team recommends that GDOT monitor this new feature for any problem areas or expanded features that may need to be added in the future.

### 5.4 Usability Assessment

The usability assessment (see Appendix D) identified usability issues with the EOS.Web interface. The complete list of issues is presented in Table 1 with associated recommended solutions. All solutions identified as within project scope were implemented as a part of this research project. Solutions identified as out of the scope for this project should be considered by GDOT at a later time.

Table 1. Solutions Recommended Based on Usability Assessment

<b>Data Entry Recommendations</b>	<b>Action</b>
1.1 Fields that contain standard information should be automatically filled during both data entry of the original record and during searches.	Implementable but out of scope
1.2 Include authors' professional titles as a standard requirement of data entry.	Not implementable due to system configuration
1.3 Provide information on word limit for abstracts.	Implemented
1.4 Include pictures of icons in the instructions to aid recognition on the screen.	Implemented
1.5 Explain why participants may skip some fields while entering data.	Implemented
1.6 Include instruction on maximum number of author-provided keywords allowed during data entry for a single record.	Implemented
<b>Error Reporting Recommendations</b>	
2.1 Provide on-screen and printed instructions on the meaning of and fixes for error codes received during data entry. Error codes received during testing were 040, 050, 245, and 650.	Implementable but out of scope
<b>Labeling Recommendations</b>	
3.1 Without context, we cannot make a recommendation about the call number RB as compared to the more familiar RP within GDOT. However, addressing this problem is important. If GDOT continues to use RB, this standard will need to be emphasized in the instructions and online navigation.	Implementable but out of scope
3.2 Create a new field for the year of publication.	Implementable but out of scope
3.3 Indicate whether the year of publication is based on the annual or the fiscal year for both data entry and search.	Implemented
3.4 Do not use the asterisk in the instructions.	Implemented
3.5 Relabel the <b>Words</b> search field as the more familiar <b>Keywords</b> .	Implementable but out of scope
3.6 Use a word more familiar to the audience than "taxonomy."	Implemented
<b>Navigation Recommendations</b>	
4.1 Participants would like an online list that helps them know what search words to use. The taxonomy list is a beginning for this, but it should be expanded and provided online as a search aid.	Implementable but out of scope
4.2 Place the most used search fields ( <b>Words</b> , <b>Title</b> , and <b>Author</b> ) at the beginning of the search options.	Implementable but out of scope
4.3 Move the link to the PDF of full reports up on the screen so that finding it does not require scrolling.	Implementable but out of scope
4.4 On the front-end interface, make the year range fields more visible.	Implementable but out of scope
4.5 Make the linked media icon more visible.	Implementable but out of scope
4.6 Add graphics that reflect the website to the instructions (for example, the MARC Detail icon).	Implemented
<b>Search and Taxonomy Recommendations</b>	

5.1 Integrate the taxonomy into an overall search strategy, and communicate this to users. Simplify the instructions on this topic and provide them both on-screen and in print. Also communicate the value of using the taxonomy terms. For example, what is the benefit of the taxonomy search using the <b>Subject</b> field versus the <b>Words</b> field?	Implemented
5.2 Communicate how the taxonomy might be useful to participants and consider renaming it with a more user-friendly term.	Implemented
5.3 Make it clear that terms entered in the <b>Subject</b> field must come exactly from the taxonomy table.	Implemented
<b>Other Recommendations</b>	
6.1 Add a link where people can quickly and easily report any errors in the online library. For example, perhaps the RB designation is missing from a research report. A simple <b>mailto</b> command can allow a user to notify the data entry administrator.	Implementable but out of scope
6.2 Clearly note all databases that are linked or searched through this system (for example, NCHRP).	Implementable but out of scope
6.3 Consider moving tip box for the subject search up in the order.	Implementable but out of scope

5.5 EOS.Web User Guide

The new record creation, entry, search, and export processes established by this research project were documented, tested, and compiled into the new EOS.Web User Guide. The research team recommends that this document be distributed to all current and future GDOT staff, as they have need to work with the research records currently housed in EOS.Web. Further, the research team recommends that the GDOT library staff track, document, and modify corrections, changes, and updates to the User Guide as needed. Ideally, the User Guide will be housed in an easy-to-find location (e.g., an organizational intranet location specifically for training resources) so as to encourage frequent reference to the resource.

5.6 In-Person Training

The research team delivered in-person training in March 2019 to a select group of GDOT staff. The new taxonomy, processes, rationale, and potential benefits of the changes were explained and then discussed further through Q/A. The research team demonstrated processes and features and then invited GDOT staff to practice using the tools with sample scenarios.

Though the in-person training with the research team has passed, the research team recommends that GDOT staff consider delivering this training themselves on an annual basis to provide employees a visual demonstration and opportunity for practice. Further, the Q/A session may help staff better understand the rationale for and importance in following these precise standards for record entry, search, and retrieval.

## 5.7 Training Video

The 17-minute training video summarizes the highlights of the in-person training for general GDOT staff (non-library personnel). The video is portable, sharable, and electronic, allowing for easy distribution among GDOT staff and even outside the organization.

The research team recommends that GDOT share the video immediately with all GDOT staff who use the library record database to ensure that they know how to properly and accurately search for research records. Further, the research team recommends that GDOT provide the video to all future hires as a part of onboarding processes (new hire training). Ideally, the video will be housed in an easy-to-find location (e.g., an organizational intranet location specifically for training resources) so as to encourage frequent reference to the resource.

## 5.8 Annotated Bibliographies

The new process for generating annotated bibliographies is quick, intuitive, integrated, and fully customizable. The research team recommends that GDOT staff use the new tool for managing queries, project research, and other functions whereby an annotated bibliography could serve an informative and useful role. Training (noted above) will help users throughout GDOT understand how to quickly generate their own annotated bibliographies for individual needs.

The research team recommends that a master cumulative annotated bibliography be generated by GDOT library staff twice a year and saved in an easy-to-find location (e.g., an organizational intranet location specifically for research resources) so as to encourage frequent reference to the resource.

## 6 Conclusion

This research project has overhauled the process and framework for creating, maintaining, curating, and exporting GDOT research resources. The first phase of this research project was to conduct a thorough needs assessment, which included an in-depth analysis of current GDOT repository practices and needs; assessment of GDOT needs for search criteria and taxonomy development; and analysis of GDOT needs for annotated bibliography content. The results were used to accomplish three additional phases of project activity: Design, Usability Testing, and Training and Delivery. As a result, the research team has:

- Verified EOS.Web as a suitable archival system for GDOT use;
- Standardized the processes for data entry and record creation in EOS.Web;
- Tested and documented processes for record creation and maintenance in EOS.Web;
- Brought existing research records (1958-2018) up to date with current standards;
- Established new functionality in EOS.Web for generating customized annotated bibliographies of archived research records; and
- Created a user guide and recorded training to support ongoing staff education efforts for record entry and retrieval.

This project should significantly boost GDOT research knowledge management and accessibility efforts for internal staff and external partners. Establishing a standardized and up-to-date digital repository was based on actual GDOT personnel needs and practices, as determined through a formal needs analysis. The solution was informed by best practices from other state DOT offices, library and information science standards, and input from GDOT staff and leadership. The project used the latest techniques and strategies from the field of digital archiving to establish a new robust taxonomy for tagging and searching report entries. Newly updated records include fully searchable abstracts and other identifying information. The new system seamlessly integrates a record selection tool that makes the creation of customizable annotated bibliographies quick and simple. GDOT personnel have learned how to use the digital repository at the on-site training, delivered at the conclusion of the project. Ongoing maintenance procedures are fully documented for future use. The resulting system is manageable, expandable, and sustainable, thus enhancing the decision-making processes for future GDOT research initiatives.

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## Appendix A: GDOT Subjects (New Taxonomy)

GDOT has established the following list of subjects based on the Transportation Research Board (TRB) standing committees. These subjects have been applied to all GDOT catalogued research reports. While author-provided keywords are somewhat useful, there is no consistency across all records in their application, format, etc. Thus, the GDOT subjects provide a way for users to consistently sort and find related records. For the sake of consistency and searchability, all GDOT subjects must be entered exactly as shown below.

<b>GDOT Subjects</b>
<b>Administration and Management</b>
<b>Bridges and Structures</b>
<b>Construction</b>
<b>Data and Information Technology</b>
<b>Design</b>
<b>Economics</b>
<b>Energy</b>
<b>Environment</b>
<b>Finance</b>
<b>Freight Transportation</b>
<b>Geotechnology</b>
<b>History</b>
<b>Hydraulics and Hydrology</b>
<b>Law</b>
<b>Maintenance and Preservation</b>
<b>Materials</b>
<b>Operations and Traffic Management</b>
<b>Passenger Transportation</b>
<b>Pavements</b>
<b>Planning and Forecasting</b>
<b>Policy</b>
<b>Research</b>
<b>Resilience and Sustainability</b>
<b>Safety and Human Factors</b>
<b>Security and Emergencies</b>
<b>Society</b>
<b>Terminals and Facilities</b>
<b>Transportation (General)</b>
<b>Vehicles and Equipment</b>

## Appendix B: Customized Citation JavaScript

```
<script type="text/javascript">

$(document).ready(function() {
    counter = 0;

    $.getScript("https://code.jquery.com/ui/1.8.23/jquery-ui.min.js");

$.getScript("https://cdnjs.cloudflare.com/ajax/libs/clipboard.js/2.0.0
/clipboard.min.js");

    $('head').append("<link rel='stylesheet' type='text/css'
href='https://code.jquery.com/ui/1.8.23/themes/smoothness/jquery-
ui.css'/>");

    function clean_label(label){
        return label.replace(/[^a-zA-Z]/g, "")
    }

    function add_to_object(an_element, obj){
        var label = clean_label(an_element.text() );
        if (obj.hasOwnProperty(label)){
            if (Array.isArray(obj[label]) == true){
                obj[label].push(an_element.next().text());
            } else {
                var temp = obj[label];
                obj[label] = [temp, an_element.next().text()];
            }
        } else {
            obj[label] = an_element.next().text();
        }
    }

    function extract_links(the_elem, obj){
        if (the_elem.attr('href').match(/^javascript/) == null){
            if (obj.hasOwnProperty('link') == false){
```

```

        obj.link = new Array();
    }

    obj.link.push('http://g92018.eos-
intl.net'+the_elem.attr('href'));
    }
    return obj;
}

function add_digital_link(obj, link_code = false){
    if (link_code == false){
        link_code =
$('input#RecordPager_CurrentID').attr('value');
    }

    var the_link = 'http://g92018.eos-
intl.net/G92018/OPAC/Common/UserControls/EOSMediaLinksThumbnailView.as
px?CurrentClientID=MG92018&PatronCode=-1&CurrentLinkCode=' +
link_code.split('|')[1]
+'&CurPage=1&PageSize=6&CurMediaType=null&DisplayCopyItemInfo=True&Sel
ectedCopies=&SelectedVolumes=&SelectedClass=&IsCourseInfo=false&IsRefT
racking=false';

    the_obj = undefined;
    $.ajax({
        async: true,
        dataType: 'html',
        url: the_link,
        success: function(the_html){
            var parsed_html = undefined;
            try {
                var parsed_html = $(the_html);
                $('a',parsed_html).each(function(){
                    the_obj = extract_links($(this), obj)
                });
            } catch(err) {
                the_obj = obj;
            }
        }
    });
}

```

```

        }
        add_citations(the_obj)
        if ($('#citationDialog').length == 1){
            var iterate_count =
$('#input[type="checkbox"].tlistCheckBox:checked').length;
            counter++;
            if (counter==iterate_count){
                // We're done!

$('#citation_progress_span').html("Done!");

setTimeout($("#citationDialog").dialog('close'),1000);
                } else {

$('#citation_progress_span').html(counter+"/"+iterate_count);
                }
            }
        }
    });
}

function reset_citations(){
    sessionStorage.removeItem('citations');
}

function trim_year(year){
    if (year.match('^.*[0-9]{4}') != null){
        return year.replace(/^(.*)([0-9]{4})$/, '$1');
    } else {
        return "n.d."
    }
}

function abbreviate_name(name){
    surname = name.replace(/^(.*?),.*$/, '$1, ');
}

```

```

other_names = name.replace(/^.*?, (.*)$/, '$1');
if (other_names.match(/[A-Z]/g) != null){
    initials = other_names.match(/[A-Z]/g).join('.') + ".";
} else {
    initials = "";
}
return (surname + initials);
}
function get_authors(a_cit){
    var names = new Array();
    names.push(abbreviate_name(a_cit.Author));

    if (a_cit.hasOwnProperty('NameAddedEntry')){
        for(k=0;k<a_cit.NameAddedEntry.length;k++){
            var a_name = a_cit.NameAddedEntry[k];
            if (a_name.match(/.*?,.*?/) != null) {
                names.push(abbreviate_name(a_name));
            }
        }
    }

    if (names.length == 1){
        return names;
    } else if (names.length > 1){
        names[names.length - 1 ] = " & " + names[names.length - 1
]
        return names.join(', ');
    }
}
function return_link_html(obj){
    link = "";
    if (obj.hasOwnProperty('link')){

```

```

        for (j=0;j<obj.link.length;j++){
            link = link + "Retrieved from <a
href='"+obj.link[j]+'>" +obj.link[j]+ " </a>";
        }
    }
    return link;
}

function view_citations(){
    if (typeof(Storage) !== "undefined") {
        if (sessionStorage.hasOwnProperty('citations') == false){
            alert("Please add a citation first");
        } else {
            var citations =
JSON.parse(sessionStorage.getItem('citations'));
            var content = "";
            for (i=0;i<citations.length;i++){
                var a_cit = citations[i];
                var elem = "<p style='padding-below:1em;'><i>"+
a_cit.TitleStatement + "</i>. (" + trim_year(a_cit.Published) + ").";
                if (a_cit.hasOwnProperty('Author') == true){
                    var elem = "<p style='padding-below:1em;'>"+
get_authors(a_cit) + " (" + trim_year(a_cit.Published) + "). <i>"+
a_cit.TitleStatement + "</i>.<br/>";
                }
                if (return_link_html(a_cit) != ""){
                    elem = elem + (return_link_html(a_cit)) +
"<br/>"
                }
                var gdot = "";
                if (a_cit.hasOwnProperty('GeneralNote') ){
                    if (Array.isArray(a_cit.GeneralNote)){
                        for (j=0;j<a_cit.GeneralNote.length;j++){

```

```

        if
(a_cit.GeneralNote[j].match(/^GDOT.*$/) != null){
            gdot = gdot + a_cit.GeneralNote[j]
+ " ";
        }
    }
} else {
    if (a_cit.GeneralNote.match(/^GDOT.*$/)
!= null){
        gdot = gdot + a_cit.GeneralNote + " ";
    }
}
if (gdot != ""){
    elem = elem + "<br/>" + gdot + "<br/>";
}
}
if (gdot == ""){
    elem = elem + "<br/>No GDOT RP Number<br/>";
}
if (a_cit.hasOwnProperty('Description') &&
a_cit.Description.match(/^.*[Pp].*$/) != null){
    elem = elem + "<br/>" + a_cit.Description +
"<br/>";
}
if (a_cit.hasOwnProperty('SummaryEtcNote') ==
true){
    elem = elem +
"<br/>" + a_cit.SummaryEtcNote + "</p>";
} else {
    elem = elem + "</p>";
}
content = content + " " + elem;
}

```



```

        $("<div id='citationReport' style='display:none;text-indent: -28px; padding-left: 28px;'><button id='pdf' onclick='javascript:return false;' data-clipboard-action='copy' data-clipboard-target='div#the_citations'>Copy Citations</button><p>There are "+ (citations.length) + " citation(s)</p><div id='the_citations'>" + content + "</div></div>")

        .appendTo("body")

        .dialog({height: ($(window).height() * .75),
                width: ($(window).width() * .75),
                modal: true,
                open: function() {},
                close: function() {
                    $('#citationReport').remove();
                }
            });

        var btn = document.getElementById('pdf');
        var clipboard = new ClipboardJS(btn);
    }
} else {
    alert("Sorry, your browser does not support citations.")
}
}

function add_citations(citations) {
    if (typeof(Storage) !== "undefined") {
        if (Array.isArray(citations)) {
            // deal with array
            for (i=0;i<citations.length;i++){
                add_citations(citations[i],true);
            }
        } else if ( citations.hasOwnProperty('TitleStatement') ==
true &&
                citations.hasOwnProperty('Published') == true)
    {

```

```

        // We have minimal metadata to continue

        cite_store = new Array();
        if (sessionStorage.hasOwnProperty("citations")) {
            cite_store =
JSON.parse(sessionStorage.getItem('citations'));
        }
        if (citations.hasOwnProperty('Author') == true){
            citations.Author =
citations.Author.replace(/(.*)\.$/, "$1");
        }
        cite_store.push(citations);
        sessionStorage.setItem('citations',
JSON.stringify(cite_store));
    }
} else {
    alert("Sorry - your browser doesn't support citations!");
}
}

function scrub_bib_code(the_code) {
    return the_code.replace(/^.*'(.*)'\)$/,"$1");
}

function add_from_results_list() {
    var url_stub = 'http://g92018.eos-
intl.net/G92018/OPAC/Details/Record.aspx?BibCode='
    var iterate_count =
$('input[type="checkbox"].tlistCheckBox:checked').length;
    var counter = 0;
    if (iterate_count > 0){
        $("<div id='citationDialog' style='display:none;'>Adding
citations... <span
id='citation_progress_span'>0/" + iterate_count + "</span></div>")
        .appendTo("body")
    }
}

```

```

        .dialog({height:140,
                modal: true,
                open: function(){
                    counter = 0;
                },
                close: function(){
                    $('#citationDialog').remove();
                }
            });

    $('input[type="checkbox"].tlistCheckBox:checked').each(function(){
        var a_link = scrub_bib_code(
    $('a.NoVisitNoUnder',$$(this).parent().next().next().next()).attr('href
    ') );

        $.get((url_stub+a_link), function(the_html){
            var values = {};
            var parsed_html = $(the_html);
            $('td.Label', parsed_html).each(function(){
                add_to_object($(this),values);
            });
            add_digital_link(values, a_link); // also adds to
session storage
        });
    });
} else {
    alert("Please check some items in the results list.");
}
}
var screen_type = false;
if ($('#table#BibDetailTable').length > 0){
    screen_type = 'bib_display';
} else if ( $("#[id^='MainRepeaterDetailRow']" ).length > 0 ) {

```

```

        screen_type = 'results_list';
    }
    if (screen_type == 'bib_display'){
        $('table#BibLeftPanelTable').append('<tr><td></td><td><button
class="ui-button ui-widget ui-corner-all" id="addCitation"
onclick="javascript:return false;">Add Citation to Report</button>');
        $('#addCitation').click(function(){
            values = {};
            $('td.Label').each(function(){
                add_to_object($(this), values);
            })
            add_digital_link(values);
            return false;
        });
        $('table#BibLeftPanelTable').append('<tr><td></td><td><button
class="ui-button ui-widget ui-corner-all" id="viewCitations"
onclick="javascript:return false;">View Citations</button>');
        $('#viewCitations').click(function(){view_citations();});

        $('table#BibLeftPanelTable').append('<tr><td></td><td><button
class="ui-button ui-widget ui-corner-all" id="clearCitations"
onclick="javascript:return false;">Clear Citation Report</button>');
        $('#clearCitations').click(function(){reset_citations();});
    } else if (screen_type=='results_list'){

    $('table#ctl100_webopacContentHolder_SearchTitleListControl_titleListHeader
tr td:eq(0)').append('<button id="addCitation"
onclick="javascript:return false;">Add Citation(s)</button>');
        $('#addCitation').click(function(){add_from_results_list();});

    $('table#ctl100_webopacContentHolder_SearchTitleListControl_titleListHeader
tr td:eq(0)').append('<button id="viewCitations"
onclick="javascript:return false;">View Citation(s)</button>');
        $('#viewCitations').click(function(){view_citations();});

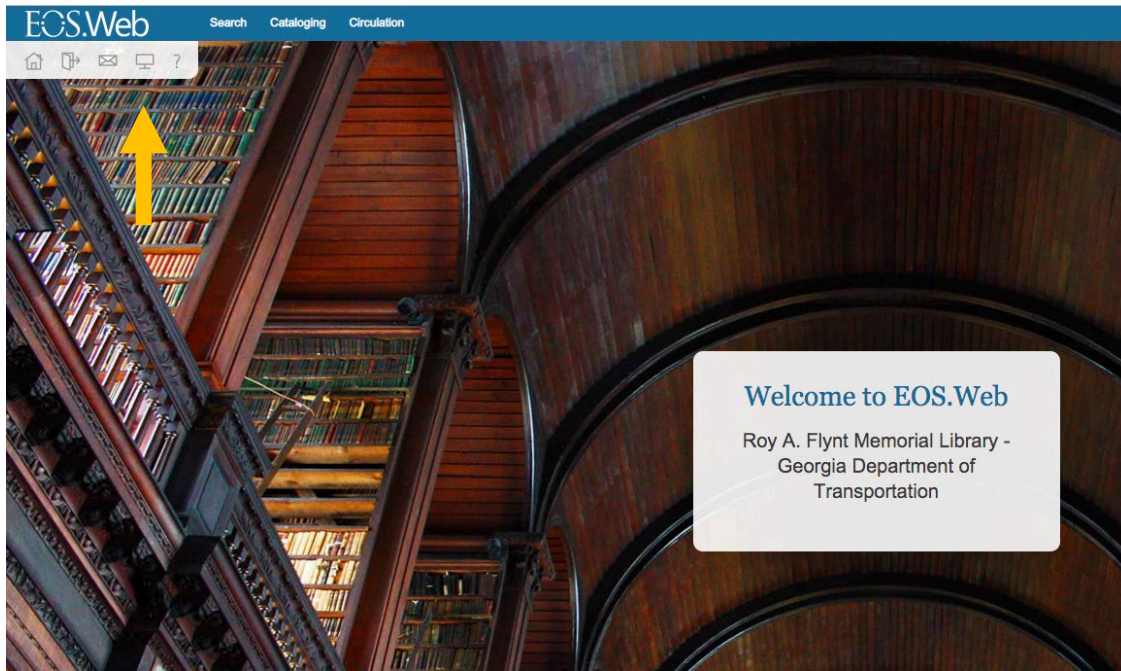
```

```
$('#table#ctl00_webopacContentHolder_SearchTitleListControl_titleListHeader tr td:eq(0)').append('<button id="clearCitations" onclick="javascript:return false;">Clear Citation Report</button>');  
    $('#clearCitations').click(function(){reset_citations();});  
  
    }  
});  
</script>
```

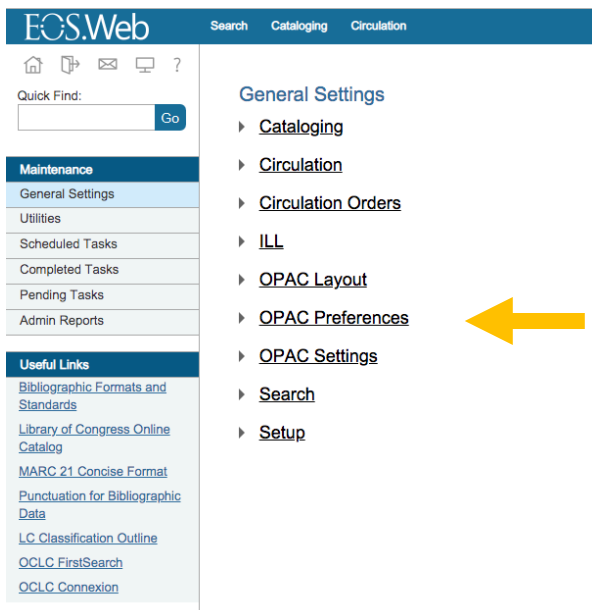
## Appendix C: JavaScript Code Installation Instructions

### Overlaying the Source Code for the Annotated Bibliography in EOS

1. Upon logging into EOS on the staff interface, choose “Maintenance” in the navigation bar on the left. This icon is the fourth from the left and resembles a computer screen.



2. From “General Settings,” select “OPAC Preferences.”



3. Under “OPAC Preferences,” select “Templates.”

The screenshot shows the ECS.Web interface. On the left is a navigation menu with sections: Maintenance (General Settings, Utilities, Scheduled Tasks, Completed Tasks, Pending Tasks, Admin Reports) and Useful Links (Bibliographic Formats and Standards, Library of Congress Online Catalog, MARC 21 Concise Format, Punctuation for Bibliographic Data, LC Classification Outline, OCLC FirstSearch, OCLC Connexion). The main content area shows a tree view under 'OPAC Preferences' with sub-items: Email Setup, SAML Setup, Sites, Favicon Upload, Sign In Options, and Templates. A yellow arrow points to the 'Templates' link.

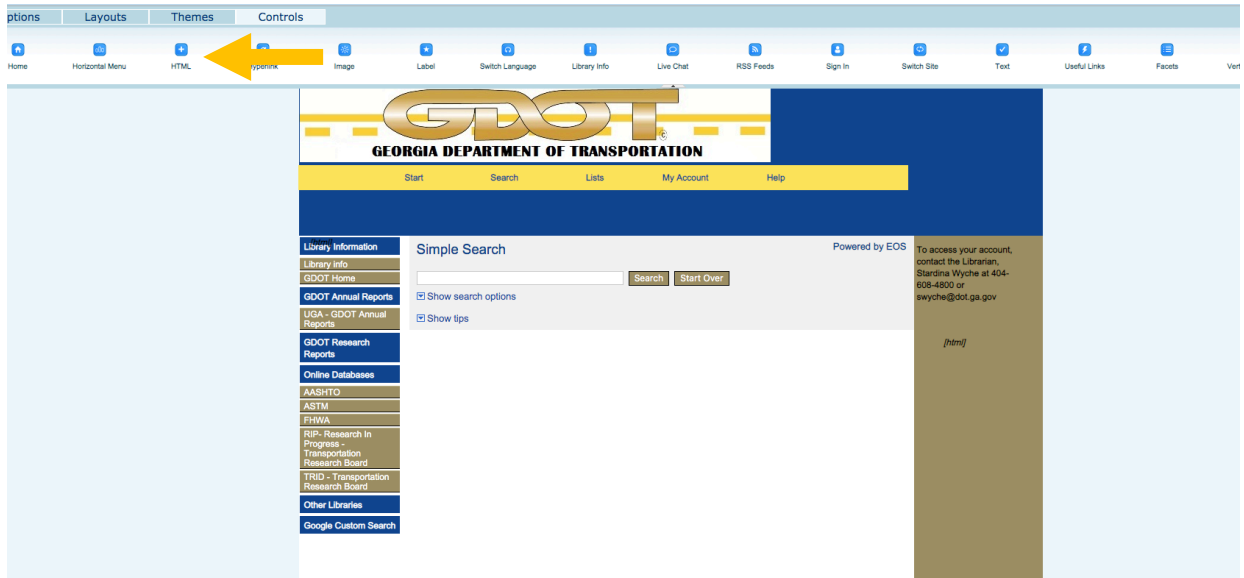
4. Select “GDOT Template” from the list of options. This will open a new tab. In the new window, you will see a template for the public OPAC. It is live, so changes take place in real time.

The screenshot shows the 'Setup > Templates...Sites' page. It features a search bar with 'Look For' and 'Type' dropdowns, and radio buttons for 'Begins With', 'Contains', and 'Ends With'. Below the search bar are 'Add' and 'Import' buttons. A table lists various templates:

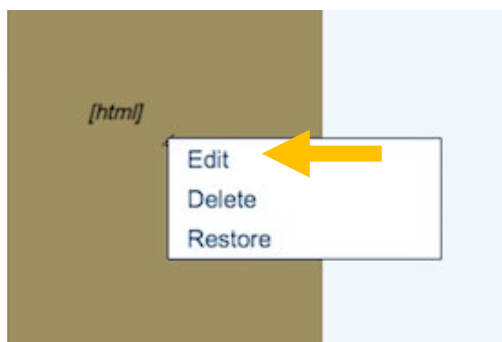
	Name	
1	Academic	Academic Template
2	Digital	Digital Template
3	GDOT Mobile Template	Mobile Template
4	GDOT Template	GDOT Template
5	Government	Government Template
6	Legal	Legal Template
7	Medical	Medical Template
8	Mobile	Mobile Template
9	Museum	Museum Template
10	School	School Template
11	Template 1	Classic Template 1
12	Template 2	Classic Template 2
13	Template 3	Classic Template 3

A yellow arrow points to the 'GDOT Template' entry in the table.

5. Select “Controls” at the top left. Once selected, there should be a range of options.
6. Select the “Add HTML” option. (The third selection from the left should be a + sign with the word “HTML” below it.)



7. To place the source code, copy the code in its entirety from its current location to your clipboard.
8. To add it to the template, select the HTML button and drag it to a location on the template. (The code has been placed on the far right of the screen where the word “[html]” appears in brackets. The word will not be visible on the live OPAC, which is what the brackets indicate.)
9. Once the “html” is placed on the template, right click the mouse to make the menu appear. Select “Edit.”







# Usability Report

## GDOT Annotated Bibliography Project

Testing prepared and administered by  
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For internal use only

## Summary

GDOT seeks to make their repository of research more accessible to their employees. Thus far, the grant team for the Annotated Bibliography project has improved the searchability of the research database, added the ability to create annotated bibliographies, cataloged past projects correctly in the updated system, produced instructions for using the updated system, and tested the usability of the search and data entry functions. In this usability report, we detail the findings of a usability study of the updated system and instructions.

## Background

The Georgia Department of Transportation (GDOT) funds research and development initiatives, but the length of the resulting project reports and sheer number of projects prevent quick searching by GDOT decision makers and other personnel. Existing search tools are segmented and do not provide a comprehensive set of relevant, user-friendly search parameters. Thus, locating a specific project is cumbersome and difficult for GDOT personnel, from management to support staff. GDOT requests that an annotated bibliography be created of all archived research reports (at least back to the 1990s). Further, GDOT is seeking an integrated, easily-maintained, digital repository that can house such bibliographies and reports, while also providing relevant, reliable, and usable search functions that all GDOT employees can use to effectively locate and access the reports.

Members of the grant team have created a user-friendly, easily-maintained, digital repository for storing, searching, recalling, and preserving bibliographic entries that includes a customized taxonomy and the ability to create customized annotated bibliographies. In order to ensure that the newly customized system is usable for the audience, the grant team performed systematic usability assessment with GDOT personnel.

## Test Objectives

- Assess the usability of the search function and the associated instructions for the updated EOS GDOT database—both public facing (front end) and proprietary (back end)
- Assess the usability of the data entry function and the associated instructions for the updated EOS GDOT database (back end)
- Assess the use of the new taxonomy for searching (front and back ends)

## Methods

Data was collected via pre-test questionnaire (see Appendix A), testing (see Appendix B), post-test instructions usability scale (see Appendix C), post-test system usability scale (see Appendix D), and a brief final interview. Changes to the protocol were not made after the GDOT pilot, so pilot data is included in this analysis.

## Test Schedule and Participants

GDOT leaders run reports based on management queries and use reports to make new funding and research agenda decisions. GDOT managers and staff do data entry and data management. They are responsible for data accuracy, record classification, and searchability of records.

Participants were recruited for their representation in these groups and for their representation in various roles and departments at GDOT.

Testing was completed on January 30, 2019 at the Forest Park GDOT-OMAT office. The grant team tested seven participants on search (front end and back end) and/or data entry (back end) in the EOS system. See Table 1.

Table 1. Participants

P. Number	P. Name	P. Title	Tasks Assigned (see Appendix B for a list of tasks)
Participant 1 (pilot)	Brennan Roney	Research Engineer	1, 2, 3, 5
Participant 2	Ian Rish	State Pavement Engineer	1, 2, 3
Participant 3	Robert Carswell	Program Coordinator GATECH UTCs	1, 2, 3
Participant 4	Sarah Jones	Civil Engineer 3	4, 5
Participant 5	Binh Bui	Research Implementation Manager	4, 5
Participant 6	Sarah Lamothe	Transportation Planning Specialist	1, 2, 3
Participant 7	Amy Ramsey	Office Manager	4, 5

### Test Environment

Participants joined Pam Brewer and Jennifer Goode of Mercer University in the GDOT-OMAT conference room. They proceeded through the protocol that included questionnaires, usability testing, and an interview. The complete protocol took no more than 45 minutes per participant.

The full assessment was conducted using Zoom web conferencing software, provided by Mercer University. The test was run using PCs. Participants accessed Zoom through an internet connection, and the session recordings were archived. Audio, video, and text transcripts were captured as well as the participants' cursor movements on the screen.

### Findings

Overall, participants found the EOS system useful and usable; however, their responses indicated there is significant need for improvement. We present all useful findings below but wish to emphasize the following three issues as most important:

- The use of RB as a GDOT research report call number is not familiar or logical for participants.
- Identifying years of publication and searching a year range on the front end was difficult and often failed.
- More aids/instructions are needed online at the point of use in order to avoid less-than-successful searches.

Participants avoided using the printed instructions until pressed to do so either with task failure or prompting from the facilitator. When they reflected on use of the instructions, they indicated they would like for more of the instructions to appear on-screen in the system and would like for the instructions to be less complex and easier to use.

In this section, you will find the results of the usability study of the EOS system updates and associated instructions, beginning with some participant characteristics. The findings have been categorized as follows:

- Strengths
- Weaknesses categorized as follows
  - Data Entry
  - Error Reporting
  - Labeling
  - Navigation
  - Searching and Taxonomy
  - Other

**Participants**

As you would expect, participants use EOS to share information with outside research agencies, find research for presenting to manufacturers, search for past research to create plans for new research, enter data, and catalog research. You can see basic participant use information in Figures 1 and 2.

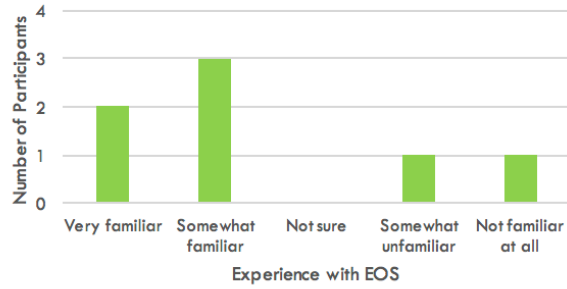


Figure 1. Participant Experience with EOS System

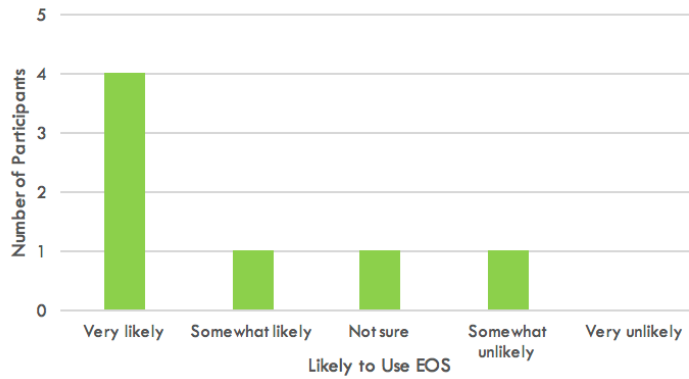


Figure 2. Participant Use of EOS System

### **Areas of Strength**

Participants identified the following strengths of the system and instructions:

- The **Words** field can now be used to search abstracts as well as other information in a record.
- Search categories in the taxonomy correlate with GDOT departments.
- Rollovers aid navigation.

### **Areas of Weakness**

Areas that need improvement in the system and instructions are categorized as follows:

- Data Entry
- Error Reporting
- Labeling
- Navigation
- Searching and Taxonomy
- Other

Detailed findings for each category are described below.

#### **Data Entry**

- Entering a single record took participants 22 to 32 minutes.
- There is a lot of room for error during data entry, including spelling and coding errors. Participants often misspelled while working in the system.
- Participants first entered names in the wrong order as they didn't see the author format in the instructions.
- Participants wondered about the information they were skipping as they followed the instructions for data entry.

#### **Error Reporting**

- At the end of the data entry task (task 5), all participants received error messages. The message codes varied among participants, but the system provided no information on what the error codes meant or how to fix them.

#### **Labeling**

- The RB call number for GDOT research reports was not familiar to participants unless they had worked with data entry in the past. In other words, it was not a logical designation for participants. They are familiar with the RP designation for GDOT research.
- The year in which a report was published appears in the **Published** field and not in a field of its own. This was not obvious to participants.
- Participants questioned whether the year of publication is based on the annual or the fiscal year.
- Participants tried to search for reports that were published in a range of years by using the **Year** field.
- Participants thought that the asterisk used in the instructions was part of a search string.
- Some participants did not equate "words" with "keywords" for searching.
- Participants did not understand why "select all" and "view all" did not result in viewing all records at the same time.
- The meaning of "place under serial control" was unclear during data entry.
- The meaning of "source not specified" was unclear during data entry.

#### **Navigation**

- The RB call number for research reports caused task failure for all but experienced staff. See the labeling section for more information.

- Participants said that there is no help for searching online in the EOS system. One example provided is that the instructions beneath the “show search” options don’t make action clear.
- Participants spent some time finding the PDF versions of reports. They eventually found them at the bottom of the screen.
- Participants could not find the year range fields. Several tried to enter individual years into the **Year** field. This was a problem on the front-end interface but not on the back end where the range fields are more accessible.

#### Search and Taxonomy

- In general, the use of the taxonomy for searching was a failure. Participants either didn’t notice it or couldn’t figure out how to use it. However, when they reflected on the test, they thought that the taxonomy has the potential to be useful if some on-screen prompts help them use it. The following list represents some of the test behavior:
  - Only went to instructions as last resort
  - Did not connect the taxonomy instructions on the front page of the instructions with those on the back
  - Entered several topics in the **Subject** field that didn’t work
  - Did not see the year in the search results
- Multiple participants requested that search help be provided online in the form of tips and suggested keywords for searching. Essentially, they want help for non-experts to conduct effective searches using the system.

#### Other

- A participant found one research report that is not coded as RB (by Wang).
- The drop-down menu on **Location** didn’t work.
- The website looks dated.

### Recommendations

We prioritize resolving the disconnect with RB labels, making the year range visible on the front-end search, putting more instructions on screen, cautioning users to use the instructions carefully, and training users on the system as the highest priority recommendations. As a minimum, linked PDF copy of instructions would help with navigation. The instructions could be presented in a single PDF or in smaller PDF “modules” at the points of need. See Figure 3.

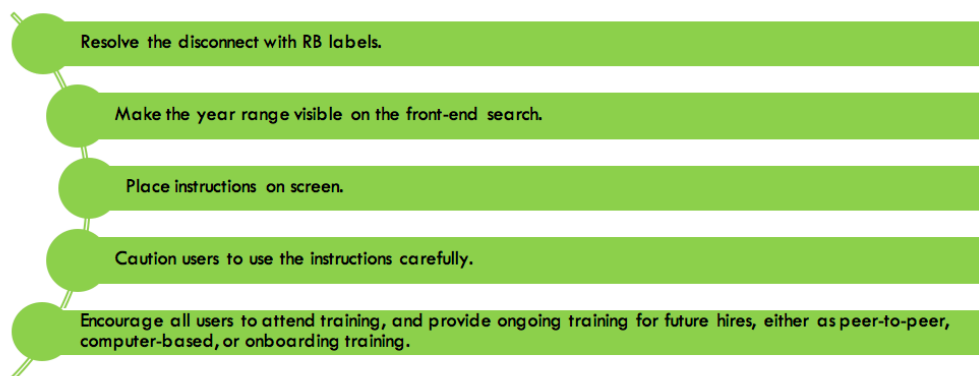


Figure 3. Five most significant recommendations of usability assessment

People tend to use instructions as a last resort unless the pieces they need are readily available during tasks. In order to ensure effective searching and accurate data entry, the system design needs to accommodate for this behavior.

For detailed recommendations, refer to the sections and tables below.

### Data Entry

The data entry process is tedious and must be accurate; otherwise, searches will not yield reliable results. See recommendations in Table 2.

Table 2. Data Entry Recommendations

Data Entry Recommendations	Action
2.1 Fields that contain standard information should be automatically filled during both data entry of the original record and during searches.	Implementable but out of scope
2.2 Include authors' professional titles as a standard requirement of data entry.	Not implementable due to system configuration
2.3 Provide information on word limit for abstracts.	Implementable and in scope
2.4 Include pictures of icons in the instructions to aid recognition on the screen.	Implementable and in scope
2.5 Explain why participants may skip some fields while entering data.	Implementable and in scope
2.6 Include instruction on maximum number of author-provided keywords allowed during data entry for a single record.	Implementable and in scope

### Error Reporting

Table 3. Error Reporting Recommendations

Error Reporting Recommendations	Action
3.1 Provide on-screen and printed instructions on the meaning of and fixes for error codes received during data entry. Error codes received during testing were 040, 050, 245, and 650.	Implementable but out of scope

### Labeling

Table 4. Labeling Recommendations

Labeling Recommendations	Action
4.1 Without context, we cannot make a recommendation about the call number RB as compared to the more familiar RP within GDOT. However, addressing this problem is important. If GDOT continues to use RB, this standard will need to be emphasized in the instructions and online navigation.	Implementable but out of scope
4.2 Create a new field for the year of publication.	Implementable but out of scope



4.3 Indicate whether the year of publication is based on the annual or the fiscal year for both data entry and search.	Implementable and in scope
4.4 Do not use the asterisk in the instructions.	Implementable and in scope
4.5 Relabel the <b>Words</b> search field as the more familiar <b>Keywords</b> .	Implementable but out of scope
4.6 Use a word more familiar to the audience than "taxonomy."	Implementable and in scope

## Navigation

Table 5. Navigation Recommendations

Navigation Recommendations	Action
5.1 Participants would like an online list that helps them know what search words to use. The taxonomy list is a beginning for this, but it should be expanded and provided online as a search aid.	Implementable but out of scope
5.2 Place the most used search fields ( <b>Words, Title, and Author</b> ) at the beginning of the search options.	Implementable but out of scope
5.3 Move the link to the PDF of full reports up on the screen so that finding it does not require scrolling.	Implementable but out of scope
5.4 On the front-end interface, make the year range fields more visible.	Implementable but out of scope
5.5 Make the linked media icon more visible.	Implementable but out of scope
5.6 Add graphics that reflect the website to the instructions (for example, the MARC Detail icon).	Implementable and in scope

## Search and Taxonomy

Table 6. Search and Taxonomy Recommendations

Search and Taxonomy Recommendations	Action
6.1 Integrate the taxonomy into an overall search strategy, and communicate this to users. Simplify the instructions on this topic and provide them both on-screen and in print. Also communicate the value of using the taxonomy terms. For example, what is the benefit of the taxonomy search using the Subject field versus the Words field?	Implementable and in scope
6.2 Communicate how the taxonomy might be useful to participants and consider renaming it with a more user-friendly term.	Implementable and in scope
6.3 Make it clear that terms entered in the <b>Subject</b> field must come exactly from the taxonomy table.	Implementable and in scope

## Other

Table 7. Other Recommendations

Other Recommendations	Action
7.1 Add a link where people can quickly and easily report any errors in the online library. For example, perhaps the RB designation is missing from a research report. A simple <b>mailto</b> command can allow a user to notify the data entry administrator.	Implementable but out of scope
7.2 Clearly note all databases that are linked or searched through this system (for example, NCHRP).	Implementable but out of scope
7.3 Consider moving tip box for the subject search up in the order.	Implementable but out of scope

## Conclusion

The grant team has established a new search taxonomy and reliable search process, updated GDOT research report records to librarian cataloging standards, made abstract content searchable, created instructions for supporting use of the front-end and back-end EOS system, and usability tested all of these elements with current GDOT employees. We find that the EOS system is a robust cataloging system that has expansive cataloging features and integrative capabilities with other library systems across the nation. However, the system is primarily designed for use by librarians. Popular search tools, like Google, have impacted how users expect search applications to perform. While EOS holds great promise for archiving valuable research artifacts, GDOT employees must be trained on specific data functions within EOS to make their search efforts fruitful. The team's instructional tools and initial training will help with this educational endeavor, but some elements of the EOS system design and functionality may persist and frustrate users over time. We recommend that GDOT remain committed to the new standards and processes for data entry and maintenance within EOS, while also considering user experience moving forward. If the EOS system design and interface cause more confusion in spite of ongoing training, GDOT should consider seeking assistance with further customization of the tool's interface.

**Appendix A**  
**GDOT EOS Web Usability Assessment**  
**Pre-Test Questionnaire Findings**

Name

How familiar are you with the EOS system that contains past GDOT research?

1xx	2xxx	3	4x	5x
Very familiar	Somewhat familiar	Not sure	Somewhat unfamiliar	Not familiar at all

If you are familiar with the EOS system, how would you describe its usability?

1	2xxxx	3xx	4x	5
Very easy	Somewhat easy	Neither easy nor difficult	Somewhat difficult	Very difficult

How likely are you to interact with the updated EOS system in the future?

1xxxx	2x	3x	4x	5
Very likely	Somewhat likely	Not sure	Somewhat unlikely	Very unlikely

If you are likely to interact with the updated EOS system in the future, how are you likely to use it?

**Appendix B**  
**GDOT EOS Web Usability Assessment**  
**Scenarios/Tasks**

Which web browser does the participant usually use? Record browser chosen for testing.

**For the following tasks, use the EOS Web Front-End User Guide.**

**Task 1**

Feel free to review the instructions briefly to get an idea of content.

1. Using the Front-End User Guide, go to the Roy Flynt Memorial Library home page.
2. You are part of a GDOT project to assess the effects of stormwater on Georgia roads. Using the public access link (front end) for the EOS Web system and the instructions, find information on your topic.
3. How many research reports are identified?
4. View the PDF of one of the research reports

**Task 2**

1. Go to the Roy Flynt Memorial Library home page.
2. Your team is going to prepare a report about bridge safety in the Atlanta area. You have been asked to brief your team on research that GDOT has already completed. Use the EOS Web to complete this task.
  - How many results do you get?
3. Narrow your search to the past 3 years only.
  - How many results do you get?
  - How many are GDOT research reports?

**Task 3**

1. Go to the Roy Flynt Memorial Library home page.
2. GDOT has a new search taxonomy to aid consistency in searching (in case keywords don't find all related material). Use the subject taxonomy to find information on public transportation.
  - a. What types of information do you see?

**For the following tasks, use the EOS Web Back-End User Guide:**

**Task 4**

Feel free to review the instructions briefly to get an idea of content.

1. Using the Back-End User Guide, go to the Roy Flynt Memorial Library home page.
2. Log in.
3. Your team is going to prepare a report about erosion. You have been asked to brief your team on research GDOT has already completed with regard to erosion. Use EOS Web to complete this research.
  - How many results do you get?
4. Narrow your search to the past 5 years only.
  - How many results do you get?
  - How many are GDOT research reports?
  - View the PDF of one of the research reports.

**Task 5**

1. Go to the Roy Flynt Memorial Library home page.  
Some new reports have come in and need to be put into EOS. Here is the information on one of them. Enter it into the system. Use the name "Usability Test X" for the title.

**Appendix C**  
**GDOT EOS Web Usability Assessment**  
**Post-Test Instruction Findings**

1. I think that I would like to use these instructions frequently.

Strongly Disagree		Strongly Agree		
1	2	3xx	4xx	5xxx

2. I found the instructions unnecessarily complex.

Strongly Disagree		Strongly Agree		
1x	2xxx	3x	4xx	5

3. I thought the instructions were easy to use.

Strongly Disagree		Strongly Agree		
1	2	3xxx	4xxx	5x

4. I thought there was too much inconsistency in the instructions.

Strongly Disagree		Strongly Agree		
1xxx	2x	3xx	4	5

5. I would imagine that most people would learn to use these instructions very quickly.

Strongly Disagree		Strongly Agree		
1	2x	3x	4xxx	5xx

6. I found the instructions very cumbersome to use.

Strongly Disagree		Strongly Agree		
1xx	2xxx	3x	4x	5

7. I felt confident using the instructions.

Strongly Disagree		Strongly Agree		
1	2	3xxxx	4xx	5x

**Appendix D**  
**GDOT EOS Web Usability Assessment**  
**Post-Test System Usability Scale Findings**

Name

1. I think that I would like to use this system frequently.

Strongly Disagree				Strongly Agree
1	2	3xxx	4xx	5xx

2. I found the system unnecessarily complex.

Strongly Disagree				Strongly Agree
1xx	2xx	3xx	4x	5

3. I thought the system was easy to use.

Strongly Disagree				Strongly Agree
1	2	3xxx	4xxx	5x

4. I think I would need the support of a technical person to be able to use this system.

Strongly Disagree				Strongly Agree
1x	2xxx	3xxx	4	5

5. I found the various functions in this system were well integrated.

Strongly Disagree				Strongly Agree
1	2x	3xxxxx	4x	5

6. I thought there was too much inconsistency in this system.

Strongly Disagree				Strongly Agree
1xx	2xxx	3x	4	5

7. I would imagine that most people would learn to use this system very quickly.

Strongly Disagree				Strongly Agree
1	2x	3xx	4x	5xx