A CONCEPTUAL MODEL AND PRACTICAL SOLUTION FOR CONSERVATION DOCUMENTATION

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Abstract

This paper explores the potential of database technology to organize, guide, facilitate, and improve conservation documentation. The example developed by the author, CDS-Documentation (CDS-D), is now published by Conservation Data Systems. The program serves not only as a practical out-of-the-box archival report generator for objects conservation, but also serves as a conceptual model for future documentation software.

Whether documenting conservation of historical objects, fine arts, or natural history specimens, and whether the works are in two or three-dimensions, simple or complex, the building blocks of documentation are the same:

- Project information (object owner, object name, accession number, etc.)
- Components (subdivisions of the object for organizing the following elements of documentation)
  - Description (dimensions, materials, construction, coatings, etc.)
  - Past interventions (restorations and earlier conservation)
  - Condition issues (specific condition problems)
  - Actions (future, present, and past tense: what, if anything, is proposed or was actually done about each condition issue)

These six building blocks link to each other in one-to-many relationships, and can be built up as needed to fit the size and complexity of the project. Thus, one object can have several components, each with optional description and past interventions, and perhaps several condition issues. Each condition issue prompts one or more actions, including, for example, a proposed treatment, actual treatment, or a decision not to treat. Two other building blocks can be linked as needed to any of the others:

- Images (digital images, slides, radiographs, sketches, etc.)
- Analysis (type, method, sample description, results and interpretation)

Database technology handles this type of modular data structure in ways not possible with word processors. CDS-Documentation shows how software can guide conservators toward documentation that complies with our published guidelines. It can arrange any amount of information for any complexity of project in highly organized reports that can be printed on archival paper or captured as digital files to be linked to collections management systems. By exploiting the potential of computer automation, documentation software saves time, improves thoroughness, and provides every possible automation amenity for recording information.
The CDS Documentation System

This paper proposes a database approach to documentation. Designed by the author and now published by Conservation Data Systems (CDS), the program is called CDS-Documentation, or CDS-D [1]. The system was designed according to recommendations in the AIC Standards of Practice [2], and it takes advantage of information technologies to improve the clarity and coherence of our reporting. The premise may seem at first somewhat different from the most common documentation approaches, but it should be measured by what documentation is intended to accomplish. Among other practical considerations, that important purpose is to protect the integrity of the information physically encoded in objects even as we necessarily alter the object in the name of stabilization and restorative conservation.

There is a traditional sequence of our reports that includes sections on (1) description, (2) condition, (3) treatment proposal, and (4) treatment. These elements may sometimes group in various ways to produce one, two, or three reports, sometimes combining the first three under the heading “Examination”. While the grouping of the elements may vary, the sequence of them is logical.

<table>
<thead>
<tr>
<th>Description</th>
<th>Condition</th>
<th>Treatment Proposal</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
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Figure 1. The traditional conservation report sequence.

The following perhaps familiar experience explains the potential difficulty with this traditional approach to documentation. An object is coming into the lab for conservation. You check the object folder consisting of a hodge-podge of papers and hope to find out what was done in a treatment a dozen years ago. If you’re lucky, you find the full sequence of reports, and begin to read.

The conservator mentions condition problem “X.” Did she treat X? You need to know, so you skip ahead to find out. Treatments are in a different section, and they are covered in a different order than the condition section so you are looking for a needle in a haystack. You do find something in the treatment proposal that is probably X, although the language and context is so different you are not sure. So you read on to see what was actually done to treat condition X, and finally locate it in the treatment report. Although connecting Condition X with its related treatment proposal and final treatment presented a challenge it nevertheless proved possible. The same is not true for issue Y, which consumes another five minutes of searching with no success.
in finding any treatment proposal or final treatment. Did the conservator just want you to know about condition Y, and judged not to treat it, or did she forget to treat Y or forget to document that she treated Y? Your confidence in the report is shaken when you realize how much of the information lacks correlation between specific condition issues and the conservator’s judgments or treatments in response to them.

The most radical proposition in this paper is that conservation documentation should maintain a direct relationship between a specific condition problem and the conservator’s judgment or other response to that issue. We will call the response an “Action”, and consider that a proposal to treat, an actual treatment, and a judgment not to treat are all actions.

The relationship between a condition problem and the conservator’s action toward it is similar to double entry accounting in the financial world, whereby every credit is balanced by a corresponding debit (eg. Fig. 2). Businesses use double entry accounting not only to help themselves keep track of money, but so others looking in can get the full picture. Violating the integrity of that dual relationship between debit and credit is called sloppy accounting at best, and “cooking the books” or cheating the shareholders at worst. For conservators, future generations are also shareholders, and they deserve to have a coherent picture when they examine our reports.

<table>
<thead>
<tr>
<th>Date</th>
<th>Accounts</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 8</td>
<td>Cash</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Revenue</td>
<td></td>
<td>50.00</td>
</tr>
</tbody>
</table>

Figure 2. Double-entry accounting.

The old approach to conservation reports with its overall-object level segregation of information, has come to us from the typewriter age. Typewriters were unable to dynamically assemble information with complex relationships. Segregation of information was a practical necessity. When computers came into the conservation laboratory a couple decades ago, few thought of it as more than an improved typewriter.

Computers can, however, show several types of information in linked relationships: One artifact, several components. For each component, several condition issues, and for each condition issue, one or more actions, and to any of the above, possibly some linked photos. Of the three most common types of computer software (word processors, spreadsheet software, and database programs) which technology can handle that?

Word processors are the direct descendents of the typewriter, and have always been the popular choice. We are familiar with them, and they work well typing old-style reports with their freely structured discussions of condition and treatment. Word processors, however, cannot easily handle more than one or two levels of relational data without running aground.
CDS-Documentation shows how relational database technology can solve the coherence problem in documentation. The program also makes use of computer automation to organize information, generate reports, and greatly enhance the data entry process.

For the simplest projects, CDS-D provides a “Short Form” is provided. This illustrates how the program uses automation to save time and improve the quality of reports. Just how much time the program saves, depends on first teaching it a few things about your lab, and how you work: A number of buttons on the screen (Fig. 3) provide automated features that draw on your own customizations entered into the program’s setup. Often-re-used information can be entered once in Setup, and thereafter be available for point and click selection. You can customize the pick-lists of condition issues, of conservation materials, and of object materials. Enter your lab’s name, your staff, and a custom report header and the automation will begin to pay off.

Figure 3. CDS-D Short Form.
A simple repair, such as the reattachment of a small molding on a wooden box, demonstrates the Short Form. The text boxes at the top of the form are for the basic object identification, and the three largest boxes are labeled “Description”, “Condition,” and “Treatment.” In this way, the Short Form simply follows the traditional sequence of report segments, but with some time-saving automation. Some of the boxes are already filled out with information you previously designated as “default,” including the conservator’s name, and the titles of the people who will need to sign the report. The form takes a very few minutes to fill, and creates an appropriately brief printed report.

The highly routine conservation of a single-piece iron object might be almost identical to hundreds of other similar projects that come through the lab, and automation becomes even more important. In the CDS-D Short Form, 4 clicks reveal a list of templates you have previously designed, and you select the one for “Small Iron Objects”. Three more clicks, and the Short Form appears with most of the report already filled in, including the detailed treatment procedure, conservator’s name, report signatories, preventive conservation recommendations, project type (ex. “Examination and Treatment”); object materials; and even some likely condition language. Now tweak the condition language that came with the template and some minimal typing of the object name, number, measurements, and description. Enter a date in the “Completion Date” box, or double click there and the current date appears automatically. Enter your treatment time, and you can mark the record complete. Because this treatment used one of your pre-defined “standard procedures,” there is no further treatment information to type.

If you had an ID photo or two, you could link them into the report with four to six clicks. Any amount of other digital photo-documentation can be linked as well. The photo cataloging form gives a place to add a caption that will be printed with the photo in the report, or if you used 35mm slides, the captions print on slide labels. In four more clicks, the report is printed. It takes about two minutes to create this routine report, start to finish.

In one more Short Form example, the object has three condition issues, and although they are combined into one condition textbox, they are numbered, and the treatment textbox uses the same three numbers to maintain the important link between each condition issue and the corresponding action. You can do that with a word processor too, of course, and even if you continue using word processors for documentation, matching numbers in condition and treatment sections can at least maintain an issue-by-issue link. The project has two ID photos and three other photographs, and its report assembles all the information into a three-page report including photos.

CDS-Documentation can thus quickly handle the smallest jobs and the most routine jobs, but it is equally equipped to handle much larger, and more complex treatments. As reported in the General Session of the 2005 AIC Annual Meeting in Minneapolis by Joe Sembrat of Conservation Solutions, Inc., the program is being used on what may be the largest and most complex treatment in North America, a Saturn V rocket; longer than a football field, and weighing over six million pounds.

The strategy for documenting this and much more modest size projects, is the same. The familiar sequence of documentation steps (description, proposal, and action), will need to work like
building blocks that can be assembled as needed to build any size structure. We rely heavily now on database technology to maintain the sequence at the component level.

The first building block is the basic Project/Object Identification form. It is the only multi-page form in the program, but the most important text boxes are on the first page. The occasional red asterisk next to a text box (the object title in this instance) tells where data must be entered for the program to work. It is very important to know the remaining majority of text boxes are for your convenience, should you choose to use them. They also serve as reminders of the types of information that are consistent with the standards of practice for documentation.

An object is, of course, usually made up of several components. Any logical breakdown can work if it will make recording more efficient. Although usually consisting of a physical part of the object, a “component” can also be a side, section, material type, or an area marked on a location map—anything that helps break the report into more manageable parts. CDS-D color codes the forms so the blue forms refer to the overall project, and the buff forms refer to whatever component is selected in the component window. You can identify any number of components, and arrange them in a hierarchy of up to four levels. Description, Condition, or Action records each also have a “location” field to further specify precise locations within the component to which it is linked.

![Diagram](image)

**Figure 4.** The CDS-D information structure.
The diagram in Fig. 4 shows the building blocks of CDS-Documentation, with their one-to-many relationships to each other. The bold print labels show the core structure: one project (object) can have multiple components, and each component can in turn, have multiple condition issues, each of which can prompt one or more responses or “actions.”

Interventive conservation projects tend to be undertaken on either a remedial or a comprehensive level. Attention in remedial projects is limited to condition problems and their treatment, while a comprehensive approach can involve observations and recording of more information: object materials, aesthetic characteristics, material evidence, past restoration and other past interventions and condition issues not actually requiring treatment.

CDS-D accommodates either approach, providing a place for one or more past interventions at the component level. Intentional alterations, restorations, repairs, as well as past conservation treatments can be recorded here, whether or not they result in condition problems to be treated. We are sometimes tempted to withhold our interpretations out of scholarly rigor because we could be wrong. The design of the program makes it acceptable to make an educated guess as to what was done in a past intervention, because a text box is also provided for recording the evidence on which we base our interpretation, however strong or weak the evidence may be. In this way, future investigators have the benefit of our interpretation, but can judge its veracity for themselves. Known campaigns of past restoration or conservation can be recorded in the system. Then as you come to evidence of another past intervention, the identified campaigns appear in a dropdown list for attachment to the intervention. This is especially useful when you are consolidating information from various old reports and documents into a single comprehensive report.

The heart of the documentation program is the Condition Issue form. There can be any number of condition issues for each component, and a location text box allows you to be specific about the affected area for each. The condition form appears with its companion, the Action form. Again, the only required fields are marked with red asterisks. The screen layout symbolizes the relationship: for every condition, there can be one or more action records. In the example, there are two, the first being a treatment proposal, and the second being the actual treatment. The dropdown button on the Action Type reveals what is meant by “action”. The first few items are most common. Even “No Treatment” is a judgment and constitutes an action by the conservator.
Figure 5. The CDS-D data entry screen with Condition and Action forms displayed. The action form is linked to the condition issue above it, which is linked to the selected component.

The system also provides a place (see the tabs near the top in fig. 5) to catalog physical fragments, (samples or pieces that could not be reintegrated), and another place to catalog report attachments (analytical printouts, copies of old documents, lab notes, etc.). The Preventive Recommendations form is simple, but includes powerful automation for selecting standardized language from any number of your own categories. It also has a report button right on the form for printing out the recommendations for storing with the object.
Figure 6. The form for cataloging photos and other graphics. This one is labeled “Action Graphics” because it will be linked to a treatment (action) record.

A button with a camera icon is provided on many of the forms. It opens a form for cataloging digital images or other graphics, and it links the image to the current record. Fig. 6 shows the form, this example being linked to a particular action record. A browse button on the form takes you immediately to the folder where your project photos are stored. Point and click to enter a photo, then type a caption with the photo in front of you. Other buttons on the form can open the current photo in an external viewer program or a photo editor program, all from within CDS-D.

Another button on the Description, Condition, and Action forms provides a place to record analysis, and it too is linked to the description, condition, or action form where the button was located.
The programmer has provided many other amenities to save time and to make it easy to correct mistakes. If you accidentally enter condition information under the wrong component, for example, you can “cut and paste” it to the correct component, and when you do, all linked action, photo, or analysis records automatically move with it. You can designate the data in some fields as “default.” During an examination, for example, “Action Type” may always be “Proposed Treatment.” When you set this text as the default, it will appear automatically when you double-click in that text box. Touch F7 to run a spell check on any text box. Enter any date in the completion box, or double-click to automatically enter the current date. Many text boxes have drop-down pick-lists for one-click data entry. One button opens a “ToDo” list for reminders specific to the current project. If there are any fields specific to your work that are not provided in CDS-D, use the “auto-text” button next to a text box and enter or select from your list of customized subheadings. The list will always be specific to the text box it is near. There are three popup pick-lists that can be set up in categories. The one in Fig. 7 is for condition issues. Clicking on the Edit button allows you to customize the pick-list for your own specialty.

![Condition Pick List](image)

Figure 7. The Condition Type pick-list with four condition issues selected.

The condition pick-list helps to sharpen perceptions by serving as a checklist of possible condition problems. Select one or several condition issues and either save them all to the same
condition record, or let the program save the selections to individual condition records so you can record actions separately for each condition.

The program offers thirty different reports, and some can be customized. Most of the time, the comprehensive report is all that is needed. This report contains all the information in the correct relationships. The programmer had a challenging task in creating a report capable of showing the sequence (description, condition, proposal, and treatment) repeated on the component-level rather than the overall object level, while also including photos and analysis records, each in their correct context.

The hierarchical arrangement of information in the report is similar to the table relationships as illustrated in Fig. 4 above, but the report must be able to repeat the full right-hand side of the hierarchy for each component.

Reports should be able to answer the questions asked by a reader in the more or less distant future. The only thing we know for sure about that reader is that we know nothing at all about what they will be looking for. This is an extremely important point about documentation. If we have fooled ourselves into assuming the future reader wants the information that we or our client wants, we will be wrong most of the time. In ten or a hundred years from now, a reader of our report may be looking specifically for the conservation materials we used, or our interpretation of past alterations, or the condition before our treatment, or what precisely we did and where we did it, or information about one of the components, or for our technical analysis of the original materials.

As much as everyone enjoys an engaging story in prose, our future reader is probably most interested in finding specific information quickly. Our report needs to be arranged in a way that information of particular types can be found – more like a reference book or outline than a novel.

How might a report efficiently answer so many diverse questions? CDS-D uses icons to mark each information type so the reader can easily filter the report by eye for whatever kind of information he or she is looking for.

The CDS-D report opens with object identification at the beginning, and for large projects, an “executive summary” can be included. The Phase section of this particular report shows that we are including an Examination and Treatment Proposal as well as a Treatment phase, each phase with dates, and staffing. The list of components (visible at the bottom of the example page) serves as a table of contents for the report. Thus all information about each component is together in the report, and the component list tells where to find it.
Component 3 is the “base” of the object reported in the example (Fig. 9). Most of the component-level building blocks are found in this example, though components rarely have so many of report elements. The gray bar marks the beginning of the component, and it is always followed by any description of the component. This description includes two linked photos. The Analysis and Past Intervention records also relate to the description of the component, so they are next.
Figure 9. A page from the comprehensive report, showing information organized under and about one of the components.

A Condition record with a linked photograph follows. Then there are two actions associated with the condition record: a proposed treatment, and another as the final treatment. Future readers can easily scan for particular types of information by looking for the associated icons (Fig. 10).
Figure 10. Icons used in the report to flag different types of information, including the shaded bar for marking the beginning of the next component.

Figure 11. The report appendix.
The automatically-generated appendix of the report (Fig. 11) details any “standard procedures” you cited in the project. Just the end of one standard procedure appears in the example. The conservation materials you cited in the report are then automatically listed along with the information about each that you had entered in setup. The appendix also includes a list of report attachments, preventive conservation recommendations, and boxes for approval signatures.

This software is designed for conservation documentation does not attempt to serve as a collections management system (CMS). However, CDS-D integrates well with any CMS database that can accommodate hyperlinks. By outputting CDS-D reports as PDF files, the reports can be linked to the CMS for access from within the CMS. TMS, the popular collections database by Gallery Systems, for example, allows such links. A curator or conservator thus can look up an object in the collections management system, and click on a link to open a full conservation report in Adobe Reader.

Can old conservation reports be retrofitted into CDS-D? In theory, this should be quite easy, but in practice, such an exercise is made more difficult because of the coherence problem: As explained above, old reports rarely have good linkage between specific condition problems and their actual treatment proposals and treatments. One or the other half of the condition-action sequence is often missing or insufficiently related.

In summary, CDS-Documentation uses computer technology to greatly improve the accuracy and utility of our conservation records through database technology. It can handle conservation projects from the very smallest and simplest to the largest and most complex, using a few forms as building blocks. It automates many documentation tasks to save recording time, and it systematizes not only our documentation, but our perceptions. It helps us complete with consistency the full sequence of observation, judgment, and intervention—component by component.

Acknowledgements

The author thanks James F. Judson of Conservation Data Systems, LLC for making this concept a reality, and for publishing it for other’s use. Aspects of the CDS-D data structure are based on original work by Nicholas Waanders. Many of the program’s features are the result of suggestions from users, some of whom are on the staff of the Department of Conservation, Colonial Williamsburg Foundation.

Endnotes

2. The AIC Guidelines for Practice is published online at http://aic.stanford.edu/about/coredocs/coe/ (accessed on 7-10-2006).

3. The presentation was entitled “Houston, We Have a Solution: The Assessment, Documentation, and Treatment of the Saturn V Rocket Located at the Johnson Space Center” by Joe Sembrat, Patty Miller, John Pursley, and Jee Skavdahl, and presented by Joe Sembrat.

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