International Council on Archives (ICA) "Access to Memory" (AtoM): Open-source software for archival description. By Jessica Bushey

Abstract

This article discusses the development of the *International Council on Archives "Access to Memory" (ICA-AtoM)* open-source archival description software and presents an overview of the community involvement that drives this project forward. In December 2011, ICA-AtoM 1.2 was released with significant enhancements and a number of impressive new features that streamline archival workflow and enable repositories to launch their collections online with minimal cost and effort. Brief examples of the new features along with use cases of ICA-AtoM implemented as a multi-institutional portal and single repository instance are included to provide a sense of the software's flexibility and scalability. The author is a systems archivist with Artefactual Systems, the lead developer for the ICA-AtoM project, and is currently the ICA-AtoM Community Manager.

Genesis of ICA-AtoM

ICA-AtoM is an open-source archival description tool developed under the governance of the International Council on Archives. "ICA" indicates that the software incorporates descriptive standards published by the International Council on Archives and "AtoM" stands for "Access to Memory," which is demonstrated through the online interface that provides public and institutional access to the holdings of archival repositories.[1]

The project's initial impetus came from a 2003 ICA Committee on Information Technology report which established functional requirements for an "Open Source Archival Resource Information System" (OSARIS). Due to a lack of funding, OSARIS did not move forward. In 2005, the UNESCO Information For All Programme (IFAP) granted 45,000 Euros to the ICA's Human Rights Task Force to create an online guide to archival sources related to human rights violations. The symbiosis between the two projects was recognized and with approval from the ICA Secretariat the Netherlands Institute for Archival Education Research (Archiefschool) was given the responsibility for coordination and Peter VanGarderen of Artefactual Systems was hired to develop an open-source application for archives.[2]

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1 Former ICA Secretary-General Joan van Albada chose the acronym for "Access to Memory" as the software name. The "ICA" prefix is intended to raise awareness about the ICA and its activities. See Peter VanGarderen. "The ICA-AtoM Project and Technology, Presentation at Association of Brazilian Archivists, Third Meeting on Archival Information Databases, Rio De Janiero, Brazil. 16/17 March 2009. (p.16) accessible online: http://ica-atom.org/VanGarderen_TheICA-AtoMProjectAndTechnology_AAB_RioDeJaniero_16-17March2009.pdf
2 Peter Horsman was instrumental in coordinating the interests of the ICA Committee on Information Technology and

In early 2006, following an extensive technical analysis, the first two software prototypes (ICA-AtoM alpha release 0.1 and 0.2) were completed. Further funding provided by the World Bank Group Archives, the Dutch Archiefschool, the Direction des Archives de France, and the United Arab Emirates Centre for Documentation (CDR) and Research allowed continued development through 2008. ICA-AtoM 1.0, the first beta version of the software, was formally released at the ICA Congress in Kuala Lumpur in July 2008. The release was accompanied by a launch presentation, user workshops and an administrator workshop, the distribution of 1300 copies of the beta 1.0 demo on CD to Congress attendees, and the launch of an on-line demonstration version and the ICA-AtoM users discussion list. The 1.0 release was followed by the first round of formal beta testing by thirty institutions around the world on sites hosted by Artefactual Systems.

At this time, the ICA-AtoM Steering Committee was formed to provide the ICA-AtoM project with more stable governance to ensure the long-term sustainability of the software and its community of users, developers and sponsors.[3] The ICA-AtoM Project "Purpose and Values statement" was drafted to provide a cohesive vision of the software for the archival community and establish guideposts for future development.

The purpose of the ICA-AtoM Project is to provide free and open-source software:

1. that enables institutions to make their archival holdings available online, especially those who could not otherwise afford to do so,
2. that manages archival descriptions in accord with ICA standards
3. that provides multi-lingual interfaces and content translation features
4. that supports multiple collection types
5. that is fully web-based, user-friendly and follows accessibility best practices
6. that is flexible and customizable
7. that is useful to both small and large institutions alike, and
8. that supports single or multi-repository implementations.

UNESCO. Artefactual Systems is a technical service provider specializing in open-source software and technology strategies for archives and libraries. The software and documentation that Artefactual creates is released under free and open-source or creative commons licenses. See, http://www.artefactual.com

3 The current list of ICA-AtoM Steering Committee members is posted on the ICA-AtoM project website. See, ICA-AtoM Governance Model, accessible at: http://ica-atom.org/about.html#governance. The ICA-AtoM Steering Committee reports regularly to the ICA Executive Board. As the ICA Secretary-General and chair of the ICA-AtoM Steering Committee, David Leitch provides executive direction for the project while Artefactual Systems is the primary contractor, managing the day-to-day software development and user community support. Rob Mildren is the technical liaison between the ICA-AtoM Steering Committee and Artefactual Systems.

The values of the ICA-AtoM Project are to conduct its affairs in the spirit of open-source collaboration, including:

1. openly sharing technical expertise
2. promoting professional best practices
3. nurturing an active community of users and developers
4. leveraging existing open web technology to deliver best-of-breed archives software
5. providing solutions to organizations with limited financial and technical resources
6. engaging active participation from organizations that have the necessary financial and technical resources
7. providing a common ground for cross-discipline collaboration with related communities
8. generating revenue to support ICA-AtoM and other ICA activities through a business model that benefits from widespread ICA-AtoM adoption.

After several more beta releases, a technical audit by the ICA, scalability testing by Library and Archives Canada and focus group usability testing in Vancouver and Toronto, the first production version of ICA-AtoM (release 1.1) was launched in November 2010. The key features of the software were: standards based design, support for hierarchical description, multilingual interface and database content, persistent permalinks to resources and standardized import and export for descriptions and authority records. The response from the archival community was overwhelmingly positive and prompted archival organizations to provide additional funding and technical expertise (in the form of code contributions) to develop more features and increase system functionality. In December 2011, ICA-AtoM 1.2 was announced and the Archives Association of Ontario announced their upgraded online gateway to archival holdings in Ontario, Archeion (Ontario's Archival Information Network) which is running on ICA-AtoM 1.2 and presents the new Trillium theme. The most recent round of funding and code contributions have been provided by the City of Vancouver Archives, the Archives Association of Ontario (AAO) and the Saskatchewan Council for Archives and Archivists (SCAA). The ICA is preparing an ICA-AtoM strategy for Executive board review at the 2012 ICA Congress and Artefactual Systems continues to be the lead developer of the software. As of June 2011 there were approximately 150-200 institutions worldwide running ICA-AtoM.[4]

4 To review a shortlist of ICA-AtoM users. See, http://ica-atom.org/doc/ICA-AtoM_users. After the release of the production version of ICA-AtoM, Artefactual began offering a paid hosting service. For $125 per month, an institution's ICA-AtoM instance is hosted on Artefactual Systems servers and made available to an unlimited number of users. The

Open-source Application

The ICA-AtoM application is based upon Qubit, a generic information management toolkit developed by Artefactual Systems.[5] The architecture of Qubit is explained on the ICA-AtoM website in the section about the software code, but essentially it is built using open-source web-based tools.[6] The Qubit license for release 0.6 – 1.1 was under GPLv2 (GNU General Public License) and now release 1.2 is under AGPLv3 (Affero GPL).[7] In general, the licensing is designed to give people freedom to use the software (e.g., available free to download from the Internet), give the freedom to distribute copies of the software, offer the source code with the program or make it easy to locate (e.g., available through a public wiki page), give the freedom to use part, or all of the software, or change pieces of it and develop a new free program. The ICA-AtoM Project uses and contributes to Qubit, and anyone that is unsatisfied with ICA-AtoM can access the Qubit code and develop, customize, theme, and brand their own web-based collections management application.

In the case of ICA-AtoM, developers can download the Qubit source code from the project wiki and change it. Developers are encouraged to share their changes by submitting them back to Artefactual Systems as a "patch". The patch will be reviewed and if it is compatible and provides an enhancement or useful new feature it will be accepted into Qubit. Twice a year, ICA-AtoM source code is merged with Qubit trunk and released as the next version of ICA-AtoM. By developing the software in this public, collaborative manner the archival community has the opportunity to become directly involved in adopting and customizing ICA-AtoM for their own use and the benefit of others. As a result, costs associated with launching archival collections online are reduced and professional capacity is

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service includes free upgrades, daily geo-remote backup (Vancouver and Toronto), release upgrades and 10 GB of digital object storage. Additional digital object storage, legacy data migration, customization and new feature development are offered as paid services. See, http://artefactual.com/ica-atom.

5 A detailed explanation of Qubit is available here: http://code.google.com/p/qubit-toolkit/

6 Qubit toolkit, "The software code" http://ica-atom.org/code.html

7 In general, GPL protects the authors rights, and offers the license to give legal permission to copy, distribute and modify the software. http://www.opensource.org/licenses/gpl-2.0.php General Public Licenses does allow developers and authors to charge fees for distributing software. See, What is free software? http://www.gnu.org/philosophy/free-sw.html. AGPLv3 is based on GNU GPL and is approved by the Open Source Initiative as an open source license. For a description of the GPLv3 Affero see, http://www.gnu.org/licenses/agpl-3.0.html

increased.

Open-source software may be free to download, but it should be noted that there are secondary costs and responsibilities associated with installing and maintaining any system. The total cost of ownership is considerably lower for an open-source system vs. a proprietary system; however, each organization must do its own cost-benefit analysis before making a choice between proprietary or free, open-source software. Support for ICA-AtoM is offered by Artefactual Systems through extensive user documentation; maintaining requirements; managing bug fixes (i.e., flaw in the program or system that causes an unexpected result); enhancement and new feature development; answering technical questions posted to the user forum; facilitating community-wide upgrades to the latest software releases; and providing knowledge transfer through discussion lists, wikis, training workshops, online tutorials and conference proceedings.[8]

The ICA-AtoM Project's approach to making all documentation and development activities available to the public is one which engages users in working towards solutions.[9] A typical wiki page for a feature under development will provide a use case or rationale for the feature, requirements sources (such as descriptive standards or system specifications), a detailed workflow analysis, a list of functional requirements and/or usability interface mockups.[10] Requirement design notes are posted live and publicly on one of the project wikis and further discussed through the discussion list. Development documentation pages and development issues are grouped together and tracked on a releases page, which includes release documentation and roadmaps for past, current and future releases.[11] In addition to development documentation, there is a comprehensive user manual, updated with each new release and complete with glossaries and screenshots.[12] By doing so, a relationship is created between ICA-

8 The detailed and usable documentation is released under Creative Commons Attribution-Share Alike 3.0 Unported license. See, http://creativecommons.org/licenses/by-sa/3.0/ The ICA-AtoM wiki page with tutorials designed for individual use and training workshops are available for download. See, http://ica-atom.org/doc/Tutorials

9 Users can download the software, review the documentation and user manual, find the source code and participate in the User Forum and Issues list via links found on the ICA-AtoM Homepage, http://ica-atom.org/

10 See for example, Accession Record requirements http://qubit-toolkit.org/wiki/index.php?title=Accession_module

11 http://qubit-toolkit.org/wiki/index.php?title=Release_1.2

12 http://ica-atom.org/doc/User_manual

AtoM users, systems archivists and software developers which builds sustainable knowledge, capacity and technological autonomy within the archival community.

Standards Based Design

ICA-AtoM 1.2 features hierarchical archival description using *General International Standard Archival Description (ISAD[G])*, *Dublin Core* and the *Canadian Rules for Archival Description (RAD)*; authority records based on *International Standard Archival Authority Records (ISAAR[CPF])*; archival repository records based on *International Standard for Describing Institutions with Archival Holdings (ISDIAH)*; describing functions using *International Standard for Describing Functions (ISDF)*; hierarchical thesauri and import and export using *Encoded Archival Description (EAD)*, and *DC XML* (for archival descriptions), *Encoded Archival Context EAC* (for authority records) and *Simple Knowledge Organization Systems (SKOS)* (for thesauri).[13] The ICA-AtoM Project believes it is important to highlight the use of standards in archival description software in order to produce more consistent data and improve workflow.

To further assist archivists in creating standards compliant descriptions in ICA-AtoM, tooltips (i.e., online text designed to assist users to enter data in the edit templates) are provided. In usability testing the tooltips feature is praised by archivists that are unfamiliar with the rules related to specific elements in the ICA standards. Tooltips are just one example of how ICA-AtoM can support the creation of consistent and robust archival description.

Criticism of ICA-AtoM's design based on standards is that the software does not support non-standardized information and the process of migration from a legacy database to ICA-AtoM poses a risk of losing this type of contextual information about the records. However, in practice, database fields that fall outside of a standard are typically created ad hoc by individuals using the system for a specific purpose for a limited period of time. The migration process is an opportunity for repositories to

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13 All the standards supported by ICA-AtoM are listed here: http://ica-atom.org/doc/Descriptive_standards

gain a greater degree of control over their descriptive data and streamline their database fields to

comply with international standards for description. Additionally, the use of standards for description

combined with features for exporting archival descriptions and authority records as EAD and EAC

result in the exchange and re-use of archival information at the click of a button.

ICA-AtoM 1.2 Release

"Release early and release often" is one of the credos of the open-source and web application

community.[14] Artefactual Systems has taken this to heart and embraces agile software development, an

iterative process that evolves through collaboration and quick release cycles. A key component of this

approach is having systems archivists work closely with the software developers to perform intensive

and iterative functional testing, identify bugs in the application, report the issues to the public list and

verify the fixes once completed. With each release the software incorporates new features aimed at

streamlining archival workflow and contributing to contextually rich archival description. The newest

release, ICA-AtoM 1.2, launched in December 2011 includes an accession module, advanced search,

global search and replace, a rights module, bulk XML import and reports. During the past year,

usability analysis work undertaken by Artefactual Systems identified areas for improvement in

navigation and user-interface layout, which led to the development of a new theme, entitled Trillium.

The Trillium theme is a fluid width layout, based on the Twitter "Bootstrap" framework, that presents a

dramatically different look and feel to ICA-AtoM.[15]

The newest release is available for download from the ICA-AtoM website, but users can test the

software first by experimenting with the online demo version.[16] The online demo is a fully-featured

copy of the application which grants users full administrator privileges for testing the entire capability

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14 The original quote is: "Release early. Release often. And listen to your customers." Eric S. Raymond, "The Cathedral and the Bazaar" 1997. http://www.catb.org/~esr/writings/cathedral-bazaar/cathedral-bazaar/ar01s04.html

15 Usability testing was performed in Toronto and Vancouver. See, Usability testing http://artefactual.com/wiki/index.php?title=AA0_%26_Vancouver_ICA-AtoM_Usability_Testing

16 Demo version available at: http://ica-atom.org/demo/

of the application. The demo website refreshes every hour to default settings and with sample data so that users have something to work with and any major alterations do not hinder others.

The following screenshots and text introduce a selection of new features included in ICA-AtoM 1.2:

Add ▼   Manage ▼   Import ▼   Admin ▼

View accession record

2011-12-01/5

Accession number	2011-12-01/5
Acquisition date	2009-7-14
Source of acquisition	Fonds was donated by Emily Wordsworth, former Special Collections Archivist at the University of Crawford, ca. 2009.
Location information	Archives main storage, aisle 04, shelf B.

Donor/Transferring body area

Related donor	Wordsworth, Emily
Contact information	**(Primary contact)** **Address** 88 Nelson Avenue Vancouver Canada V2C R6T **Email** archivist@crawford.com

Administrative area

Acquisition type	Gift
Title	Madeline Chang Fonds
Creators	○ Chang, Madeline
Scope and content	Fonds consists of photographs belonging to Madeline Chang, dated 1960-1985. The colour photographs document the travels of Madeline Chang and her younger sister, Evelyn Chang.
Physical condition	Excellent condition.
Received extent units	300 colour photographs
Processing status	Complete
Processing priority	Medium

Rights area

Related right	**Act** Discover **Restriction** Allow **Start date** 2011-12-1 **Basis** Policy

Information object area

Information object	Madeline Chang Fonds

Edit   Delete   Deaccession   Create Archival description

Accession Module

ICA-AtoM 1.2 provides an accession module designed to assist archivists in establishing basic intellectual and physical control over a new accession at the time it is received by the repository. By creating an accession record, information is recorded in ICA-AtoM about he accession transaction, the

contents of the accession and management events related to the accession. Permission to view, create, edit and delete an accession record is limited to authenticated users with log-in privileges. The accession record is not aimed at end-user description, such as a finding aid for the repository's archival resources. As part of the archival workflow, the accession module edit template includes donor contact information and a rights module to capture copyrights, licensing, statutes and policies that may restrict access to the associated records. After creating the accession record, a simple click of a button allows the archivist to deaccession the whole or a part of the accession, or create an archival description from that accession, inheriting data already entered into the title, creator name, archival/custodial history, scope and content, and physical condition fields.

Advanced Search

In ICA-AtoM 1.1 the basic search box allowed users to search using natural language and sophisticated boolean or proximity search criteria. ICA-AtoM uses the Zend Lucene search engine and

ranks results based on where the search term appears in the record. For example, hits in the title, creator and access point fields are ranked higher than the archival history field. Now, in ICA-AtoM 1.2 the basic search box has been supplemented with an advanced search feature. This new feature allows the user to search for terms in specific fields including title, scope and content, biographical history and access points. Additional advanced search functionality is provided by a series of filters, which allow users to narrow their results according to criteria such as a specific repository, media type or available digital objects.

Global Search and Replace

In ICA-AtoM 1.2 a *Global Search and Replace* feature is now available to Users with Administrator privileges only. With this powerful new feature, a user can search the archival descriptions for a keyword or phrase by utilizing the advanced search interface and then replace the selected word or phrase with a case sensitive change, a different spelling or an entirely different word.

The emphasis on global means that the replace will take effect in all records that fall within the context of the search. Prior to implementing the changes, ICA-AtoM cautions the user and requires confirmation to proceed with making the changes.

Donor Module

The ability to add donor names and contact information into ICA-AtoM and link them to an accession is another new feature in release 1.2. With the donor dialog in ICA-AtoM, archival repositories can link one or more donors to their related accessions and manage contextual information such as donor addresses and donation histories all within one application.

Rights Module

The addition of a Rights management module in ICA-AtoM 1.2 provides archivists with the ability to link associated rights to accession records, archival descriptions and digital objects. A user-friendly rights dialog with menus and drop-down lists enables users to record the intellectual property rights, license, statutory right, donor restrictions and/or policy that pertains to archival materials in the custody of the repository. The Rights management module is designed to indicate permissions granted (i.e., allow) to the repository and the prospective end-user and restrictions (i.e., disallow) imposed on the use of archival materials.The module contains fields to identify the rights holders and their related contact information. The rights elements in ICA-AtoM reflect PREMIS metadata elements.[17]

17 Preservation Metadata Maintenance Activity (PREMIS) http://www.loc.gov/standards/premis/

Use Cases

MemoryBC (British Columbia Archival Union List)[18]

In August 2008 Artefactual Systems undertook a data migration from the Archives Association of British Columbia's (AABC) custom-designed database to ICA-AtoM. Key reasons for the switch were the lack of support for hierarchical description and digital object upload in the existing system, as well as unsustainable maintenance and upgrade fees. ICA-AtoM provided the missing functionalities along with EAD import/export capabilities, a multilingual user interface and support for translation of descriptions into multiple languages.

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18 The British Columbia Archival Information Network, "Memory BC" has not upgraded to 1.2 yet; however, there 1.1 site is live and located at: http://memorybc.ca/

The project consisted of migrating the existing data from the old system to an ICA-AtoM instance hosted by Artefactual Systems, assessing the functionality and performance of ICA-AtoM in the context of large volumes of data, and testing the ability to manage import/export and direct data-entry by participating union list institutions. The project also involved development of the custom "Columbia" theme for what would become MemoryBC.

After a migration of ca. 17,000 records the system went live in August 2009. The launch was accompanied by a series of workshops provided throughout the province by Artefactual Systems and AABC Education Coordinators. MemoryBC continues to be hosted by Artefactual Systems, while institutional support and coordination of the 183 repositories that contribute descriptions to MemoryBC is provided by the AABC.

AAO, Archeion Network

In 2010 the Archives Association of Ontario (AAO) hired Artefactual Systems to upgrade its Archival Information Network (Archeion), a publicly available, bilingual online gateway to descriptions of archival records located in repositories throughout Ontario. The immediate issues were a legacy server at risk of failure, software that did not support multi-level descriptions or digital object upload, and system architecture with limited scalability.

In the first phase of the project, Artefactual Systems exported 7,000 archival descriptions from Archeion's existing server and migrated them onto Artefactual System's server, to be accessed through Archeion's customized ICA-AtoM interface. While Artefactual developers were working on the migration process, AAO and an Artefactual systems archivist conducted usability testing of the ICA-AtoM 1.1 software at the University of Toronto to identify end-user issues as they relate to the effectiveness and usability of the application. Documentation of the usability testing study, its findings and future feature developments were made available on the Artefactual wiki.[19]

In the second phase of the project, Artefactual launched the new Archeion Network, which is based on a customized theme "Trillium" and incorporates a new user interface derived from the usability study and functional requirements identified by AAO.

City of Vancouver Archives

In 2010 the City of Vancouver Archives hired Artefactual Systems to improve the way they accessed, managed and preserved their archival descriptions and born digital materials. The City of Vancouver Archives (CVA) is responsible for permanently preserving archival records created by the city of Vancouver and for acquiring the archives of private individuals and organizations. Artefactual Systems responded with a two-tier software solution, ICA-AtoM (for archival description and collections management) and Archivematica (for OAIS-compliant digital object preservation). After a series of meetings with key stakeholders at the City of Vancouver and a usability testing session,

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19 Usability testing and analysis available on the Artefactual Systems wiki, http://artefactual.com/wiki/index.php?title=AA0_%26_Vancouver_ICA-AtoM_Usability_Testing

Artefactual Systems and the City of Vancouver Archives identified new features for development and release in ICA-AtoM 1.2.

In November 2011 digital archivists at the City of Vancouver Archives performed extensive data clean-up of their existing databases in preparation for migrating over 214,000 records and uploading 70,000 digital objects. As mentioned earlier, the challenge of ICA-AtoM design based on standards is that non-compliant fields in legacy databases must be addressed prior to migration, otherwise this data will be lost. The month prior to the launch of CVA's new website, all existing archival descriptions held in databases at the CVA will be migrated into ICA-AtoM. Once all the archival descriptions and authority records are migrated, the digitized access copies of photographs, moving images and audio recordings will be uploaded into ICA-AtoM and linked so that users can have online access to the complete holdings. In early 2012 the City of Vancouver Archives will launch ICA-AtoM 1.2 as their online access system to their archival holdings and digitized surrogates.

Future Developments

Now that ICA-AtoM 1.2 has been successfully launched, the focus will turn to providing technical support via the user forum, updating the online User Manual and beginning development work on release 1.3 (scheduled for Spring 2012). Future features being developed with funding from the Canadian Council of Archives and National Archief of the Netherlands are aimed at enhancing search capabilities further by integrating faceted searching and developing a mobile friendly interface to ensure users can access and search archival collections on a variety of handheld devices. As demonstrated earlier in this article, ICA-AtoM development is driven by the needs of the archival community. By embracing standards and engaging with an open-souce model, the ICA-AtoM Project is the best method for developing and improving the highest quality technology for archival repositories.