The CARM2 Print Repository: from planning to operations

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Abstract:
CAVAL is an Australian library consortium that provides a range of services to member libraries and other customers in the region. A key service is the management of the CARM (CAVAL Archival and Research Materials Centre), a purpose-built, high-density, environmentally controlled storage facility designed for the long-term storage and preservation of print materials. The initial module, CARM1, began operations in 1996 and filled to capacity over a ten year period. In 2007 a feasibility study projected future unmet demand from existing members of around 67 kilometres of high-density shelving space over a 20 year period. To meet this demand for the storage of low-use paper-based research storage, CAVAL has now built a second storage facility, CARM2, with a capacity of 62 linear kilometres of library-like storage for a capital cost of $AUD14 million.

The planning for CARM2 commenced with a review that assessed options available to CAVAL member universities for the long-term storage of print material. This review analysed alternative storage solutions (for low-use material) from the perspective of potential users (i.e. universities) to assess the financial and non-financial impacts associated with the options. The results provided an indicative evaluation of alternative storage options compared to CARM taking into consideration the quantitative, qualitative and risk implications of each option from the perspective of a potential user. A range of options were considered, including a Base Case of ‘Do nothing’; the option to digitise and discard all low-use materials, options to build on-campus storage facilities and to contract a commercial storage provider. It was concluded that the CARM2 option is a competitive option for the storage of low-use research materials because a lower initial capital outlay is required compared to the purpose-built options, with no additional library resources; the facility provides the qualitative needs for a user of a low-use storage facility and set-up and operational costs to the user appear to be minimised.

This paper will describe the development and implementation of the business model for CARM2, the impact on the design and funding model, the lessons learned from the management of the original CARM facility and the construction and commissioning of CARM2. It will also discuss the ongoing issues associated with the ownership and governance of the shared facility and the trends away from the shared collection model.
CAVAL is an Australian library consortium that provides a range of products and services to member libraries and other customers in the region. Established in 1978, CAVAL is owned by 11 universities in the states of New South Wales, Tasmania and Victoria. CAVAL’s vision is to anticipate, offer and develop services in partnership with university libraries to support the integration and access of information resources for teaching, learning and research. Cost effective and collaborative library support services are provided through economies of scale, scope and expertise.

The CARM Centre
The CARM (CAVAL Archival and Research Materials) Centre is a purpose-built, high-density, environmentally controlled print repository designed for the long-term storage and preservation of print materials. A print repository is a form of storage that brings together low use items from a number of libraries in a secure environment where they can be stored for perpetuity. Items are made available to researchers through the inter-library loan system, with material delivered ‘digital to desktop’ wherever possible (Jilovsky & Genoni 2008).

The Centre is located on the Research and Development Park of La Trobe University in Bundoora, a suburb of Melbourne, Australia. The facility commenced operations in 1996 and over the next decade the storage space in what is now known as the CARM1 module filled almost to capacity. This collection is now known as the CARM Shared Collection, as the depositing libraries have ceded ownership to the CAVAL consortium (O’Connor & Jilovsky 2008). Funded jointly by the majority of CAVAL members, the Australian Government and the Victorian State Government on behalf of the State Library of Victoria, it was envisaged as a cost-effective solution to ensure the retention of a ‘last copy’ of lesser-used items from the member libraries.

In 2007 a feasibility study projected future unmet demand of around 67 kilometres of high-density shelving space over a 20 year period (Hincks 2007). To meet this demand CAVAL has since added a second module to the CARM Centre, known as CARM2, with a capacity of 62 linear kilometres of library like storage for a capital cost of $AUD14 million.

Planning for CARM2
As CAVAL staff began to explore the specific needs of member libraries for a CARM2 module, it was apparent that the universities themselves had entered a more competitive environment and were less willing to contribute to a shared facility which benefited all members. In addition, accounting practices and institutional policies had changed so that the larger universities were now unwilling to cede ownership of items to a shared last copy repository, preferring to retain ownership of library materials even if they were stored off-site.

Extensive consultation with stakeholders was undertaken throughout 2007. CAVAL staff and the CARM Centre Advisory Committee reviewed international best practice for the long term storage of library materials and considered the opportunities for change to policies to ensure that CARM2 would better meet individual library and consortium needs. The purpose of the building was clarified and specific design elements were considered and agreed on through a Value Management Workshop. The outcomes of the many discussions and consultations were incorporated a Design Brief.

Lessons learned from CARM1
CAVAL’s practical experience from 15 years of managing the CARM Centre provided the starting point for planning CARM2. The lessons learned included

- the height of doors and lift access dimensions had limited the ingress of art and museum objects into CARM1; CARM2 dimensions were all increased
although the original plan for CARM1 had been to adjust shelf heights as needed, in practice the shelves were difficult to adjust without specialist tools and strength; CARM2 shelves were designed to be adjusted by CAVAL staff.

- the loading bay was too small and assumptions that deliveries would be made by smaller trucks had proved wrong; therefore modification of the roller door height and depth of entry was documented as a mandatory requirement for CARM2 and in order to meet current health and safety best practice a dock leveller was included.

- the receipt and processing areas of the original building were cramped and divided into several small workrooms; the design brief specified enlarged new spaces suitable for the efficient and safe flow of materials for both CARM 1 and CARM 2.

- there is no sprinkler system in CARM1, a VESDA (Very Early Smoke Detection Alarm) system was sufficient to meet the fire regulations at the time of its construction; fire engineering advice was that this would not be the case for CARM2; therefore a minimum six metre separation between CARM1 and CARM2 and a fire wall between the loading bay and CARM2 would be needed.

- the CARM1 shelving system had been designed for the storage of high-density library materials sorted and boxed by size; in order to better reflect market demand and income opportunities the CARM2 shelving specification articulated greater flexibility, particularly for the ingest and storage of books in 'library-like' sequences.

- the CARM1 lighting system was turned on and off by switches; the lighting for CARM2 specified movement controlled sensors for increased efficiency.

- the CARM Centre had been designed for 15 to 20 staff, growth of other CAVAL business activities plus the expected CARM2 operations would increase numbers to around 50 staff; therefore the design brief incorporated streamlined office accommodation and revised requirements for toilets, car-parking and staff amenities.

The CARM2 Business Model

It became clear that although several CAVAL members had an urgent need for additional space, the others did not and that there was little opportunity for external funding to construct CARM2. Therefore a new business model was needed in order to make a case to those member libraries with the greatest need. In 2008, CAVAL commissioned a study to demonstrate the cost benefit of using a shared off-site facility for the long-term storage and preservation of little-used publications. This study (Ernst and Young 2008) examined nine possible options for a university library with a need to reduce onsite legacy print collections. Each option assumes 586,000 volumes stored over a 10 year period.

<table>
<thead>
<tr>
<th>Option</th>
<th>Financial Impact: (total cost in nominal terms) over a 10 year period</th>
<th>Preservation outcome</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do nothing</td>
<td>$1,119,000</td>
<td>Poor</td>
<td>Very High</td>
</tr>
<tr>
<td>2. CARM2 Upfront commitment</td>
<td>$6,297,000</td>
<td>Excellent</td>
<td>Low</td>
</tr>
<tr>
<td>3. CARM2 without pre-commitment</td>
<td>$8,227,000</td>
<td>Excellent</td>
<td>Low</td>
</tr>
<tr>
<td>4. Build new library on campus</td>
<td>$9,628,000</td>
<td>Good</td>
<td>Moderate</td>
</tr>
<tr>
<td>5. Digitise collections</td>
<td>$58,116,000</td>
<td>Excellent</td>
<td>Moderate – High</td>
</tr>
<tr>
<td>6. Retro-fit on-campus library for medium to high density storage</td>
<td>$4,948,000</td>
<td>Good</td>
<td>Moderate</td>
</tr>
<tr>
<td>7. Re-fit existing off-site university-owned building for medium to high density storage</td>
<td>$8,417,000</td>
<td>Good</td>
<td>Moderate – High</td>
</tr>
<tr>
<td>8. Purpose-built off-site medium to high density storage facility</td>
<td>$5,233,000</td>
<td>Good</td>
<td>Moderate – High</td>
</tr>
<tr>
<td>9. Contract for storage with commercial provider</td>
<td>$3,066,000</td>
<td>Poor</td>
<td>Very High</td>
</tr>
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</table>
This established that over a 30 year period, a university library would have the best outcomes if it participated in a shared off-site facility, either as an upfront investor, or as a lessee of space in a shared facility like the CARM Centre, especially if receiving member discounts.

1. The CARM2 option (whether based on an on-going annual rate or up-front capital contribution) is a competitive option for the storage of low-use research materials. The primary reasons for this are:
   • the use of the facility requires a lower initial capital outlay for the set-up of the storage facility compared to the purpose built options, nor is there a need to source additional library resources to monitor and catalogue research materials;
   • the facility provides the preservation needs for a user of a low-use storage facility; and
   • set-up and operational costs to the user appear to be minimised.

2. The purpose built and re-fit options appear less attractive due to:
   • the relatively high cost of developing or refurbishing a purpose built facility for the sole use of a single University;
   • the need to source resources to process, catalogue and monitor low-use research materials by the Universities;
   • the opportunity costs associated with developing on campus; and
   • the risks to the Universities associated with the development period may be too high given the purpose of the facility is not a core tertiary service, but rather a key requirement of tertiary libraries.

3. While the digitisation option does appear to be a costly resource intensive process, the future unidentified cost savings (beyond the cost of retrieving materials which were identified as a financial saving) and additional services offered in a digital environment do make this option attractive. Alternatively, the impact of permanent loss of material research volumes need to be considered by the Universities, particularly for books which may hold some research value as an artefact (Ernst & Young 2008).

A proposal was put to CAVAL members for a shared facility with provision for separately leased and licensed space within the facility, managed by CAVAL but permitting each library to retain ownership and control of its off-site collections. This model allowed for ‘library-like’ shelving for medium density storage of library volumes in shelf order similar as per standard library shelving. Materials would be stored in double rows but maintaining sufficient browsing and retrieval access. An added benefit of this model was that no pre-processing would be needed. Feedback from libraries was that the cost of processing items ingested into the CARM Shared collection had been inhibiting, and that academics preferred to retain the capability of being able to physically browse collections.

Member libraries making the upfront contribution to the CARM2 project were offered long term discounts on annual maintenance fees so that the average cost to store a volume in the CARM2 space was calculated at between $0.50 and $0.80 per annum depending on the choice of configuration (high or medium density respectively). Subsequent lease or licence arrangements would also offer ‘library-like’ storage at the member rate and more commercial rates for non-members. Libraries could still opt to pay CAVAL to process (de-duplicate, re-catalogue, sort and re-box) items to deposit in the CARM2 facility which would enable higher density storage.

**Design and Funding of CARM2**

A project architect (H2O, a local Melbourne company http://www.h20architects.com.au) was selected in mid 2007. The design team began by reviewing and validating the design brief and developing preliminary costings. The supplier of the shelving system (Dexion http://www.dexion.com.au/) was selected through a formal tender process, and the Dexion engineers worked closely with the design team worked from this point on.
At the same time discussions with member libraries and other agencies regarding their interest in leasing of space for collections such as museum and gallery items continued. Monash University, the University of Melbourne and RMIT University indicated their interest in becoming Contributing Partners (licensees). In August 2008 agreement was reached with these three institutions and legal agreements were drawn up; in exchange for a contribution to the capital costs of CARM2 each institution would receive ‘reserved space for a long term lease of ‘library-like’ storage. Extensive consultation with and a high level of communication with the university librarians and the financial, property and legal offices of each contributing university was a key factor in the successful outcomes of this process.

At this time La Trobe University raised concerns about the presence of a protected tree on the site. As a consequence it was necessary to re-site the CARM2 module and the layout of the building and shelving were re-designed to incorporate a connecting corridor and some minor changes to the Administration area. The project had been paused whilst the business case was then re-worked to re-determine the viability of the project. The new option provided for a slightly increased capacity and the model was deemed to be still viable over the 30 year term. A decision was made to leave one quarter of the CARM2 facility initially un-shelved, so that this ‘void’ space could be used for shorter-term storage of museum and art collections. Work on the revised design continued during the second half of 2008, and in December approvals from La Trobe University and the local authorities were received enabling the preparation of tender documentation.

Five building companies responded to the tender for the construction of CARM2, and it was awarded to St Hilliers’ Contracting Pty Ltd. The timing of the building contract resulted in savings due to the small number of competing projects during the global financial crisis. The total price was significantly below the pre-tender estimate. The total cost of $AUS14 million included contingencies and consultancy fees, of which $AUD1.6 million had already been paid by CAVAL.

**Construction and commissioning of CARM2**

Construction commenced in July 2009. During the construction period a number of variations to the building contract were considered, costed and authorised. These works ranged from minor changes such as the provision of additional site access to critical issues such as further investigation of the foundations for the existing Administration building.

Other costs included in the project budget were enhancements to the CARM computer systems. In particular the 15-year old CARM Tracking system was de-commissioned following data migration to the Ex Libris Aleph Library Management System. The Aleph system was further enhanced and extended to enable the capacity to manage and retrieve items stored in call number (‘library-like’) sequences within the CARM2 storage areas. Some refurbishment of the existing Administration Building to accommodate the new Loading bay, the relocated Entry and extended Meeting rooms along with associated furniture and fittings was undertaken and new security and telephone systems were installed to service the extended facility.

The CARM Centre Advisory Committee and CAVAL staff worked together on the development and enhancement of handling procedures and protocols for the storage of items in CARM2 and the potential extension of the CARM Shared collection into CARM2. Workflows for the deposit and handling of materials in both CARM1 and CARM2 were reviewed by an ergonomicist before specifications for desks and trolleys were finalised.

During the construction phase regular tours and promotional visits to the site, and later to the new facility were organised. This ensured that all stakeholders, staff from member libraries, potential customers and business partners as well as interested colleagues were involved in
the project. In addition photographs documenting construction progress were made available on the CAVAL Intranet and through a CAVAL Facebook site.

The handover and implementation phase incorporated training for CAVAL staff on the operation of services such as air-conditioning, security, lighting, fire and emergency services and the safe usage of the shelving system. Practical Completion of the CARM2 facility was achieved on the 27 October 2010. Following this the building contractor provided ongoing maintenance, rectification of defects and assistance through the warranty period of 12 months.

Although the construction ran over time due to poor weather during the early stages and other delays due to the necessary rectification of some minor design issues, the project was completed under budget. There were some last minute issues with the sprinkler system which had to be rectified to satisfy building occupancy requirements. A satisfactory outcome was negotiated and implemented.

The first materials were deposited into CARM2 by RMIT University on 3rd November 2010, and on 3 December, Stage 2 of the CARM Centre was formally opened by Senator the Hon Kim Carr, Minister for Innovation, Industry, Science and Research.

The completed facility features tight environmental controls to ensure the long-term preservation of stored materials. The air inside CARM2 is maintained at 20°C (±2°C) and 48% (+–5%) humidity, and it is designed to maintain these conditions for a minimum of 24 hours in the event of a total loss of power. The building is essentially a highly insulated box that doesn't leak, with extra thick insulation in the walls, roof and beneath the concrete slab. Upon completion, the whole building was pressure-tested to pinpoint leaks. The exterior of CARM2 features a translucent facade in acrylic and metal panels that softens its appearance and helps it to blend into the leafy setting on the La Trobe University campus.

**Issues and Trends**

After one year 20% of the shelved space in CARM2 had been taken up and the ‘void’ space almost fully leased for the storage of art and museum collections associated with member universities. In order to ensure that the shelving space that is not allocated to the Licensees brings in sufficient additional revenue to repay the loan a business development specialist has been engaged to market the facility and lease the space. Although at this point in time the take-up of space is slower than expected, the core funding over the long-term is assured by the accrued contributions from the contributing CAVAL members and provides two thirds of that funding for the next 30 years.

CAVAL provides inter-library loan and document delivery services from the CARM Shared Collection and from the collections of member libraries for which ownership has been retained. The retrieval rate is less than 1% per annum from the CARM Shared Collection and around 3% per annum for the ‘self-owned’ off-site collections.

The study by Lizanne Payne suggested that high-density storage facilities have moved into the mainstream for collection management in academic libraries, at least in the United States. She urged academic and library communities to leverage their collective capacity to develop a broader, system-wide approach to maintaining print collections across institutional boundaries. Further she suggests that the benefit of ‘last copy’ storage at shared facilities, such as CARM, are the extension of the capacity while reducing unintended duplication (Payne 2007).

In Australian academic libraries practices and policies around continuing to build and maintain print collections in a digital age are changing rapidly. Some aim for a ‘steady state’
collection, where equal numbers are discarded as are added and others assume that there will be a copy somewhere else, either print or electronic (Anderson 2012). With the focus on digital collections there is a reluctance to commit to long-term storage of physical items.

A number of environmental factors influenced the preference of CAVAL member libraries for a CARM2 business model that provided shared space and infrastructure but ownership of the collections stored being retained by the individual libraries. These factors included academic staff viewing research material being removed to off-site storage as a diminution of library services, the inclusion of the value of library collections on university balance sheets and the size of physical/print collections being a key component on some university ranking systems.

As a consequence discussions on the possible extension of the CARM shared collection into CARM2 have not progressed. Instead policies have been reviewed and made more flexible e.g. libraries are now able to trade their allocations in CARM1. Nonetheless the shared infrastructure continues to provide economies of scale and other benefits. The success of the construction project was a combination of shared expertise - CAVAL’s experience in operating a print repository, good partnerships with experts in other fields (architects, engineers, project managers, builders, shelving specialists) and the continuity of personnel and expertise over the length of the project (Wright, Jilovsky, Anderson 2012).

A number of studies investigating the overlap and duplication across collections have been undertaken in recent years. In Australia Paul Genoni has documented several of these which include the CARM Shared Collection and the collections of CAVAL member libraries, his most recent study endeavours to better understand the distribution of legacy print material across Australian academic and research libraries (Genoni & Varga 2009) (Genoni & Wright 2011).

It is expected that there will be a significant reduction in costs over the long-term if libraries choose to retain legacy print in off-site and shared facilities. CAVAL modelling to date estimates the average cost per volume per annum to store items in the CARM Centre Shared Collection to be approximately AU60 cents. This includes amortised annual costs including depreciation, staffing and contribution to overheads. The average annual cost per item in a ‘self-owned’ collection in CARM2 is lowest for material stored in high density for the long term e.g. AU50 cents over a 30 year period; for leased space in medium density configuration the cost is estimated to be AU90 cents per item per year. These estimates are comparable to the costs established by the ReCAP group of libraries in the United States and reported by Constance Malpas at CAVAL in October 2010 (Malpas 2010). The cost per volume per annum of items in on campus library collections has been documented as $US4.25 (Courant & Nielsen 2010).

Now that the CARM2 facility is in use the focus has turned to ensuring that the CARM Centre as a whole is operated efficiently and that all costs are monitored and controlled. The benefits of long term storage are continuing to be marketed to members and other universities, and opportunities for short term storage contracts promoted to government agencies, corporate entities and cultural institutions. Additionally ancillary services such as digitizing and copyright permissions that enhance the supply of off-site storage for future needs of members and clients are being further developed.
References


Wright, Janette, Cathie Jilovsky & Craig Anderson (2012). The story of a shared last copy repository in Australia: The CARM Centre Stage 2 Development. Collection Management 37 (3-4).