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The story of a shared last copy repository in Australia: The CARM Centre
Stage 2 Development

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The CARM (CAVAL Archive and Research Materials) Centre in Melbourne was developed in the mid nineteen-nineties by CAVAL Ltd, a not-for-profit cooperative owned by a group of university libraries in Victoria, Australia. The original CARM vault was developed to provide a shared last copy repository for low-use published materials and when this facility approached capacity in 2006, CAVAL commissioned a market assessment of the demand for off-site library storage over the next 30 years. In 2007 CAVAL began planning the development of Stage 2 (CARM2). This article describes how a new business model was developed and implemented, the impact on the design and funding model and the lessons learned from the management of the original CARM vault and the construction and commissioning of CARM2. It also describes the ongoing issues associated with the ownership and governance of the shared facility and the trends of participants away from the shared collection model.

KEYWORDS: print repository, shared collection, last copy, off-site storage, business case, building project, Australia

BACKGROUND

Over the ten years at least three significant factors have had a significant impact on academic libraries. The first of these commenced in the mid 1990’s as a result of the growing Internet presence making the delivery of digital versions of journals, and in some cases monographs, available more quickly and arguably more economically. This trend accelerated in the years following 2000, resulting in almost all academic journals being available in electronic format, and in many cases significant back runs being digitized. The increasing availability of scholarly journals in digital format is referred to by many authors (Foote and Foote 2011).
The second factor arises from this growth in the availability of digital versions of journals, but is driven by the ubiquity of Internet access. As students access an increasing amount of study resources directly from the Internet, and have an expectation that the Internet can be relied upon as a source of reliable information there has been a decrease in loans of physical materials. Within Australia collectively there has been a decrease in loans per student from an average of 32 loans per student p.a. in 2000 to an average of 21 loans per student p.a. in 2010 (CAUL Statistics http://statistics.caul.edu.au).

This increased availability of digital resources, and reduced need for loans of physical material has been confounded by a slower rate of change in monograph publishing patterns and licensing conditions. Academic publishers have continued to produce “print on paper “ books, which has required libraries to continue to purchase in physical format (Pochoda 2008). In addition to this need to continue purchasing monographs in a physical format, licensing conditions have meant that in many cases libraries have been able to purchase archival electronic versions of journals, but still have an annual subscription to these resources. This annual subscription method of obtaining access means that libraries are dependent upon year-to-year budget availability and long term vendor viability if they wish to maintain access to journals indefinitely. Unwilling to take the risk of losing access to essential research material libraries have often opted to maintain a physical subscription as well as an electronic version, or have continued to hold back-runs of journals to ensure access in an unclear future.

The third factor has been a change in expectations of college and university administrators and library users for library spaces. The growth and acceptance of “Learning Commons” with large numbers of computer workstations in libraries has become widespread. This extension of the long expected provision of space within the library for study was matched with an expectation and growth in group study space in libraries.

These three factors, electronic availability of journals, reduced use of physical collections and increased need for student space have produced an incentive for libraries to look for alternative storage solutions, especially for off-site storage in order to move low use print materials from relatively expensive open access to lower cost, closed high or medium density storage.

CAVAL AND THE ESTABLISHMENT OF THE CARM CENTRE

About CAVAL

CAVAL Ltd is a not-for-profit, limited-by-guarantee company wholly-owned by 11 universities in three states of Australia, Victoria, NSW and Tasmania (http://www.caval.edu.au/about-us). Established by the Victorian universities in 1978, CAVAL has developed a range of services and facilities that aim to provide sustainable shared infrastructure for its members and other universities and libraries. CAVAL works on a collaborative and commercial basis to deliver specialised library services, training and storage to academic, public and special libraries throughout Australia.

The CARM Centre

CAVAL’S archival and research materials (CARM) centre was opened in 1996. 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 intended to provide a cost-
effective way to ensure the retention of a ‘last copy’ of little-used items in the member collections (O’Connor and Jilovsky 2008).

CAVAL is on the Research and Development Park of La Trobe University in Bundoora, a suburb of Melbourne, Australia about 16 kilometres from the central business district. At the time of the establishment of the CARM Centre, La Trobe University made its contribution by way of a long term lease under ‘peppercorn’ rental terms with eventual return of the property to LaTrobe University after the initial term of 20 years and options for extensions until July 2055 (La Trobe University: CAVAL Lease 1995).

CARM2 BEGINNINGS

In the early 1990s, as the CARM Centre began to fill, the CAVAL Management began to consider plans to extend the facility. In 2006, CAVAL commissioned a market survey of the future demand for off-site storage among university libraries including the CAVAL members and some other university libraries. Ron Hincks and Associates completed the study of future needs early in 2007 (Hincks 2007) and CAVAL began to plan to develop the second stage of the CARM Centre, known as ‘CARM2’.

In 2007, CAVAL was able to invest in a feasibility study for CARM2 and also to contract a project management firm, Carson Group, later Coffey Projects, to manage the specification and design of CARM2, although there were insufficient funds in CAVAL’s reserves to finance the actual construction and there was little if any support from member libraries to contribute to CARM2 on the same basis as for the original facility. What had changed?

- The universities themselves had entered a more competitive environment and were less willing to contribute to a shared facility which benefited all the players.
- In addition, accounting practices and institutional policies had changed so that the larger universities in the consortium were unable or 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.

Design and Requirements

- In parallel with the consideration and discussion of the business possibilities, exploration of what might be incorporated into an extended CARM facility was begun.

A key component was identified as the necessity to provide a stable internal environment, with minimal dependence on control systems. Ideally this should be achieved by constructing the external walls, roof and floor of the building from materials that, as far as possible, insulated the interior from external climatic changes and have a high thermal and hydrosopic capacity i.e. a cool temperature, ideally controlled in a building constructed according to the principles of climatic inertia and humidity below the point where microbiological activity occurs. Sharp fluctuations in temperature and relative humidity put stress on archive and library materials, therefore conditions in which temperature and relative humidity remain as stable as possible are preferred. The standard ISO 11799:2003 (Annex B: informative) is prescriptive rather than performance-based so that, as found by other storage facilities, the standards were used more as a checklist for design elements rather than as a formal technical requirement. The storage vault design should be designed so that, in the event of loss of power and implementation of disaster prevention measures, (such as the closing of all openings), it will maintain environmental conditions consistent with preservation needs over
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an acceptable time period for an acceptable cost. The environmental monitoring system must be easily accessed and used by trained staff.

In addition to the need for CARM2, it was clear that sections of the existing facility needed review and redesign. A review of the existing loading dock and the space allocated to the functions of receiving and processing materials into and out of the CARM facility showed that these areas needed to be redesigned and expanded. The assumption that small trucks or vans would deliver materials more often than larger ones had proved to be wrong. Therefore it was essential that the roller door height and depth of entry into the loading dock be increased, and that a dock leveller be installed to support good health and safety practice.

A number of other issues were discussed during the exploratory design phase. These included allowance for future expansion by the construction of additional storage modules on the site. Location of the electrical equipment ‘outside’ the protection zone was identified as a way to minimise the risk of an electrical fire within the storage area. Rain water tanks were specified to harvest the water from the roof of the new facility, along with filters and pumps and a non-potable water reticulation system to run the water to cisterns and irrigation outlets.

The incorporation of a Very Early warning Smoke Detection (VESDA) system was determined to be essential in conjunction with a non-pressurised sprinkler system activated through smoke or thermal detectors. Further discussion during the pre-design phase identified the necessity of maintaining a minimum separation of six metres between CARM1 and CARM2 and installing a fire wall between the Loading Dock and CARM1. The fire permit conditions had changed considerably since the construction of CARM1 in 1995 - which has a VESDA system but no sprinklers – and therefore the CARM2 project had to be designed in such as way as to avoid any necessity to retro-fit CARM1.

It would be important for the concrete slab to be designed to provide the right base for the shelving system. It was considered desirable that the contractual arrangements with the shelving provider be set up so that the procurement and quality control be managed by the building contractor. The elected shelving provider would need to demonstrate innovation in space efficient design and a shelving system fit for the defined purpose.

As the installation of the shelving system would necessitate the delivery of shelving uprights of lengths of approximately 13 metres, and it would be likely that this would be staged over time, allowance for the provision of a permanent secure doorway of sufficient size rather than a temporary opening would be needed in order to allow the delivery of the shelving system components. Ideally the process of selection of the shelving system supplier should be completed at the design development stage in order to ensure that the shelving system design is fully incorporated into the overall building design. The process should include a prototype which can be tested to ensure that all requirements are met. The means of shelf adjustment must not compromise the structural integrity of the shelving system.

As ergonomic and safety issues were identified and documented it was recognised that the design must incorporate clear through-ways throughout the facility for the movement of materials, and floor surfaces which are compatible with the use of trolleys and pallets. In the design of the materials movement mechanical assistance was specified for lifting from vehicle tray surface to work surfaces, from and to different levels of the complex, and from trolley to shelf. The design of trolley wheels would need to be compatible with the mesh walkways to be installed on the upper levels of the shelving system.

A workshop with stakeholders from CAVAL member libraries and the CARM Advisory Committee was held in June 2007. The day was facilitated by Graeme Murphy from Hamlet Management Pty Ltd, Library Space and Master Planners (http://hamlet.customer.netspace.net.au/) . The agenda incorporated a review of current
international practice for the long term storage of library materials and a discussion of the application to CARM. This was an opportunity for participants to consider opportunities for change that would better meet individual library and consortium needs and to recommend changes in current policies and practices. Participants were encouraged to identify collections that member institutions may wish to accommodate in, such as the “shared collection” (the collection commonly referred to as the last copy collection), “formed collections” (collections of lesser used library materials from participant libraries), “decanted collections” (temporary accommodation of collections while other things happen at the home library) and the implications of each on ownership, retrieval, shelving design and costs was explored. The outcomes of the workshop discussions were incorporated into the Design Brief prepared by Hamlet Management.

Following the appointment of the Project Managers, (Carson Group, later Coffey Projects), a Value Management workshop was held. The highly interactive style enabled all participants to rapidly gain knowledge and expand their knowledge about the project. It is a very effective management and planning tool based on a flexible and dynamic team based approach, utilising a creative problem solving methodology facilitated by an external skilled person and using a multi-skilled group of stakeholders including management, operational staff, professionals, technicians and external service providers. The outcomes of this workshop for CAVAL were very useful, and broke some formally ‘sacred cows’. For example, the former objections to sprinkler fire systems were resolved whilst the preference for ‘above-ground’ storage was re-affirmed.

The workshop clarified the purpose of the building and allowed the consideration of specific design elements (e.g. it was agreed that there was no need to specify cantilevered shelving for storing long runs of bound newspapers horizontally.)

It also confirmed the need for a building of multiple levels but not necessarily of the same footprint as CARM1. Whilst the ideal configuration for high use access would limit the length of any shelf runs, the intended low use nature of the collection allowed consideration of a different shaped building. Constraints applied by planning authorities were highlighted through this process, for example height restrictions and the requirement for environmental management of existing flora on the proposed site.

**CARM2 Business Case**

As the demand for increased volumes of off-site storage space for legacy print were established it became clear that the CAVAL members with an urgent need for additional space were in the minority and that there was little appetite among government agencies for funding the extension of the facility. This required a new business model to present the case to those member libraries with the greatest need.

In 2008, CAVAL commissioned Ernst and Young to conduct 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.

The Ernst & Young study (Ernst and Young 2008) examined the 9 options available to a university library with a need to reduce onsite legacy print collections. Each option assumes 586,000 volumes stored over 10 years.
<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>
</tbody>
</table>

Ernst & Young analysed these options from an economic and preservation perspective over the long term, including the calculation of ‘net present value’ 30 years after the initial investment.

The Ernst & Young review concluded that libraries would benefit from participating in the CARM shared development.

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.

The review established that over a 30 year period, a university library needing to store approximately 586,000 volumes off-site, would have the best outcomes, from an economic and preservation perspective, if it participated in a shared off-site facility such as the proposed CARM2 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.

The model proposed for this review and subsequently proposed to CAVAL members was of a shared facility with provision for separately leased or licensed space within the facility, to be managed by CAVAL but permitting each library to retain ownership and control of its off-site collections. This model allowed for ‘library-like’ shelving of off-site collections, with shelf configurations of 500 mm depth, 370 mm height and bay widths of 1200 or 1800 mm. This configuration enabled medium density storage of library volumes in shelf order similar to that achieved in normal library shelving. The additional shelf depth, (CARM1 had a shelf depth of 450 mm), enabled the storage of double rows of shelf order materials while still maintaining sufficient browsing and retrieval access as for low use materials. The ‘library-like’ configuration was used to licence linear space to the contributing libraries. It more closely matched the space requirements for libraries to relocate materials off-site and also provided a browsing capability for library clients to visit and review physical collections. It also had the added benefit that it did not require pre-processing by the library or by CAVAL. A lesson learned from the operation of CARM1 was that libraries resented having to pay for processing of items into the shared collection, and that academic staff in universities resisted the concept of off-site storage where there was no physical browsing available.

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 enabling higher density storage. On average, high density storage in boxes, sorted by size achieves storage of 85 volumes per linear metre compared with 70 volumes per linear metre on average for ‘library-like’ double shelf-order sequences.
THE BUILDING PROJECT

The first task was the selection of a project architect. This was managed by the Project Planners, Coffey Projects, through a Request for Tender process. The Melbourne based company H2O was selected and the project formally began with a start up meeting on 31 May 2007. The design team (architects, engineers and a range of specialist consultants) began work with preliminary activities such as town planning meetings with the local authority (City of Darebin), an arborist review of the trees on site, geotechnical investigations and a land survey. The Project design brief was then reviewed, validated and costed. The first of 29 meetings of the Project Control Group (PCG) was held in July 2007. The Group compromised four CAVAL staff members (the Chief Executive, the CIO who took on the role of CARM2 Project Manager, the CARM Manager and the Administration Manager) along with the Architects, the Engineering Consultants, a specialist Cost Planner and professional Project Managers (Coffey Projects).

During the Schematic Design phase the PCG reviewed and discussed several detailed reports – the Master Planning/Pre-design report, Cost Plan A (5%-7% design contingency) and the outcomes from the Value Management Workshop. The project team also investigated suitable shelving suppliers and determined that there were very few potential local construction companies with the necessary capability. Coffey Projects let a formal tender process and Dexion (http://www.dexion.com.au/) was selected. This enabled the design team to work closely with Dexion engineers during the design phase.

Although the dimensions of the project were now taking shape along with the likely costs, without a clear business case and sources of funding the project could not continue. Whilst the CAVAL Board deliberated on the proposed budget and business models the project was paused, with the exception of the completion of some investigative studies such as traffic movements. It was noted that key issues such as fire-risk and shelving design would not be able to be fully explored and resolved until the Design Development Phase could be completed. The outcome of would be a more accurate cost (cost plan C - 1%-2% design contingency) for the construction of CARM2.

At this time offers were made to all University Members to participate as Contributing Members or as leasing members and discussions also continued with other agencies regarding their interest in and the opportunities for leasing of unused space for compatible collections such as museum and gallery collections. Monash University, the University of Melbourne and RMIT indicated their interest in becoming Contributing Members (licensees).

In June 2008 the CAVAL Board made a decision to proceed to full design documentation and tendering.  It was recognised that various factors such as a dramatic increase in the price of steel and building costs since the project was paused would have significantly increased the total price estimate. As this would then have an impact on the pricing per linear metre for contributors and for lessees, further negotiations with the 3 licensees were required to ensure the project viability. Nonetheless these negotiations were successful and in August the relevant senior level committees of each Contributing Partner agreed to contribute to the construction costs of CARM2 in exchange for ‘reserved space for a long term lease of ‘library-like’ storage. Draft Agreements were prepared and provided to the parties for review. The negotiations took some considerable time and extended the offer beyond the original funding proposal to take account of re-leasing options e.g. the re-leaseing of unused ‘reserved’ space on behalf of contributing libraries with 15% of the revenue to CAVAL.

At this time La Trobe University raised concerns about the presence of a protected tree on the site. Alternative options were explored including the relocation of the tree and an alternative siting of the CARM2 building. This was achieved by placing the CARM2 building on the
north boundary of the site and the proposal was then acceptable in principle to both LaTrobe University and the Council planning authorities. However as number of other trees would need to be removed from the site, an offset plan for the planting of an additional 72 trees was now required. After some negotiation and reviewing of alternatives an arrangement was made with the City of Darebin for a 10-year offset management plan within the local area which met all the planning requirements. CAVAL has since engaged a specialist ecologist to manage this site over the required ten year period.

The re-siting of CARM2 required a redesign of the building and shelving layout to achieve at least equivalent capacity and operational efficiency. The revised design incorporated a connecting corridor between the Loading Bay and CARM2, along with minor changes to the Administration area, such as renewed toilet facilities, in order to rationalise and streamline office functionality. The specification for rack shelving was also revised to take account of the different building footprint and the agreed operational requirements for ‘library-like’ shelving, rather than the high-density box system used in CARM1. This was as a direct result of the business plan which reflected market demand and income opportunities. Once the revised proposed capacity was determined the business case was re-worked to re-determine the viability of the project. The new option provided for a slightly increased capacity and the business case was deemed to be still viable over the 30 year term.

As project managers Coffey Projects supervised all aspects of the project. A risk matrix was developed for the budget, design, construction and other elements to ensure that the project remained within scope, timelines and budget.

Work on the revised schematic design continued during the second half of 2008, and in December the Board approved the preparation of tender documentation. La Trobe University authority to proceed was received in November, subject to the finalisation of the net gain of site planting plan, University approved signage and a maximum building height of 15.1 metres.

The details of the formal agreements with the Contributing Partners continued to be reviewed and discussed and were finalised at the end of 2008. An important element in achieving this approval and commitment of in-principle funding was the level of communication with the universities involved. This required extensive consultation with each of the university librarians, the finance and property people at each university as well as ongoing communication with the legal offices of each contributing university. In additional proposals were provided to several other universities for the contribution of up-front funds for to CARM2. However none of these were taken up.

Applications for planning permits were placed with the Darebin Council and other relevant authorities (e.g. the Metropolitan Fire Brigade), and a target completion date of mid 2010 was set. Planning Approval was received from the City of Darebin in May 2009. The conditions included meeting specified requirements for bicycle racks and storage, a travel plan for staff and visitors to the building, a landscape plan, and car parking and traffic flow.

Coffey Projects, on behalf of CAVAL, invited 5 building companies to tender for the construction of CARM2 on 24 March 2009. Due to the impact of the Global Financial Crisis the total Cost Plan Estimate prior to tender prepared by Currie and Brown, Quantity Surveyors, had been reduced. This estimated cost included approximately $1.4 million already expended by CAVAL on consultant’s fees and planning approvals (e.g. Coffey Projects; H2O Architects; Currie & Brown; engineering and mechanical services; landscaping and habitat consultants, traffic and fire protection consultants). CAVAL formally requested La Trobe University to extend the term of the Lease under the options facility in the Lease agreement. Whilst the extension of the term was not specifically agreed, due to its not being due for renewal until 2015, LaTrobe University agreed to support the planning approval for
the project on the condition that CAVAL pay an increased annual rental according to the original terms of the lease agreement.

After a formal Tender Recommendation Report from Coffey Projects, the CAVAL Board voted to proceed with the Building contract with St Hilliers’ Contracting Pty Ltd. The tender evaluation process took account of a range of factors including price, size and reputation of the building company, project scheduling and milestones, site management, the use of specified subcontractors, and their willingness to ‘novate’ Dexion as part of the project (i.e. for the building contractor to subcontract Dexion at the price tendered by Dexion).

The timing of building contract resulted in savings due to the small number of competing projects during the global financial crisis. The total price incorporating the St Hilliers and Dexion tender pricing of $AUD14 million was significantly below the pre-tender estimate of $AUD16 million. This total included contingencies and consultancy fees, of which $1.6 million had already been paid by CAVAL.

Construction commenced in July 2009, with an estimated Practical Completion Date of 2nd August 2010. Some delays were incurred early on due to wet weather. A number of variations to the construction contract were considered, costed and authorised during the construction period. These additional costs were covered by Consultancy and Construction contingencies in the budget. The variation works ranged from minor changes to critical issues. Minor changes included provision for additional Site Access and critical issues included the need for further investigation of the foundations for the existing CAVAL Administration building and minor modifications to the design. e.g. a relocation and redesign of the temporary opening for second stage shelving and the redesign and supply of secondary steel design to roof insulation. Some building variations were required due to poor ‘as built’ documentation of the original CARM Centre, and to the identification of enhanced fire, safety and engineering requirements as the project progressed.

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. This work was undertaken in consultation with systems staff at the University of New South Wales.

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 a new telephone system was installed to service the new facility. The replacement and relocation of the original toilet facilities was completed early in the construction program in order to meet the projected peak accommodation needs for Cataloguing and Processing staff.

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 Centre shared collection into CARM2. Workflows for the deposit and handling of materials in both CARM1 and CARM2 were reviewed by an ergonomist before the specifications for desks and trolleys were finalised.

The new extended Loading Bay was completed in December 2009 and use commenced in January 2010. This work, the completion of the new toilets and other refurbishment works in the Administration building required decamping of staff in 4 stages. The final stage which included a new main entrance to the facility was completed in May 2010.
The formal Commencement Date estimated as the 28th July 2010 in the Licence Deeds with the University of Melbourne, Monash University and RMIT University, was then re-negotiated to October 4th, and later further re-negotiated to November 1st.

Regular tours and promotional visits to the construction 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.

Practical Completion of the CARM2 facility was achieved on the 27 October 2010 and CAVAL took possession of the facility. A range of outstanding defects (mostly of a minor nature) were documented at this time and St Hilliers continued to work to complete these along with providing ongoing maintenance and assistance through the warranty period of 12 months. Some additional works, such as external cleaning of the original buildings and minor ‘make good’ works necessitated by the period of construction were completed in December 2010.

Whilst running over time due to poor weather during the early stages of construction and some minor design issues which required rectification, the project was completed under budget and with 5 days delay beyond the re-negotiated completion date. Some additional contingencies (included within the total project budget) were expended during the Defects Liability period in order to complete the project and to purchase additional equipment including trolleys and a barcode printer.

Some additional works were required to satisfy building occupancy requirements and CAVAL negotiated a satisfactory outcome with the Project Management Team, the Design Team and the Building Contractor taking account of lost income associated with the delayed completion and commencement of the facility and the additional cost involved in completing additional work on the sprinkler system.

The first materials were deposited into CARM2 by RMIT on 3rd November 2010. RMIT University filled its initial allocation of space and pre-paid for an additional 370 Linear Metres of Library-like space under comparable terms to the original licensees. Licence pre-payments are recognised over the 30-year term as income for CAVAL and licensees are billed for annual maintenance fees at the discounted rate.

The total shelved area is 23.5 km and of this 15.8 km are fully funded through pre-paid licence agreements and annual contracted levies. The remaining 7.7 km, funded through a bank loan, is available for CAVAL to lease to other clients.

**Completion and Implementation of CARM2**

As the construction phase was coming to an end, detailed planning for the handover and implementation period began. Training for CAVAL staff was arranged on the operation of services such as air-conditioning, security, lighting, fire and emergency services and the safe usage of the shelving system. Manuals were also provided, although many of these would be of most use to future maintenance personnel, others were of assistance to the CAVAL team as work began on developing policies and documenting procedures and workflows.

The implementation and setup was broken down into the following components

- Building administration – ensuring that utilities (electricity, water) were properly connected and ready for use in the expanded facility; checking that all signage was complete;
negotiating and expanding insurance cover; finalising parking areas and permits; liaising with Security staff to ensure that everything was configured and implemented correctly e.g. staff access, visitor access, delivery arrangements, surveillance cameras; checking the operation of the Air Conditioning system and the new Building Management System; testing the expanded phone system; reviewing the cleaning arrangements; developing and documenting delivery procedures for the new Loading Dock; updating the Emergency/Evacuation/Fire Procedures (including Fire Panel and VESDA system operations) along with training Fire Wardens and running several trial evacuations; revising Occupational Health and Safety procedures; documenting the new key system and issuing keys to appropriate staff, maintenance and security personnel; negotiating maintenance arrangements during the warranty period and beyond, including orientation for maintenance staff; updating of CAVAL’s Asset Register.

• IT setup – finalising, testing and documenting configuration of the Aleph and Relais ILL systems; installing wireless routers in both CARM1 and CARM2; programming wireless scanners.

• CARM2 setup – reviewing and finalising all logistics; space planning, incorporating allocation and documentation of space for licensees, member libraries and customers; developing setup plans and specific procedures for licensees e.g. Monash University’s decision to store materials in high density and the University of Melbourne and RMIT University’s decision to store materials in medium density; designing, documenting and installing shelf labels for the 17,332 shelves (both human readable and machine-readable barcodes), training of operational staff on usage of the specialised equipment i.e. platform ladders, motorised lift, movement of pallets and trolleys; checking the environmental controls; developing and documenting a shelf loading plan which incorporated the engineering advice on usage of the shelving; testing and documenting the lift operation and procedures.

• Business setup – finalising pricing and sales arrangements; ensuring all Contracts were properly signed and copies filed; re-negotiation of the final commencement date with the licensees.

• Promotions setup – organising the launch of the facility; writing and circulating Publicity information and press releases; communicating with members; arranging tours for staff from member libraries, prospective customers and other stakeholders.

The completed facility features tight environmental controls to ensure the long-term preservation of stored materials. The air inside the storage vault is maintained at 20°C (±2°C) and 48% (+-5%) humidity. The vault is designed to maintain these conditions for a minimum of 24 hours in the event of a total loss of power and is essentially a highly insulated box that doesn't leak. The building has extra thick insulation in the walls, roof and beneath the concrete slab. Upon completion, the whole building was pressure-tested to pinpoint leaks. Due to the need for long-term storage, the facility has a design life of 40 years, over three times that of many commercial buildings being built today. The building's exterior features a translucent facade in acrylic and metal panels that softens the appearance of the building and helps it to blend into its leafy setting on the La Trobe University campus.

Environmental characteristics

• The orientation of the building minimises the size and exposure of the east and west facades to the high thermal loads of Australian summer conditions.

• Flooring materials including carpet tiles and marmoleum sheet flooring have been selected for sustainable characteristics including sustainable manufacture, maintenance and disposal at the end of product life.
• The design was created with a preference for self finished materials, to reduce energy consumption from maintenance.

• The location of the building has been selected to minimise the impact on existing trees and trees removed for the construction of the building have been replaced by new plantings west of the existing CARM1 building.

• Minimise Mechanical energy consumption by maximising slab, roof and wall insulation and building sealing.

• Design to allow flexibility to easily accommodate future changes, to reduce future energy and resource consumption

• Reduced extent of external glazing, to reduce additional heat load in summer and heat loss in winter.

• Encourage occupants to use stairs for intra floor access, to reduce energy consumption from lift usage.

• Lighting operation controlled by sensors to avoid unoccupied sections of the facility remaining lit.

• Remote access BAS (Building Administration System), to increase control and operational savings.

• T5 lamps installed to most light fittings, to reduce power consumption from lighting.

• Sensible Light Switching Zones that relate to occupation, to reduce power consumption from lighting.

• Roof water collected, stored and reused, to reduce water consumption.

• Fire System Water stored and re-used.

On 3 December 2010, Stage 2 of the CARM Centre was formally opened by Senator the Hon Kim Carr, Minister for Innovation, Industry, Science and Research.

By the end of 2011, (the first year), 20% of the shelved space in CARM2 had already been taken up. In addition, floor space in the un shelved ‘void’ space has also been fully allocated on a rental basis to a number of art and museum collections including some associated with member universities. These additional sources of revenue from the sale of space to commercial clients are expected to generate 10% of CAVAL’s total revenues in 2012 and contribute almost all of this to CAVAL’s operating costs.

However the core funding over the long-term is provided by the accrued contributions from the contributing CAVAL members and provides 2/3 of that funding for the next 30 years.

After some initial concerns that the proposed take-up of the commercially available space in CARM2 would not materialise, by the end of 2011 there are a number of prospective clients for short-term storage commencing in 2012. To ensure the availability of space for the CAVAL members when it is required, CAVAL is seeking storage contracts of less than 10 years.

An agreement is in place with the Ian Potter Museum (University of Melbourne) for a long-term lease of floor space in the CARM2 ‘void’. Specialised storage racks for art works and museum items were constructed for the Ian Potter Museum in mid 2011 on the floor of the void space in CARM2. Other space has been taken up by the La Trobe University Art Museum and the Dental Museum (University of Melbourne).

Discussions on the future of the CARM shared collection and the possible extension of this model into the CARM2 facility have to date not resulted in agreement to initiate a shared
collection model in CARM2 but rather to review the collection policies for the CARM1 shared collection; to allow libraries to trade their allocations in CARM1 and to consider more flexible arrangements for the continuation of the Shared Collection.

**Issues and Trends**

The issues and trends post-occupancy have been a continuation of those trends which led to the construction of the new CARM Centre storage facility. This section will discuss current issues affecting short to medium influences and possible longer term trends which may affect the facility.

A predominant factor in the short to medium term, especially within the member institutions is the need for off-site storage, as outlined in the background section of this article, along with several factors which are specific to the supporting institutions but reflect more general trends. These factors revolve around collection ownership and manifest themselves in several ways. The ownership issue has three contributing factors: internal political implications, accounting balance sheet implications and university rankings. These are described below.

**Internal political implications:**

One of the major contributors to the Centre had previously experienced a strong, direct and negative reaction from some of academic staff to the removal of material to off-site storage. This was seen by some influential academic staff as a reduction of service due to the loss of direct, browsable shelf access, and may have been a reflection of more significant changes within the University to a focus on major renewal with deep and widespread changes to course configuration and delivery.

As a result some academic staff strongly resisted removal of material from open access, and especially moving material into a shared off-site collection. Given this strong reaction, the University Library had a need for maintaining ownership of materials placed off-site, and was not able to support continued investment into a facility for a shared off-site collection, however they still had a need to off-site storage for “self-owned” collections. This need had the effect of increasing their contribution to the facility for “self-owned” collections.

**Accounting balance sheet implications:**

Another major contributing institution had made an accounting decision to “write-down” library material asset valuations over a 50 year period, instead of the more common 5 – 10 year period used by most Australian universities. This meant that low-use material which was ceded to a shared collection had a negative balance sheet impact which the University was unwilling to accept. As a result, while the library had a need to move low-use material into off-site storage in order to make more floor space available for new acquisitions and student space, they could not cede material to a shared collection. As in the internal political implications above this had the effect of increasing that university’s contribution to the facility for “self-owned” collections.

**University rankings:**

One of the major contributing institutions to the Centre placed a high value on their place in world-wide university rankings, particularly those which consider physical collection size as part of the ranking methodology. As a result there was a direct incentive to maintain ownership and collection size while there was still a need to provide for collection growth and student space without increasing building size. This resulted in increasing that university’s contribution to the facility for “self-owned” collections.
Immediate issues and trends for CAVAL as an independent body:

The above current issues and trends had a direct impact upon funding the building, as well as an ongoing influence on use of the space which was leased. Beyond these influences emanating from partner institutions, the new facility also has implications for the owning body, CAVAL.

While member institutions directly contributed approximately 80% of the new building cost, the remaining 20% was funded via a loan facility from the bank, on the assumption that the space could be leased to third parties or other members who did not directly contribute to the building cost. Long term storage is a long term proposition requiring a lengthy sales cycle. While it was clear from the needs analysis that there would be an eventual requirement for this storage space, the need was not immediate.

As a result CAVAL has had to absorb the cost of funding the 20% of the new facility which CAVAL owns from existing operations until users are found for the new space. Additionally, CAVAL made the initial investment of approximately $1.5 m for the preliminary planning and schematic design work. In doing so, CAVAL used its reserves accumulated over a number of years of minor surpluses. These contributions and drawdown of reserves has produced budget tensions as the organization strives to have a minor surplus each year in spite of a greatly increased allowance for asset depreciation for the new building and the cost of supporting the loan interest. While the business plan covers a 30 year period, the budget is run on an annual basis.

In order to find paying users for this space CAVAL has had to adopt a more directed sales focus, and employ a dedicated business development person, with the consequent but necessary costs that entails. While there is no doubt that this facility will pay for itself and become a valuable source of income in the longer term, in the immediate term this has produced some degree of financial stress.

Possible longer term issues for the sector, member institutions and CAVAL:

In the longer term a number of factors are likely to affect the use of the CARM vault. While it is unknown to what extent these factors will affect the CARM Stage 2 development it is self-evident that they will have some degree of impact. These factors include:

Reduced need for print on open access:

There is a trend for decreasing use of print material in academic libraries, as demonstrated by the CAUL Statistics set cited in the Background section (CAUL Statistics http://statistics.caul.edu.au). Conversely, in spite of wide-spread lay opinion that “everything is available on the Internet”, or that Google Books have supplanted any need for archival print collections the reality is that there is much which is not available in any electronic format. Those materials which are available on Google Books, or via the Hathi Trust still have an unclear access future in North America. Outside North America it appears that even if the Google Books Settlement had been determined in Google’s favour that the Settlement could not apply in non-North American jurisdictions.

These two factors, a reduced call for print, along with a large amount of content which is available as print-on-paper only, will produce an increased need for off-site archival type storage, otherwise specific titles will disappear in a type of “intellectual extinction”.

Increased need for space:

There is a continuing growth in student numbers, particularly in Australia, with the Commonwealth Government setting ambitious targets for growth in tertiary education. If Commonwealth targets are met there will be a 25% growth in the number of students by
2025, with an additional 214,000 additional students in the tertiary system. At current costs and rates of space utilization it is estimated that it will cost more than $AUD 9 billion to provide this space, which has not been funded by the government. This growth in student numbers will increase pressure on buildings, with the result that institutions will be seeking ways to save space. This need for space combined with the reduction in use of print will produce increased pressure for off-site collection storage.

Relative costs of storing legacy print off-site in shared facilities

CAVAL estimates the average cost per volume p.a. to store items in the CARM Centre Shared Collection to be approximately $AUD0.50. This includes ingest costs for processing into high density storage and amortised annual costs including depreciation, staffing and contribution to overheads. This is comparable to the costs established by the ReCAP group of libraries in the U.S. and reported by Constance Malpas at CAVAL in October 2010 (Malpas 2010). The per volume cost per annum of storing in on-site library collections was established at U.S. $4.25 compared to an average of U.S. $0.80 for off-site collaborative storage.

Whilst the average cost estimates vary somewhat and are dependent upon the extent to which an institution applies overhead costs to the library, it is clear that there is a significant reduction in costs over the long-term if libraries choose to retain legacy print in off-site and shared facilities.

Additionally, the experience at CAVAL of managing the Shared Collection (last copy repository) and the off-site ‘self-owned’ collections of member libraries is that the retrieval rate is less than 1% p.a. for the Shared collection and less than 3% p.a. for the ‘self-owned’ off-site collections.

Recognition of the value of shared collection

In Australia to date there has been little interest in funding of shared physical collections by any level of government or the tertiary education community beyond libraries in spite of the above influences, and potential savings. This lack of interest may change in the future as a realization dawns on government and university administrators that there are potential sector-wide savings. In addition the current Australian Government interest in digital material as demonstrated by the ANDS project (http://www.ands.org.au/) may wane over time.

Overall a number of influences may coalesce to produce increased interest in shared storage and use of high or medium density storage for low-use print collections.

Since the commencement of the CARM Centre, it has been managed by a Committee of representatives from member libraries, the CARM Centre Advisory Committee. Early in the operation of the Centre, the Committee determined that there would be no formal ‘collection policy’ and that items would be selected for inclusion by the member libraries using their own collection management criteria. This has resulted in a dearth of information regarding the character of the Shared Collection and a tendency for it to be regarded as a dumping ground for unwanted materials, and consequently of little value. There has been no attempt to characterise the collection either by period of discipline and no attempt to complete journal or series runs which would support the concept of an identifiable collection. It is still somewhat unclear what is included in the Shared Collection. Of course, every item is catalogued and its bibliographic record is available on-line, (originally in the online COOL-CAT), but also in the Libraries Australia national bibliographic database and more recently, via Libraries Australia, in WorldCat (OCLC). Recent attempts to establish the character of the collection have demonstrated a high number of serial titles including abstracting and indexing services, (e.g. Psych Abs) and incomplete journal series (Jilovsky and Genoni 2008, Genoni and Varga 2009).
Another issue impacting on the evaluation of the value of the facility and its service is the accuracy of record matching which occurs when the bibliographic records for items held in the Shared Collection (repository) are matched against the catalogue records of other libraries and within the national and international bibliographic databases (e.g. Libraries Australia, WorldCat.) Pilot studies (Genoni and Wright 2011) to date suggest moderate levels of duplication but also affirm that there are significant numbers of titles which are uniquely held in Australia by the CARM Centre Shared Collection. Errors in matching bibliographic records in the national bibliographic database will tend to underestimate the level of duplication of holdings.

**CONCLUSION**

Several conclusions emerge from this experience. Firstly it is clear that there are lessons to be learned from experience and that by having operated the CARM centre for more than a decade, CAVAL was better placed to work out real costs and efficiencies for CARM2. This experience also allowed CAVAL to recognise the key design elements for storage of bound printed materials and to take advantage of the shelving supplier’s standard racking design instead of requiring an expensive custom-built solution. If an individual university library were to specify a purpose-built facility, it is unlikely to have had the dedicated experience in recent times (i.e. the previous decade) to draw upon.

Consistent with this conclusion that experience is important to a successful outcome, CAVAL did not try to directly manage the design and construction phase of this project. Before the schematic design was prepared and planning approvals were sought, CAVAL engaged a professional project management company with experience of similar building projects. Coffey Projects, formerly the Carson Group, were engaged from 2007 and provided valuable expertise in dealing with planning authorities, designers and builders. The company also provided an ‘arms length’ negotiation service to navigate through contractual issues, building defects and unexpected delays or design/build ambiguities. This was especially important during the period leading up to the tender process for the selection of a building company during a period of economic volatility and again at the completion and sign-off of the project. Of particular relevance to the construction of an unusual building such as the CARM2 facility is continuity of personnel and expertise over the length of the project.

Another conclusion is that there are obvious benefits to shared infrastructure even if the trend for the participants has been away from shared collections or last copy repositories. The cost elements of feasibility, specification and design, and the ongoing costs for security, finance, maintenance and associated services such as document delivery, digitisation and management of last copy and duplicate collections, are able to be shared across the contributing members, even without sharing or merging their off-site holdings.

**REFERENCES**


