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GIPPSLAND LIBRARIES CO-OPERATIVE AUTOMATION PROJECT FEASIBILITY STUDY REPORT

Prepared for the
LA TROBE LIBRARY SERVICES
LA TROBE COUNCIL

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Gippsland Libraries Co-operative Automation Project Feasibility Study

1. Introduction

1.1. Background

The Gippsland Libraries Co-operative consists of four library service providers: the Wellington, East Gippsland and La Trobe shire library services together with the West Gippsland Regional Library Corporation, which covers the South Gippsland, Bass Coast and Baw Baw shires. The Gippsland region serviced by these library services has a total population of approximately 235,000 across an area of 40,000 sq km.

The combined membership of these library services is just over 100,000, however there is a component of this membership which is composed of individuals joining multiple libraries, so the total number of individuals who are members of the Libraries Cooperative is less than this total membership figure. The extent of this multiple library membership is unknown.

1.2. Objective

The Gippsland Library Cooperative has commissioned the Centre for Electronic Commerce at Monash University to conduct a study to examine the feasibility of implementing a system that will allow patrons of each of these library services to make use of the cooperating libraries using a single library card.

The desire to examine such a system was stimulated, in part, by a Reciprocal Borrowing Scheme being run by three South Australian libraries: the University of Adelaide, the University of South Australia and Flinders University. This scheme is describe in some detail in Appendix A.

1.3. Scope

This report addresses:

- the philosophical implications and commitment required by all participating Councils and Libraries;

- the potential benefits to the participating libraries;

- the potential disadvantages for the participating libraries; and

- the overall hardware and software requirements of the system.

The report does not attempt to develop a cost benefit analysis, or provide detailed specifications of the hardware or software required to implement a universal library card.

1.4.   Methodology

Upon its completion, the entire assignment will have comprised five phases:

1. An introductory workshop to:

    -   initiate the project;

    -   introduce the researcher to key personnel from each of the libraries in the Cooperative; and

    -   determine relevant issues and important information sources.

2. Information gathering:

    -   interviewing personnel from other libraries, and other organisations, identified as being able to contribute to the project;

    -   research of relevant developments in the area of cards for identification and authentication; and

    -   discussion with the staff from Dynix Australia and Stowe Computing Australia, the two companies marketing the circulation software being used by members of the Libraries Cooperative.

3. Information synthesis:

    -   the analysis of the information gathered;

    -   assessment of available options, the associated technological requirements and potential benefits; and

    -   the identification of a preferred option and development of a draft report

4. Circulation of the draft report, to allow the members of the Gippsland Libraries Cooperative to consider the recommended strategy, and confirm the analysis and findings.

5. Completion of the final report, based on feedback from the Cooperative.

2. Current System

2.1. Functionality of Existing Library Cards

2.1.1. Identification of Patron

Under the current system in use at all of the libraries services in the Gippsland Libraries Cooperative, a library card is issued to each patron when they register at a library in one of the library services. These cards are imprinted with a barcode. This barcode (or strictly, the number it represents) is used to identify the borrower.

The patron writes or signs their name on the card. This signature or handwritten name provides the user authentication function of the card (see Section 4.3, "Identification and Authentication"). In the existing public library system, minimal use is made of user authentication, and the signature is rarely, if ever, checked (see Section 4.4, "Authentication at Libraries").

2.1.2. Automatic Data Capture

The use of a barcode on library cards (and also on library books) is to facilitate the automatic capture of data. This is not the only possible system, other library systems make use of smartcards for the identification of patrons and magnetic devices to identify both patrons and books. However, the advantages that barcodes offer are that:

- their functionality is not easily affected by careless handling, and

- the vast investment in barcode systems across a range of industries has enabled the development of systems that are both relatively inexpensive and highly functional.

Until recently, the barcodes on both books and cards have been read using hand held barcode light pens. The use of these has required some degree of expertise and they have usually been operated by the library staff. Today there is a move towards the development of more automated systems that will allow the library patron to process the items that they borrow from the library. This involves the use of a barcode reading device, into which the patron's card is placed to be read (similar to the way a debit card is read by an automatic teller machine), and a fixed scanner, to read the barcode labels on the items to be borrowed.

2.1.3. Display of Administrative Information

A third function of the existing library cards is to provide for the patron basic information about the library service, including: the identity of the library service (including any logo); and the addresses, phone numbers and opening hours of library branches. Library cards may also list the conditions under which books and other items are to be borrowed.

2.1.4. Equity of Access

The current library card system is available to all members of the public regardless of their age, physical, mental or intellectual ability, socio-economic group or any other attribute.

2.2. Multiple Library Membership

Within the Gippsland region a number of library patrons make use of the facilities of more than one library service. The exact number of such individuals is unknown, but it is assumed to be a significant minority.

Under the existing system, an individual wishing to make use of more than one regional library service must join each one separately. The results of this are that:

- patrons are discouraged from making use of multiple library services by:

    - the processing associated with joining multiple times;

    - the need to maintain several library cards;

- the difficulty of accessing libraries across regions (and indeed across the various library sectors such as universities, schools and the general public) discourages more extensive library use;

- the need for interlibrary loans rather than direct borrowing from multiple libraries increases the paper work processed by library staff as well as the cost of lending books across regions and/or sectors;

- the collection of accurate statistics regarding the usage of libraries is made more difficult.

3.   Requirements of Universal Library Card

There are several possible approaches to the development of a universal library card for the Gippsland Libraries Cooperative. These are developed later in this document.

However, there are a number of basic requirements that any alternative system must meet in order to fulfil the needs of the Libraries Cooperative. These are:

- It must be usable at all cooperating libraries.

- It must be able to perform the functions of the current card system in terms of:

  - identification and authentication;

  - ability to capture data automatically;

  - equity of access;

  - usability at both fixed and mobile libraries.

- In addition, it is desirable that it provide space for administrative information in the manner of the current library card.

4.   Identifiers

4.1.   Identifiers

From a theoretical viewpoint, an ***identifier*** is an attribute of an entity that allows that entity to be uniquely distinguished from other similar entities.

From a practical standpoint, libraries commonly need to distinguish between at least two types of entities:

- borrowable entities (books, periodicals, cassettes, CDs etc); and

- patrons.

The identifiers used in each of these cases are numeric or alphanumeric strings.

Since this study is primarily concerned with library patrons, further discussion on identifiers will refer to patron identifiers.

The need for ***uniqueness*** of borrower identifiers is self evident. The numbering systems currently in use ensure that no two borrowers within a single library service have the same identifier, although they do not guarantee that a single borrower has no more than one identifier.

Any alternative system that seeks to extend the use of a single library card to multiple libraries will need to ensure that this identifier uniqueness is maintained across library services as well as within each library service.

4.2.   Barcodes

The ***barcode*** is a way of representing the identifier, principally to facilitate automatic data capture. The same identifier could equally well be represented as:

- digits on a form

- bytes encoded on a magnetic stripe

- bytes in a silicon chip on a smartcard

As previously discussed, barcodes are used for reasons that have much to do with history, robustness and cost of the infrastructure.

There are numerous ways of representing an identifier as a barcode. Each representation is known as a ***symbology***. Two main symbologies are used in library systems:

- Codabar (sometimes also known as 2 of 7) and

- Code 39 (or Code 3 of 9).

Several other symbologies are used in retail, industrial and other applications.

In library applications, Codabar generally consists of a string of 14 digits. The first digit distinguishes between a patron and item. Usually a first digit of '2' tells the circulation software that a patron number is being scanned; the number '3' signifies that an item is being scanned.

The next four digits (digits 2 to 5) identify the institution. The next eight digits (digits 6 to 13) are issued sequentially and represent the entity being identified (eg patron, book, journal, etc) and the final digit (digit 14) is a check digit used to verify that the barcode number has been scanned accurately.

Code 39 is a barcode symbology that has been adopted as a standard by the US Department of Defense, and consequently is used widely across a range on industries. This symbology may contain fewer than 14 characters and can be used to represent alphabetic as well as numeric characters. While in theory Code 39 applications do not require a check digit, in practice this is often incorporated into the number represented.

The process of translating the symbology of the barcode into the identifier it represents is handled by the barcode reading device. Modern barcode readers are generally capable of interpreting several different symbologies.

4.3.   Identification and Authentication

Identification and (user) ***authentication*** are terms that are often confused with one another. In order to clearly understand the requirements of a the patron's library card, and the ability of various alternative schemes to provide the required functions, it is important to understand the distinction between these two terms.

To be strictly correct, the term user authentication should be used to distinguish it from the authentication of other entities such as electronic messages. However, in the rest of this report, the term authentication will be used.

Identification and authentication are normally defined as follows:

- ***Identification*** involves proffering of non-secret information, such as the name of the individual or the organisation. It is essentially "stating who you are".

- ***Authentication*** is the checking of the identity ("prove that it is you"). One could say it is the authentication of the identity of the user. It typically involves proving knowledge of secret information, possession of a token or verifying personal characteristics to verify the user's identity.

In practice, the two may merge and identification may be subsumed in the process of authentication. The proffering of secret information or possession of a token may in fact also be used to identify a user. An example is that the quoting of a licence number and other "fairly secret" data may act as both identification and authentication.

It should also be noted that neither identification nor user authentication need be unique to an individual. An individual may be identified or authenticated in terms of group membership.

4.4.   Authentication at Libraries

In the case of a library card, the barcode ***identifies*** the card owner and a signature (if present) would be used to ***authenticate*** them. Generally, however, public libraries make little or no use of library cards for authentication purposes.

One aim of public libraries is to maximise the number of books borrowed by the public. Enforcing the authentication of the borrower's identity would make the process of borrowing more time consuming and difficult.

Not authenticating the identity of the borrower allows an individual other than the owner of the card to borrow books against the card. In practice, the library card offers borrowing rights to the bearer of the card, not the owner, although it is the owner of the card who is assumed to take responsibility for the care of the books while they are on loan.

While the problems of book loss or damage caused by lack of authentication are manageable, it is considered to be in the best interests of both the library and the borrowing public not to enforce authentication. If the incidence of book damage were to increase substantially, this practice would need to be reappraised. Thus although the library card is not currently used for authentication of patrons, that functionality should be available, in case it is required at a later date.

5.   The Universal Library Card

There are four separate issues to be considered in assessing the feasibility of a universal library card for the participating libraries. These are:

- the approach to identifying a borrower at the libraries;

- the approach to accessing borrower data at the libraries;

- the approach to storing the borrower identifier on the card; and

- consequential additional functionality available with the card.

5.1.   Identifying the Borrower

The key issue to identifying the library patrons using the universal library card is to ensure that the identifier used will be unique across all participating libraries. It is important to consider all libraries that might possibly choose to join in this project, because once the system of identification is in place, it may be time consuming, inconvenient and expensive to change.

The available alternatives are to:

- put multiple existing identifiers on a single library card;

- replace existing identifiers with a single, common identifier;

- recognise an additional universal identifier in addition to existing identifiers; or

- support the multiple existing identifiers in the circulation software.

5.1.1.   Multiple Identifiers on One Card

The least technologically complex solution to a universal library card would be to retain the existing identifiers of the participating libraries. When a borrower wants to make use of the library services of a library beyond their initial "home" library, they would present their existing library card at the "foreign" library, register in the current fashion, but have a new barcode identifier attached to their existing card.

This approach would require no modifications to existing software, and, providing the existing light pen barcode readers are able to handle the symbologies used by each of the libraries, the library staff would merely have to select the correct barcode to be able to pick up the borrower's identity. Additional equipment would be required to attach subsequent barcodes to the original "home" library card, but this equipment is relatively inexpensive, and would only be required in limited quantities.

The disadvantages of this approach are:

- choosing the correct barcode to use would probably require human judgement and be beyond the new generation of card readers being adopted for borrower issued loans;

- the system would rapidly become unworkable for borrowers wishing to use more than a couple of "foreign" libraries;

- this does not reduce the processing of registering with a "foreign" library; and

- it is a technologically retrograde solution, requiring the additional investment in technology such as barcode printers and laminating systems that is being phased out of use in most libraries.

This approach is not recommended unless it were simply for piloting purposes in a very limited trial to determine the uptake of the idea.

5.1.2. Replace Existing Identifiers with a Single Identifier

Replacing existing identifiers with a single common identifier has the advantage of resulting in a simpler, more elegant solution than any of the other approaches. However, this advantage is more than outweighed by the multiple problems it would raise.

This approach would require the re-issuing of all existing borrower identifiers, including those of patrons who have no desire to make use of the other library services. It would also require discarding existing stocks of unissued library cards and modification of existing software to handle the new identifier.

Most difficult of all would be the management of the transition process, maintaining both identifiers until some defined cut-off date, and then ensuring that outdated cards were no longer in circulation.

This approach is not recommended.

5.1.3. Additional Universal Identifier

The intent of this system is to maintain indefinitely, two identifiers in parallel at each participating library. While this would not have the simplicity of the previously discussed approach of replacing the existing identifiers, it would be substantially more practical. The new identifier would only need to be used by those patrons who wanted to make use of more than one library.

This new identifier could be either a library issued identifier, or one issued by a third party. If it were to be a library issued identifier, then it would be more economical for all new library cards to support the new identifier as well, at least after existing stocks of blank cards had been exhausted. In this case the approach would be similar to the previous one without the need to cut over to the new identifier completely.

If the identifier were to be issued by a third party, the participating libraries may need to introduce an additional form of card reader,

since it is unlikely that a third party would introduce barcoded cards. However, the third party approach would remove the need to manage the identifier and the issuing of cards.

This approach would require that the circulation software at each of the libraries support two identifiers. Discussions with the developers of both the Dynix and the Bookplus software (the two circulation systems in use within the Gippsland Libraries Cooperative) have indicated that supporting multiple numbering systems for the patron identifiers is not likely to be a major undertaking. While it would to some extent depend upon the nature and format of the identifier, and some custom coding will be required, both software systems have the capability to handle additional identifiers.

The major obstacle to this approach is the development of a single universal identifier. Existing candidates such as drivers licences, credit cards, Medicare cards, etc are not issued to every potential user of this system. The only potential identifiers with sufficient universality are either a new library identifier developed by a body such as the State Library of Victoria or the National Library of Australia, or alternatively an identifier used in a universal scheme such as the Victorian Government Electronic Service Delivery (ESD) initiative.

Of these two, the ESD identifier offers some substantial advantages, since it is a scheme that is currently in development, and the Victorian Government has a commitment to making it work. There is also some potential for the development of a universal library card to be adopted by Multimedia Victoria as a pilot project for ESD. The possibility of this should be explored further.

This is the preferred approach to the development of a universal library card applicable to a large number of participating libraries. It is recommended that this approach be explored further with a view to developing a project as part of the implementation of ESD.

5.1.4. *Support Multiple Existing Identifiers*

This approach would see each library supporting the identifiers issued by the other participating libraries. It would depend upon the uniqueness of existing identifiers across the entire set of participating libraries. Currently this appears to be the case within the library services of the Gippsland Libraries Cooperative.

Of all the approaches discussed, this is the only one that does not require the issuing of new library cards.

This approach would require that the circulation software be able to handle multiple identifiers. There is no clearly defined maximum number of identifier that would need to be supported, so the software may require significant customisation if a large number of libraries were to participate, and no limit were to be put on the number of libraries that a borrower could be eligible to use concurrently. Alternatively a policy decision could be taken by the

participating libraries that the number of libraries that an individual was eligible to use at any one time should be limited.

Adopting this solution would also require that the barcode readers in use at each of the participating libraries be able to support all barcode symbologies in use at any participating library. As previously mentioned, such support is likely to be present any modern barcode reader, and it is unlikely to cause significant problems.

It is recommended that the requirements of this approach be examined in more detail. This approach will work best for the development of a universal library card in a limited region with a small to moderate number of participating libraries services.

5.2. Accessing Borrower Data

It is possible to develop a universal library card system without the need to exchange any patron information between the circulation systems of the participating libraries. However such a system would provide few advantages beyond the existence of the single universal card. Any system which attempts to reduce the administrative processes associated with the system will require some degree of information about the patron to be exchanged between systems of the libraries concerned.

This exchange of information effectively results in the development of a universal patron database. However, it is important to note that a universal patron database does not necessarily imply universal access to the patron data. Access can be strictly limited to a particular group of patrons, and to particular range of information about patrons.

This database could be in one of three formats:

- a ***centralised*** database;

- a ***distributed*** database; or

- a ***replicated*** database.

Whichever form the database takes, there are some basic functional requirements of it:

- existing borrower data must be stored somewhere;

- each library must have access to sufficient data to maintain a record of loans;

- overdue notices, fines and other notices must be servable on the borrower concerned; and

- privacy requirements must be satisfied.

5.2.1. Privacy Issues

However the borrower data is shared between the participating libraries, the issue of confidentiality of personal information must be considered. The importance of such issues are often underestimated, but awareness of them is growing, particularly as the use of electronic communications to access personal data increases. Furthermore, institutions such as public libraries are generally seen as being more sensitive to these issues, and thus have a responsibility to set an example of the careful use of personal data.

As a starting point, it must be stated that users of a single library have consented to providing their personal details to that library only. It would be a breach of their rights for this information to be made available to any other library without their express consent. Furthermore, if any personal data of a sensitive nature is to be exchanged between libraries, the person concerned must give their ***free*** and ***informed*** consent to sharing it.

The definition of free consent requires that not giving that consent does not unduly or unreasonably disadvantage them. If the exchange of sensitive information were to be a condition of using a universal library card, and the universal library card were to replace any other way of accessing multiple library services, then it may be difficult to maintain that consent had been freely given. This is particularly the case since public libraries effectively have a monopoly on the lending of books to the general public.

This issue becomes more critical as the information exchanged becomes more sensitive. It is worth noting that research has shown that among the general population:

- 15% - 20% of individuals have unlisted phone numbers and

- 5% - 7% of individuals consider their address sensitive.

The exchange of free text and descriptive codes as part of the patron database can be of particular concern since these can easily be used to describe situations that the individual concerned would be reluctant to have as public knowledge.

The risk of an exchange of information being considered a breach of privacy can be reduced if sensitive information is not exchanged routinely, but only in cases where there was a reasonable grounds for suspicion on the part of one of the libraries that there was a problem in relation to the patron. For instance if the library suspected the patron of damaging books, it would be more likely that an exchange of sensitive information would be considered reasonable than if it were routinely done for every patron.

Thus this exchange of information about a patron is less likely to breach the patron's right to privacy if it occurs on an exception basis, rather than on a routine basis, or if the information exchanged is limited in scope and sensitivity.

5.2.2. Centralised Database

A centralised database is one where all the data to be accessed is stored at a single (logical) location. This would provide a system similar to those run by large retail stores for their store cards. The universal library card system would, in the same way as the store card system, maintain a central register of users and allow the holder to make use of the card at any branch.

Implementing a centralised database would require the development and management of a new centralised database system, and would require significant modification to the circulation software to either:

- integrate the centralised patron database with other library software functions;

- outsource all the library functions to the maintainer of the centralised system; or

- replicate all, or portions, of the centralised database locally.

A major problem for users of the Bookplus software is that this software uses the council names database as its patron database. This database could not form part of a centralised database of library users.

Furthermore, a centralised database may also create a serious privacy problem, since it could be considered a breach of a borrower's privacy rights if information about them were to be accessible to every participating library even though they only make use of the services of one of the libraries. To avoid this happening, it would be necessary to ensure that access to each patron's information was disabled to all participating libraries except those for which it had been specifically enabled.

This approach to the user database is not recommended.

5.2.3. Distributed Database

In a distributed database model, the database is broken up into components that are distributed according to some defined rules. In this case, it would entail each library storing details of its own users and permitting "foreign" libraries to access (some of) the details of those patrons who wished to use the services of the "foreign" library.

This approach would require the provision of real-time telecommunications links between the participating libraries. This increases the vulnerability of the system since its proper functioning relies on the integrity of these links and the up time of the remote systems. However, this increased vulnerability could be managed by ensuring that the network availability meets the demands of the system. It is considered that adequate network availability can be provided through use of the Internet with a sufficiently reliable service provider.

For such a distributed model to function as required will be necessary to examine the existing user databases to remove records

of users from "foreign" libraries. These records are present wherever library patrons have registered at more than one library under the existing system. While the continued existence of user records at other than their home library will not have a major impact upon the service the individual library patron receives, it will reduce the ability of the participating libraries to collect accurate statistics and will offer less control over the provision of library services.

A distributed database model would continue to raise problems of data access where one of the participating libraries uses the Bookplus software. The Council hosting the database for that library will not provide access to its database without adequate security provisions to safeguard the integrity of its systems, and the confidentiality of its user database. It may also require the development of security policies to further safeguard its interests. For similar reasons, the council may also be reluctant to allow its own library on-line access to other computer systems.

5.2.4. Replicated Database

A replicated database is one in which several copies of the database exist in locations convenient to the users of the database. These copies are updated at frequent intervals to ensure the consistency of the data stored in each.

The replicated database approach is the one used by the South Australian universities in the example described in Appendix A.

This approach offers the following advantages:

- reduced reliance of the system on telecommunications links, since the connections are not time critical;

- independence of the systems means that one system failing does not immediately affect the others; and

- the potential for privacy and access problems is reduced since:

    - no library needs to allow another access to its database; and

    - control over what data is exchanged is retained by the "home" library.

In order that it function as intended, the replicated database approach will require participating libraries to address the issue of "foreign" library patrons currently registered in their user databases in the same way as a distributed approach. This will necessitate library patrons who are currently registered at a library other than their "home" library re-registering for reciprocal usage rights at these libraries through the "home" library.

It is recommended that the replicated database approach be adopted.

5.3.   Format of the Universal Card

There are three main alternative formats for the storing of the identifier (and any other required information) on the universal card. These are:

- barcodes
- magnetic stripe
- silicon chip (smart card)

The issues that impact upon this decision are those of information storage, hardware support and potential for additional functions.

5.3.1. Barcodes

Whatever decision is made about the format of the universal library card, barcoded cards will continue to be used in library applications. Thus the use of barcoded cards for this system will reduce the need to support multiple card formats. In addition, the latest generation of card readers for barcoded cards are very similar in appearance, use and functionality to those used for magnetic stripe cards and smartcards. This will allow the provision of unattended self service functions for the user that the use of light pen barcode readers has not permitted.

The major disadvantages of the barcode as a storage mechanism are that:

- older barcode readers may require updating or replacing to handle multiple symbologies;
- barcodes offer very limited information storage in their current one dimensional form, and two dimensional barcode technology is still immature; and
- they are not readily rewritable.

In the short term at least (within the next two years or so), the use of barcoded cards is recommended as the preferred approach to developing a universal library card.

5.3.2. Magnetic Stripe

Magnetic stripe cards are the most widely used form of card data storage. This technology has been present for many years, and is now considered to be nearing the end of its life cycle.

Points in favour of the use of magnetic stripe cards are that the readers are relatively inexpensive, the cards are rewritable and there is additional space, albeit limited, on the magnetic stripe for other functions such as stored value.

However, in light of the fact that the technology is becoming dated, and the impending emergence of newer chip card (smartcard) technology, this approach is not recommended.

5.3.3. Smartcards

The chip- or smart-card is widely accepted as being the replacement for the magnetic stripe card in a range of functions, particularly where security is a concern. These include financial transactions, secure access to physical or electronic systems and personal identification and user authentication.

Smartcards come in two main forms: memory cards and microprocessor cards.

Memory cards can be thought of as having a similar level of processing as a magnetic stripe card but with a much larger storage capacity. Strictly speaking they are not smart in any sense and should be referred to as memory or chip cards.

Microprocessor cards are more correctly referred to as smart cards. They are able to run small programs, allowing them to contain small applications which may include significant security capability. Depending upon their configuration, these cards may vary considerably in their functionality, memory and also their cost.

Currently there are a number of different, not necessarily compatible, approaches to implementing smartcards. At this stage, no single approach or set of protocols has emerged as a clear leader. Furthermore, because the technology is so new, the smartcard readers, although rapidly dropping in price, are still more expensive than barcode or magnetic stripe readers.

The use of smartcards will provide a technologically more sophisticated solution, with more than sufficient functionality for the development of the universal library card in its current form. It would allow the storage of information and software applications on the library patron's card. This may support the development of new business processes not considered in this report.

Whether the additional capability of the smartcard merits the additional cost that it will incur depends upon the scope of the universal library card project. In a purely regional context, the use of smartcards simply to enable reciprocal borrowing appears to be a case of technological overkill.

However, if the project were to have a geographically wider scope, or were to include functionality beyond the provision of reciprocal borrowing rights, then the application of smartcards becomes a much more realistic proposition. Furthermore, the cost of smartcards and the supporting technology will decrease over the next two or three years as their use increases.

If the development of a universal library card were to be approached from a wider perspective by the State Library of Victoria or even the National Library of Australia, then the use of a smartcard as a library card becomes the preferred approach, since other alternatives are unlikely to provide the necessary level of functionality.

It is recommended that a proposal to use a smartcard in the context of a state wide universal library card, championed by the State

Library of Victoria, and run as part of the Victorian ESD project be examined in more detail.

5.4. Consequential Additional Functionality

At an initial workshop to discuss the development of a universal library card, other areas of potential benefit that might be enabled by such a card were considered. These include:

- securing out-of-hours and remote book return devices;

- providing a stored value payment function;

- identification for other non-library functions.

5.4.1.   Out-of-Hours and Remote Book Returns

Out-of-hours book returns at fixed libraries could be made more secure by incorporating a card reader. This could be configured to require a borrower's library card to be inserted before the return device opened. The card reader could be connected to the circulation software to ensure that the return only opened to valid user cards and to record the event in a log.

Secured remote book returns, that would provide a book return point for users of mobile libraries, could also be developed. There would be more difficulty in ensuring that with a remote book return service the card inserted belonged to a current library borrower. This is because of the difficulty of connecting the book return device to a current copy of the library user database. However, sufficient security may be provided merely by ensuring that the identifier on the card was in the correct format for the universal library card.

This device would work with any of the formats of card suggested in this report, ie barcode, magnetic stripe or smart cards. The use of the information storage and processing capability of smartcards would allow the development of more sophisticated systems These could record books returned at book return devices connected to fixed libraries as well as at remote book return devices. This information could be stored on the card itself to enable the return of books to be logged, and to enable individual patrons to provide positive proof of book returns. The development of a functionality specification for this is beyond the scope of this document.

Currently a customised solution to incorporate card readers with book return systems would need to be developed, although in discussion with Raeco, who develop library equipment, some interest was expressed in the idea. If this appears to be a commercially viable device, the company will investigate further its development.

The secured remote book return service could be expected to provide substantial benefit for isolated communities where the mobile library may only visit for one day every three or four weeks. It may also allow the introduction of fines for overdue books where this has not been seen as reasonable to date because of the difficulty of returning

books. This, in turn, will lead to better management of the book stock.

5.4.2. Stored Value

Stored value functionality can be provided with a universal library card through the use of either magnetic stripe or smartcard technology. This would provide the ability for library patrons to pay for a number of services while removing the requirement for library staff to handle cash. Payments that may be made in this way include:

- library fines;

- payment for interlibrary loans;

- photocopying;

- access to computers and printers;

- payment for services on the Internet accessed through the library's Internet connection;

- new services - library services ordered remotely, delivery of books, journals, research.

The use of stored value cards (SVCs) for such payments would require the installation of appropriate card readers attached to the particular devices at which the transaction is to take place.

In addition, it would be necessary to determine how funds are transferred from the point at which the card was "loaded" with value to the supplier of the service. If externally loaded SVCs are used, and the SVC readers are linked to an acquirer bank, then this problem is handled by the banking infrastructure. Otherwise it would be necessary either to restrict use of the SVC to the library at which it was loaded, or institute a clearance scheme that would allow funds to be transferred between libraries in settlement of the usage of the SVCs.

Most observers believe that the use of SVCs will not become generally accepted until late 1998 or early 1999. Consequently this functionality is unlikely to become a practical application within the next two years.

5.4.3. Identification for Other Functions

Depending upon the level of identification and authentication provided by the universal library card, it may also allow library patrons to carry out other functions from, for instance, a terminal at a library. This could include the provision of state government services (through the ESD project) or local government services (either directly or via ESD).

The identification and authentication requirements depend largely upon the nature of the services being requested. Provision of information about services and other public, non-personal information are not likely to require either identification or authentication. The requirements for payments using credit, debit or

stored value cards will generally be handled by, or on behalf of, the issuer of the card used to make payment. The provision of information or services involving confidential or personal information will almost certainly require strong authentication and require an appropriate smartcard.

Overall, these functions will require either an appropriate payment card (credit, debit or SVC) or a system involving the level of identification and authentication provided by an appropriately developed smartcard infrastructure such as ESD.

6.   Implications for Participating Libraries

6.1.   Policy and Process

The development of a universal library card will require the development of business processes to support the new functionality being offered. It will be necessary to examine what level of support is provided by current processes, determine what new processes need to be introduced and from this decide what data must be exchanged between participating libraries to enable these to work. Issues of privacy associated with the exchange of this information will need to be addressed.

It may be possible to provide the required services with minimal exchange of information. For instance, if predefined levels of borrowing, and conditions of eligibility are developed by the participating libraries, and the "home" library takes responsibility for the delivery of overdue notices, it may be possible for the "home" library of an individual to determine their borrowing status at any given "foreign" library. In this case, the only information the "foreign" library may require about the borrower is their identifier and borrowing status. Other information such as name, address and phone number would not need to be exchanged. This would minimise any privacy concerns.

The exchange of this personal data may require the development of new policies at a library or council level, particularly where the library uses the council names database as its patron database.

Use of the universal library card may require the alignment of authentication procedures. For example, if one participating library is willing to accept books being borrowed by an individual without authenticating that the individual is the owner of the card against which the books are borrowed, and a second participating library has a policy of ensuring that the borrower is the owner of the card the mismatch in authentication requirements may require substantially more business processing and the availability of greater amounts of borrower data than if the authentication requirements were more closely aligned.

A consequence of the universal library card may be that the library patrons view the participating library service as somehow unified, and may consider that books borrowed at one participating library should be returnable at any of the others. This will need to be addressed, either in the form of clearly stated conditions of borrowing, or processes to cope with the potential for increased physical transfer of books between libraries. This may be of particular concern where the movement of books between these libraries would otherwise be covered by a payment for an inter-library loan.

6.2.   Identified Benefits

The potential benefits of the development of a universal library card to be used between participating libraries have been identified as being:

- increased patronage of libraries;

- removal of the need for patrons to maintain multiple cards;

- reduction in the number, and hence the cost and administration, of interlibrary loans;

- better collection of statistics on library use;

- development of easier cross-sectoral library usage.

6.3.   Identified Disadvantages

The potential disadvantages of the universal library card may be:

- the cost associated with the requirement for hardware and software upgrades and customisation;

- the increased number of books returned to libraries other than the one from which they were borrowed;

- the requirement to develop new processes to support the use of the card;

- the need to develop policies associated with borrowing status and eligibility; and

- the need to address privacy issues and develop policies associated with exchange of user data.

6.4.   Hardware and Software Requirements

At this stage, hardware and software requirements to support the universal library card cannot be specified in detail.

Initial discussions with the developers of the two circulation software systems involved indicate that the required functionality is either currently present, or can be provided without major customisation. The South Australian example described in Appendix A did not require a significant amount of customisation, although it should be noted that the libraries all had access to in-house expertise to provide the custom programming.

The major barrier for the software development will be the current use of older versions of the software. Dynix no longer provide support for older software and some hardware platforms. This will either require the upgrading of software and hardware, or the sourcing of support from outside Dynix.

The only apparent hardware constraint is in the use of card readers. If a barcoded card is to be used, existing card readers will need to be checked to ensure that they support the required barcode symbology. If magnetic stripe or smartcards are to be used, new card readers will need to be acquired, installed and the software configured to work with them.

7.   Recommendations

While the exact measure of the benefits or the costs or a universal library card cannot be determined at this time, the system does appear to be technically and administratively feasible.

Two approaches are recommended for further consideration:

- A regional approach, focussed principally on reciprocal borrowing and based upon the use of a barcoded library card, that is technologically possible today.

- A state-wide approach, with a wider range of library functions based upon the use of a smartcard. This approach will require the development of the necessary infrastructure, which is unlikely to occur before late 1998 or 1999, but would be developed in conjunction with other non-library functions that will reduce some of the direct costs to libraries and increase the overall functionality of the card.

Of these two approaches, the one based upon the use of a smartcard offers the greater functionality initially, with the potential to expand this functionality and to integrate it with other applications. This is the preferred option in the medium to long term (ie three or more years).

7.1.   Regional Approach

This approach is similar to the one being used by three South Australian Libraries, and documented in Appendix A of this report.

The system is based on the use of existing identifiers at the participating libraries, and uses a barcoded library card displaying the identifier from the borrowers "home" library.

A replicated database of eligible library users would be maintained. Patrons wishing to make use of other libraries would be required to nominate the libraries, and a minimal set of necessary borrower information would be exchanged with these libraries at frequent intervals. This information set would include the borrower's identifier, their "home" library and borrowing status, and any other information considered essential to support the scheme.

Existing software will require a moderate level of customisation to support multiple identifiers and the automatic download and upload of borrower information.

This approach can be implemented using available technology and minimal modification to existing systems and procedures. Administration and operation of the system becomes increasingly difficult as the number of participating libraries increases. However, it is manageable for a small to medium number of libraries (say, up to 6 or 8 libraries). For this reason, this approach is considered to be best suited to a regional implementation.

7.2. State-wide Approach

The second recommended approach is a more technologically complex system with a wider geographical reach using a single universal patron identifier stored on a smartcard to co-exist with (or even replace) the existing identifiers used by the participating libraries.

This system should be developed in conjunction with the State Library of Victoria and Multimedia Victoria and use the Victorian ESD infrastructure. It would enable library systems across the state to participate in the system and may allow ad-hoc use of library services without prior arrangements.

This approach could work with a centralised, distributed or replicated database of patron information. However, the use of a replicated database approach becomes more complex as the number of participating library services increases and relies on the user nominating particular libraries they wish to access. Privacy concerns as well as the difficulty of implementation mean the use of a centralised database approach is not recommended. For this reason the distributed database approach is preferred.

The use of a distributed database would rely on the inclusion of the library user's "home" library system on the card to identify where their information is stored. It would also require the development of policies to allow the provision of access to the "home" library database from other participating library services.

This approach relies on the use of infrastructure and protocols that are not yet available. It is not anticipated that they will be in place until late 1998 or 1999. The development of a solution based on this approach should be seen as being viable in a two to three year time frame.

Funding for this approach may be sought from a number of relevant agencies, however the Electronic Commerce and Community Funding Program through Multimedia Victoria is recommended.

This approach is much more scalable in terms of both geographical reach and functionality. This potential for expansion, together with the ability for library functions to be developed on the card in parallel with non-library functions means that this solution is more beneficial in the medium and long term, and is the preferred approach to the development of a universal library card.

Appendix A - South Australian Reciprocal Borrowing System

The libraries of three universities in South Australia, the University of Adelaide, Flinders University, and the University of South Australia, have established a system for reciprocal borrowing. This system allows eligible library users at each of these libraries to register themselves for borrowing privileges at any of the other libraries. This is done directly on the library management system of the "home" library, and borrowing rights are available the next day.

The registration process and the day-to-day administration of the system is completely automatic. There is no paperwork in the transaction, no requirement to issue new library cards and no involvement on the part of the library staff at either library. Registration is for a period of 35 days, after which the user must re-register to retain reciprocal borrowing rights.

The process is initiated by the library user through a screen in the computerised catalogue system. The user identifies the library for which they want reciprocal borrowing rights. The borrowing and eligibility conditions of this library are displayed on screen, and if eligibility criteria are met, the user is required to indicate that they agree to abide by the rules of the target library, and that they give permission for their personal details to be exchanged between the "home" and target library systems.

The library management software notes in the user's record the libraries at which they are registered to borrow. Each night the details of the all currently approved users are exported as text files (one for each target library) and transmitted across the Internet to the computers of the target libraries. The receiving application then imports these files and updates the membership files of the circulation system with the details of all eligible users. In this way, if any user's status changes so that they are no longer eligible to borrow, this change is reflected at the target library within 24 hours. A user whose privileges are temporarily suspended at the "home" library still has their details loaded at the target library, but with an expiry date that has passed.

As soon as a user's details have been imported into the target library system, borrowing can occur. The user does not need to register, be issued with a local card, or present any further documentation. Each user's record imported into a "foreign" library system includes details of their "home" library. Overdue and other notices for this user are sent to the "home" library for distribution according to local procedures.

Statistics are maintained for the number of users granted reciprocal privileges at each library, and cumulative statistics for the extent of use of the various libraries by those users are also easily retrieved.

The development of the system has required a certain amount of customisation of the library management systems of the three libraries concerned. It required:

- customisation of user screens;

- modification of the user database to include "home" and "foreign" libraries;

- coding of registration procedures;

- export of details of users with reciprocal borrowing rights to the target library's transfer file;

- transmission of data;

- import of details of users from "foreign" libraries.

The transfer data is sent as a tab delimited ASCII file and contains the user's number, name, address, category (staff, student or postgraduate), and registration expiry date. Since all three libraries use the same software, the programmers carrying out the customisation process were able to reuse the procedures and programs created at one site at the other sites to reduce the overall project requirements.