Introduction
There is much potential for community information networks in New Zealand, and for the public library to become involved in developing and managing these networks. However, there is not much effective activity in this area that includes libraries. Some libraries encourage Internet access to information, but only a few libraries have taken the next step of facilitating access to networked community information by actively linking users with Community Information Networks (CINs) and by participating in electronic community information initiatives. It is likely that the level and amount of Web and Internet use vary significantly across the public libraries in New Zealand, but it appears that the Web and the Internet are increasingly used to supplement or even replace more traditional forms of library use and information access.

This is a story of an innovation as seen through the experience of selected staff at one public library in New Zealand, ‘Alexandria City Library’. Because of the requirement that the test library remain anonymous, ‘Alexandria City Library’ or ‘ACL’ has been adopted as its pseudonym.

Through this case study, this research seeks to extend our understanding of how CINs are being used by public libraries, and to assess key factors in adoption of the Internet for CINs. It also explores the application of a particular theory to the diffusion of CINs in ACL through Internet connectivity and, through this theory (Diffusion of Innovation), assesses the conditions which make these networks feasible.

It must be noted that this paper is part of a larger project in which library staff as well as users are surveyed. In this part we focus on the library staff in one library, who are the key personnel in developing and managing the CIN; in the second part, reported elsewhere, we survey the users to determine their views of the CIN and to assess their rates of adoption and the attributes that contribute to or hinder this. (Tran 2004)

Definitions of CIN
A detailed discussion of the appropriate definitions is provided elsewhere (Tran 2004); for the purposes of this paper, we present the definitions with little embellishment.

From a technology perspective, Bajjaly (1999) says that a CIN should provide three services:

- electronic information services that deal with the local community
- access to these electronic resources and services for the community
- training, support, and technical assistance to enable participation.

In order to archive these objectives, a community network must be based on modern information technology (IT) and communications technology (CT) that permit the provision of low-cost electronic information services to and about communities. But it is not just a matter of IT and CT, as many technology experts believe. It is also a matter of community support and it is about people. A CIN meets the needs of people for community information; a CIN is a tool for distributing public information that people want and need; a CIN is a device for communication among people. A public library is also about people and about communication of information, so the library can be a leader in community information networks.
‘Community information network’ (CIN) in this research means the application of IT and telecommunication technologies, and specifically the Internet, to provide information services to the local community.

**CIN Development at Alexandria City Library**

Community information services at ACL have been offered since 1980. Initially, these were based on user demands for community information, usually in the areas of housing, employment, travel and entertainment. Since 1995 the library has used a website and provided electronic services over its network.

One result of ACL’s ongoing web development has been a joint venture between the City Council and ACL. This is a listing of community organisations in the city and some surrounding districts. Today the ACL CIN website includes a wide range of categories, such as:

- Community information database
- Community advocates
- Community boards
- Community governance
- Community relations
- Community services committee
- Creative communities
- Events calendar
- Jobs noticeboard
- Media releases.

The ACL website has been developed as an Alexandra City Council initiative with a series of partners including the Community Development Corporation, Alexandra Tourism, community groups, the business sector, education, and the science and technology sector. It is in part this variety of contributing organisations that makes the website more than a library information service, but rather a CIN as defined for this research.

**Rogers’ Theory: The Diffusion of Innovation**

Rogers (1995, 2003) presents a model of the diffusion process which determines the rate of innovation adoption. As Figure 1 shows, there are five sets of factors that affect the rate of innovation adoption.

![Figure 1. A General Research Framework of the Diffusion Process](image-url)
The important aspect is the rate of adoption of innovations, which sits in the centre of the model. The rate of adoption refers to the fact that certain individuals adopt innovations more quickly than others. Adoption growth usually begins relative slowly, suddenly “takes off” for a period of time, then eventually levels off. Rogers (1983) explained that this is because a small number of opinion leaders are the first to adopt, and that they are later copied by a large wave of followers, which accounts for the dramatic growth. Eventually, when the innovation becomes widely diffused or is replaced with a superior innovation, adoption growth levels off.

Why have we chosen Rogers as the lens through which to view the ACL CIN? This has been explained fully elsewhere (Tran 2004), and here we can only summarise our reasons for choosing Rogers as the preferred model.

Most important is the fact that the DoI model is extremely robust and up to date (the latest edition published in 2003). In terms of its currency, Rogers has made sure that his theory first published in 1962 has evolved and kept up with new insights and developments over the years. This constant evolution has given it a robustness that is unusual in many other models frequently employed in information systems research, such as the Technology Adoption Model (TAM).

From a public library perspective, Chatman (1986) defined the content of innovation as information. Her approach is a significant advance on the use of Rogers in the proposed research for two reasons. First, the traditional diffusion of innovation theory is confirmed as applicable to technology in libraries. Second, the meaning of innovation extended to information means that one can use the theory for more than just technology. In this research we are interested in two developments: (1) use of the Internet as an information tool in libraries – this relates to the traditional aspect of the theory; (2) community information on the Internet – this relates to the second aspect of the theory devised and tested by Chatman. In other words, we can use Rogers as a framework for testing both principal aspects of this research problem.

Following Chatman’s breakthrough extension of the model, DoI has been used successfully in a wide range of information environments. It has been employed in many countries as a means of evaluating a range of services provided by such organisations; applying it to CINs in public libraries is a natural extension of its wide-ranging application in the library environment.

When looking at ACL, we have analysed the potential influences on the adoption of CIN that includes attributes of the innovation in public libraries. This is based on the attributes of an innovation in Rogers’ model (Figure 1). Those attributes are relevant to CIN development, and they are also appropriate for collecting information related to CINs. This is confirmed in the actual research, which tests this model.

**Research Design**

Face-to-face interviews were conducted with five key CIN staff of ACL as a means of gathering data on the perceptions, motivation and attitudes of those directly involved in developing and managing the CIN. These staff were:

- Library Manager
- IT Service Manager
- Community Database Designer
- Community Assistant
- Community Coordinator

To deal with the many variables embedded in the interview questions, it was necessary to devise a series of ‘propositions’. Ten propositions have been created to test the CIN attributes, and these propositions are described and analysed in the next section.
To analyse the data gathered in this qualitative phase of the research it was necessary to review, transcribe, categorise and code information from the interview transcripts. This was done in order to understand the phenomenon being investigated and to present the findings in a suitable manner. (Gorman and Clayton, 1997) The categorisation and coding allowed the researcher to divide the data into smaller units of analysis so that patterns could be found that might help explain the phenomenon being investigated.

Research Questions, Propositions and Findings
This section presents:
1) research propositions related to the first research question - Can Rogers’ Diffusion of Innovation Model be applied to the diffusion of CINs in Alexandria City Library?

2) findings from staff interviews related to the second research question - What are major attributes that have affected CIN adoption in Alexandria City Library?

In order to determine the impact of each CIN variable on the innovation (development of the CIN) a set of propositions is tested, one for each variable. These propositions are based closely on Rogers’ definitions of the key variables, substituting ‘CIN’ for ‘innovation’. (Rogers, 1995 pp.10-16) That is, CIN can be considered as an innovation as well as a new method of providing community information through the library website. As with any innovation, the more the CIN fits each proposition (and the more it fits each variable), the more successful it is likely to be. (Clayton, 1997)

Because of limited space in this conference paper, the findings section has been summarised from staff discussions during the interviews.

Proposition 1 (Relative advantage) - the degree to which a CIN is likely to be implemented successfully will be increased by the extent to which it offers relative advantage. (This relates to the degree that it is perceived as better than traditional methods of providing information services to the community.)

In the interviews library staff indicated that, in their view, community information services on the ACL website offered a number of distinct advantages over traditional information services. These advantages include:

- it offers 24/7 service as it provides information to users throughout the city and the region at any time, and any place
- it can provide a growing range of materials for a variety of purposes because it includes almost everything of interest to the local community
- it is searchable in what staff hope is a variety of user-friendly ways
- it helps people to make friends and to communicate
- staff provide better on-screen search tools that enable users to find information quickly and efficiently
- staff can introduce more content more easily onto the CIN site, particularly resources that aim to serve the needs of the community.

From these views expressed by the Alexandria CIN staff, it is clear that they regard their CIN as having relative advantages in: 1) accessing, 2) communication, 3) information exchange. Therefore, it seems that Alexandria staff believe their CIN is more effective than the traditional methods of providing information services to the community.

Proposition 2 (Compatibility) - the degree to which a CIN is likely to be implemented successfully will be increased by the extent to which it offers compatibility. (This relates to the degree to which the CIN is perceived as being consistent with the existing values, past experiences, and needs of potential staff and users.)
ACL staff offered a range of comments that suggest a high level of perceived compatibility between their abilities and needs and the CIN:

- The CIN is well-matched to librarians’ skills and abilities
- More than being able to explain the CIN content to users, the staff need to feel comfortable with using the CIN themselves in their work, and staff comments indicated that this appears to be the case at ACL
- The staff use the CIN for a range of work-related enquiries, and they feel comfortable about accessing data through the CIN
- It seems that compatibility of the Alexandria CIN has grown as the system has grown, and more than one staff member commented on how it has evolved over the years into being more compatible with evolving technologies and staff expectations.

In ACL it seems clear that compatibility has not been an issue, and that it is a feature of this CIN. It is compatible with staff expertise, so that staff feel comfortable when asked questions about the CIN content; staff agree that the CIN is important in helping them do their professional work; and the CIN has always been compatible with the latest technologies, from fiche to in-house online to Web access.

**Proposition 3 (Complexity)** - the degree to which a CIN is likely to be implemented successfully will be decreased by the extent of its complexity. (This relates to the degree to which a CIN is perceived as difficult to understand and use.)

We have seen that the relative advantage and compatibility of the Alexandria CIN are high, and that they can be said to contribute to the successful implementation of this CIN. But perhaps the complexity of the CIN is a much less positive feature. ACL staff have raised the following issues regarding the complexity of CIN:

- The issues of complexity include incompatible hardware, various and confusing software applications, and a high number of IT-related skills. These issues relate to staff and their use of the CIN and must be acquired for staff to operate the CIN effectively
- Staff relations with users is another issue. For example, staff involved with CIN development need to understand user requirements for community information, their IT abilities, ability to use the interface, etc.
- A charge for searching and downloading information from the CIN is being considered at Alexandria, and it is a difficult matter to decide. If it is introduced, the charging system may be too complex for some people, and will introduce another matter to be managed
- It is difficult to define the concept of community information; and the criteria for inclusion of community groups are not always consistent
- The complexity is made more difficult by a lack of clear definitions of what to include and what to exclude.

All of these comments point to a high level of complexity and resulting frustration on the part of staff. It is not possible at this point to quantify the degree to which this may have negatively affected CIN adoption at ACL.

**Proposition 4 (Trialability)** - the degree to which a CIN is likely to be implemented successfully will be increased by the extent to which it offers trialability. (This relates to the degree to which a CIN may be experimented with on a limited basis.)

ACL staff seem to have been cognisant of this issue, and have made clear efforts to ensure trialability in a variety of ways:

- There is a requirement of continual testing and monitoring of the relationship between the Library and the Council to ensure that the procedures are efficient and effective
The library web team is constantly improving CIN content and access in order to help people find information more efficiently in the community database.

An important aspect of trialability is the way in which development occurs through a process of experimentation and ‘trial and error’.

It seems that almost instinctively ACL staff have understood that the way to serve users’ varied needs most effectively is to develop an understanding of information that is most valuable to people, have increasingly skilled CIN staff and build a ‘best practice’ CIN model – all of which have been achieved through trialability.

**Proposition 5 (Observability)** - the degree to which a CIN is likely to be implemented successfully will be increased by the extent to which it offers observability. (This relates to the degree to which the results of a CIN are visible to others.)

Observability refers to the visible output of the CIN database, an essential attribute to the diffusion of CINs. Making sure the CIN database can be viewed by various browsers is an essential feature that ACL staff have worked conscientiously to achieve. They also have tried to ensure that the ACL website is easy to navigate and easy to use by all kinds of browsers. Without this being done successfully, people would have difficulty in seeing information through CIN, and there would be much less adequate diffusion of the CIN and much less adoption of the CIN.

ACL staff try to deal with various browser functions by first testing community service information before publishing it through the City Council’s server. They believe that it is the best way to ensure that the community database and library website are clearly accessible to people through the various browsers they might be using. Without observability having been tested and refined in this way, the community information would not be readily accessible to ACL’s users.

**Proposition 6 (External communication channels)** – the degree to which a CIN is likely to be implemented successfully will be increased by the extent to which the library staff have learned about CIN from external communication channels (mass media).

From the interviews it emerged that external communication channels have been of secondary importance in implementing the CIN. At least the evidence is that little has been done to foster or utilise such channels extensively.

To develop, maintain and extend the ACL CIN, a discussion forum on the website is used to supplement the face-to-face discussions about content and usability. This idea is for staff to encourage people in participate in the CIN and nurture it. People other than staff have become quite enthusiastic, and they are allowed to run sessions and actually put up material. In this way users themselves become clear communication channels about content and use of the CIN.

In order to collect data and information for the CIN database Library staff often contact individual organisations by post for delivering larger amounts of information, with the telephone a second level communication channel.

From this evidence, it seems that communication channels do not loom large in the thinking of ACL staff. However, as the next proposition suggests, there may have been inadequate clarity in distinguishing between external and interpersonal communication channels.

**Proposition 7 (Interpersonal communication channels)** – the degree to which a CIN is likely to be implemented successfully will be increased by the extent to which the library staff have learned about CIN from interpersonal channels within the library (face-to-face exchange of ideas).
While the external communication channels appear less significant in defining the content and use of the ACL CIN, most staff place considerable emphasis on interpersonal communication channels as a way of gathering and disseminating information about the website. Internally, the web team talk with staff about their work in the association with CIN, and some are immediately interested to see what is being done, while others are not particularly keen to know. Externally, ACL staff talk with people outside the library and show them how to use community information on the website, or discussing better ways of using community information on the website.

Face-to-face communication with users is believed as an important means to find what they need is in order to provide relevant information to them. However, the chance to talk with people and build a good relationship with them is still an issue that ACL needs to address more thoroughly. ‘The qualitative surveys do not really work’ in the opinion of the Library Manager.

**Proposition 8 (Extent of change agents’ promotion efforts)** - the degree to which a CIN is likely to be implemented successfully will be increased by the extent to which the libraries become change agents in the introduction of Internet-based community information services.

- Initially, a few people did not like the electronic services because they were fearful about their own skill levels. This has changed over the last two or three years. This is because the Library has provided opportunities for them to increase their skills
- Staff attitudes about the CIN differ somewhat. Young staff seem very keen to be associated with the website, and they consider it the way forward; as a result, most of them have adopted it wholeheartedly; while few staff at the other end of the spectrum who are suspicious of the web
- Staff have changed to a more team-based approach in their work, building relationships with local organisations as well as local users and citizens, IT dealers, City Council, and improving IT skills, etc.
- Staff are very supportive of each other and are happy to share their expertise with another team member who cannot find an answer to a particular information problem.

There is a practical example of extent of change agents’ promotion efforts. In 1998 ACL did not have the web presence for children and teens and now it does. The IT Services Manager is very clear about how this has been implemented: the library staff have to go out and talk with people about the new site, explaining, distributing information about the new site, and convincing people to use it. The next step is the people’s decision: they will make the decision to use it or not; and if the content is appropriate, this will confirm their decision, which will be evident when they return to the site as regular users.

**Proposition 9 (Social system)** - the degree to which a CIN is likely to be implemented successfully will be increased by the extent to which the library staff participate as members of a social system. (This relates to the degree to which the innovation is perceived as a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal.)

The important question here is whether ACL staff participate as members of a social system; this might be a micro system within the Library, as well as a macro system that extends into the community. If they do, then it should be evident that there is a series of interrelated units engaged in problem solving.

At ACL, a set of associated units and CIN staff that have committed themselves to develop and redevelop the Library website in order to provide community services on it. It can be seen that these units work in team and they are engaged in joint problem solving to achieve providing community services via the website. They are ‘a social system’ in the terminology of Rogers (1995).
The activities that have drawn ACL staff into a social system for developing the CIN include: 1) teamwork, 2) partnership, 3) cooperation, 4) collaboration.

**Proposition 10 (Types of innovation decisions)** – the degree to which a CIN is likely to be implemented successfully will be increased by the extent to which the library offers various types of CIN-related innovation decisions.

At ACL considerable discussion takes place before any major decision is made regarding the CIN. Three examples show the range of decision-making processes that are employed, and all of them can be related to Rogers’ typology.

- First example - the Community Database Designer, Reference Manager, IT Services Manager and Library Manager held a series of meetings in order to make a decision to develop in-house database.
- Second example - the IT Services Manager can make decisions about IT solutions and technologies that are needed, but he has to discuss these issues with the Library Manager for budget approval. This case also shows the cooperation and support in developing community services at ACL.
- In different contexts the decisions can be made by individual staff. Thus in the third example the Community Assistant can decide the most efficient ways to support users; The Community Coordinator can decide what topics and directories might be added and which template would be relevant to the database; and The Library Manager is charged with decisions on the budget and funding, or approving purchase orders related to CIN.

Following Rogers (1995), the above examples show that there are three types of innovation-decisions in ACL: collective decisions (Example 1), optional decisions (Example 2), and authority-based decision (Example 3). All three types of decisions are needed for the ACL CIN to develop into the effective information resource that it has become in recent years.

**Conclusion**

The results of this continuing research project thus far indicate conclusively, in response to the first research question, that Rogers’ Diffusion of Innovation framework is an appropriate vehicle for assessing the development of Community Information Networks as innovation in New Zealand public libraries. It allows a robust series of factors to be considered and evaluated as a means of indicating likely successes and failures in continuing CIN development.

More specifically, in relation to the various sets of factors as expressed in the preceding propositions, it emerges that some seem rather more significant that others in determining the successful adoption of a CIN. Specifically, the following factors appear to have exerted a positive influence on CIN development at ACL:

- Relative advantage
- Compatibility
- Trialability
- Observability
- Extent of change agents’ promotion efforts
- Social system
- Types of innovation decisions

In this qualitative investigation it has not been possible to quantify or rank these factors in terms of impact, but the first five would seem to be most significant in the eyes of ACL staff. The last two factors seem less important.
In contrast, complexity seems to have been a definite drawback, and there is clearly room here for more detailed investigation through other cases of the issue of complexity in CIN adoption. To what extent can complexity be minimised, and how does complexity impact on client reaction to a CIN? These are questions worth further study.

Likewise, from this research it has emerged that Rogers’ communication categories (external communication, interpersonal communication) are not that clearly perceived by practitioners (or researchers perhaps), and that this needs to be addressed in more careful distinctions being made between the categories in any future research.

What remains now is to compare the perceptions of CIN staff with the perceptions of actual CIN clients. This is the next phase of the research.

References

Appendix – List of Questions to be used by the Interviewer

**General background**
- Could you please introduce yourself? Tell me something about your professional background.
- What is your current position?

**Major attributes and factors associated with the diffusion of CINs**

**Relative advantages**
- In the provision of information services via CINs, what do you think about the differences between these services and traditional/print services?
- ‘The CIN has improved the ways that your library is providing services to the users’. What is your view of this statement?
- If you have the choice between CINs and traditional methods of providing information services, which one would you prefer? Why?

**Compatibility**
- How comfortable are you with the CIN both technically and ‘socially’ (as a means of communication)?
- Do you feel that your job dealing with the CIN is more interesting than others you could do?
- Would you accept almost any type of job assignment in order to remain involved with the CIN in this library? Why?
**Complexity**
- What obstacles did you face when starting the network? What other ongoing challenges do you face in developing or using the CIN?
- Have you changed the way you do your job to facilitate CIN’s development? Was this change easy for you or difficult?

**Trialability**
- When did the library first operate CIN? And what CIN services did the library first provide to users?
- What CIN services is the library currently providing to users? How does the library experiment with or test these services?

**Observability**
- Do you have CIN users within your library (your colleagues, etc.)?
- Is it easy or difficult for internal users to access the CIN?
- What CIN services have they used (facilities, technology, etc.)?

**Innovation-decision type**
- Were you involved in the process of making decisions about CIN development in your library? If yes, please describe this process.
- How do you receive decisions, reports and information about CIN development?
- What requirements and responsibilities have you got in the provision of CINs?

**Communication channels**
- By which ways do you have discussions with internal and external users on CINs (telephone, email, or face to face)? How often?
- How do you involve in the process of providing community information services to external users?
- What methods of communication do you often use to communicate with your colleagues and external users in term of your work assignment? How important is each of these methods to your work? (For example: email, meeting, telephone, hand written text, etc.).

**The social system and change agents**
- What organisations, services, networks, educational institutions, or other entities does your CIN cooperate with? What are their roles in the project?
- How has the CIN affected your library in terms of library structure, staff and employees, and other factors?
- Has your level of productivity changed? What is the impact on the quality of work in term of your involvement with CIN?