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Is 'community' important for Community Information Systems?

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Abstract

Community information systems have the power to transform communities. However, without fully understanding the pre-requisite factors affecting community information system viability, and the complex relationships between these factors, communities struggle to manage such projects in a way that leads to viable systems that deliver real benefits. This paper develops and presents a Model of Community Information System Viability Pre-requisite Factors, based on both existing literature and the study of three community information system projects. This Model represents the generic factors that inform viability (i.e. leadership, active membership, funding, awareness, and system design and functionality), and also considers the impact of community context. This study argues that the viability of a Community Information System cannot be considered in isolation. All factors are directly impacted by the value of the Community Information System to the community. Management can also heavily impact on the success of a Community Information System.

Keywords

Community, Information System, Model, Viability, Website.

INTRODUCTION

While information systems have the ability to transform both business and education (the theme for ACIS 2103) it is also important to consider their role in transforming communities. Transformation of the behaviour and communication of communities naturally flows into the business and educational sectors within that community. As Gurstein (2004) states "Communities are the bedrock of human development" (p.2). With information systems now embedded in the daily habits and interactions of people in all types of communities, both organisations and the community members themselves are seeking to use these information systems to *improve* their social and professional interactions. This paper presents a model for understanding the factors that impact on establishing and maintaining viable community information systems (CISs) based on the literature, and the relationships between these factors. This model was then tested against the experiences of three communities as they each undertook the process of establishing a community website (as an example of a CIS). As well as considering the validity of the model, these case studies allow us to understand the impact of *context* in CIS viability and, ultimately, sustainability.

The social context in which information system projects operate has been identified as a major factor in adoption of technology (Borgida et al. 2002), and in determining the participation levels and interactions between community members (Guthrie and Dutton 1992; Virnoche, 1998 cited in Borgida et al. 2002). Research that allows us to observe the role of social issues and features, such as community history, size and cohesion, has the potential to assist future communities undertaking this process. Of the limited published literature addressing such issues, no major studies have conducted a review of these factors across multiple communities, and none have used structured observation or an informed review process throughout development. With each community having a distinct identity that will affect the process, this research observed three communities to identify common issues likely to impact on the development of all community websites. This research proposes the first model of CIS viability, incorporating an understanding the role of the community context within CISs.

The term 'community information system' is broadly used to define technology-enabled interactions within communities – for example, systems that share local information that inform locals' perceptions of their community (for example, local government publicising data about the area, details of events, or encouraging direct interaction through social media); systems that allow people to contribute information about their community (for example, reporting graffiti through a website or app); shared infrastructure (including data, a web portal, support and/or associated outputs such as reports) to build community capacity, and even Massive Online Open Courses (MOOCS) (which it could be argued was predated by projects such as the 'Community Information Systems' project conducted in 2001 (Groves and Schuler 2001)).

While some CISs (such as MOOCs) may be targeted at a purely online 'community' of individuals, this research is focused on CISs that are created to meet the needs of geographically co-located individuals. This research specifically focuses on community websites as one type of CIS. Community websites typically provide a range of content and services, often including current local news and the ability for community members to interact online. While a community website allows only online interaction between community members, the social dynamics of the communities that engage with these community websites are often similar to those of the traditional face-to-face community they represent, and it is now accepted that it has become "tricky to divide the 'virtual' from the 'real' in any simplistic way" (Wakeford 2004, 130); this is reinforced by the growth of online interaction options (for example, email, instant messaging, newsgroups, social media, online collaboration tools, video conferencing, and the integration of all these options into shared platforms). These online interaction tools facilitate the linking of individuals, creating online community spaces and social networks where members can share and develop ideas and knowledge, give advice, and support each other in problem solving (Millen et al. 2002; O'Neil 2002; Vrazalic and Hyland 2004).

LITERATURE AND MODEL DEVELOPMENT

Research indicates that most viability and sustainability models to date have been designed for commercial projects rather than community-based projects. Despite much discussion in community informatics literature about the importance of sustainability for CIS projects, few models that address the complex intersection of *community/social*, *funding* and *technology* issues have been developed. This section presents three models that seek to identify and describe sustainability issues for CIS projects. As noted below, each of these models has shortcomings – none consider the full breadth of issues raised in the literature. After presenting the models, a theme-based summary of related literature is provided. Arising from this review is our Model of Community Information System Viability (Figure 1).

Romm and Taylor developed the *Autonomy/Harmony Model* (2001) to describe the impact of the social context on, and predict the sustainability of, any community informatics project. Each community's level of *Autonomy* and *Harmony* is assessed and marked on the Autonomy/Harmony Model 2x2 matrix, with the combination of these two factors used to determine the project's likely sustainability. However, a study of the Autonomy/Harmony Model found that it ignored numerous factors that have the potential to influence the success and sustainability of CIS projects. The ignored factors include "technological development, government, finances…motivation, politics [and] culture" (O'Neil 2002, 78), and that community harmony and autonomy will typically change over time (O'Neil 2002).

While interested in building a CIS sustainability model, Ripamonti et al. stated that this "is a long and complex process" (2005, 65). Therefore, they limited their model to two issues: "how to define the cost structure of online communities and how to measure their benefits" (Ripamonti et al. 2005, 65). Despite recognising the importance of social and technology factors, these are not included in the model because the researchers believed each CIS project must identify their own social and technology success factors. The model, based on concepts found in business literature, focuses on financial sustainability.

The *S3 Model*, designed specifically for community website projects, identifies dimensions that impact on the sustainability of regional community websites at each of the three stages of development: Set-Up, Survival, and Self-Sustainability (Vrazalic and Hyland 2004). While useful for identifying a range of factors that must be considered in the development and sustainability of a community website, it assumes that funds available in the first stage and that they are part of a top-down government driven program (Vrazalic and Hyland 2004). Also, the model does not identify the interdependencies of the identified dimensions, and has not been validated.

The success and subsequent sustainability of CIS projects, and community websites in particular, is influenced by many diverse *community/social*, *funding* and *technology* issues. With no CIS model that addresses all these aspects, there is an opportunity for this research to fill this gap in the literature and identify the interdependencies of the identified issues.

A review of the literature, in combination with consideration of the three models presented above, revealed six repeated themes:

1. To *lead* the CIS development, an effective management team is required, including a skilful facilitator to support the management team.

Previous community ICT projects have shown that organisational support, a high quality management team, and specifically an effective facilitator, are essential for success (Beamish 1995; Mieszkowski 2000; Millen et al. 2002; Muylle and Basu 2004; Vrazalic and Hyland 2004; Ripamonti et al. 2005). Community-based facilitators work closely with community members, and so require a variety of interpersonal and organisational skills. They need the ability to engage and work closely with the community, identify community needs and respond to them appropriately, establish partnerships and maintain open communication, and build community trust (Mieszkowski 2000; Donovan et al. 2002).

Maintaining a sufficient level of membership (to provide staffing) is often problematic for community websites, particularly when all are working in a voluntary capacity. High turnover of members is common (Tanner 2005). It is typical for community websites to be initiated by a small group of committed individuals (Ripamonti et al. 2005). The community website's ability to survive the departure of the founding members is integral to its success (Beamish 1995). If the community website is not self-sustaining in terms of new community members joining the management group, or if the management group cannot afford to pay staff, this is problematic and is likely to ultimately result in website failure (Ripamonti et al. 2005).

2. A CIS has little value without an *active membership base* of people using it.

While e-commerce websites typically measure success by the total website traffic, studies have found that this is not a critical success factor for community websites (Muylle and Basu 2004). Rather, it is the presence of an active community, where members contribute to the community website (for example, by asking questions, sharing ideas, discussing public issues, and providing information and expertise), thereby creating a sense of community identity, that is essential (Schuler 1996; Day 2002; Wang and Fesenmaier 2004). Community websites should be designed to maximise participation from all areas of the community; a large membership base minimises the problems of large numbers of lurkers and is beneficial in the longer term because it allows the community to evolve and prosper over time (Wang and Fesenmaier 2004).

3. It is essential to ensure sufficient on-going *funding* for the CIS.

Despite Guthrie and Dutton's (1992 cited in Borgida et al. 2002) claim that the amount of financial resources available does not play a major role in determining the participation levels and interactions between community members (when compared with the significant influences of social and political contexts and the community culture), many other studies found that financial issues affected almost all aspects of CIS start-up and development, content and technical maintenance of the system, and when attempting to achieve critical mass for longer term financial viability. Many identified funding as a key element for sustainability (Beamish 1995; Millen et al. 2002; Fisher and Craig 2004; Muylle and Basu 2004; Fisher and Craig 2005; Ripamonti et al. 2005), thereby impacting on community engagement and success. The issue of finance was considered so integral to the success of community websites that the S3 Model (above) was developed to identify the issues that impact on each of the three phases of community website development (Vrazalic and Hyland 2004). This is also true of Ripamonti et al.'s (2005) model (above).

4. Promotion must start early and continue after CIS launch to maintain high *awareness* of the system; community members must know about it before they will use it.

Without a community of users, a website cannot be considered a 'community' website (Schuler 1996; Millen et al. 2002; Damsgaard, 2002 cited in Fisher and Craig 2004; Fisher and Craig 2005). Maximising community involvement is important for a community website, with a lack of community participation being identified as the major reason for the failure of some community websites (Fisher and Craig 2004). Community participation is key to collaboration between website managers and community members: collaboration is essential for building trust and support among community members participating in the community website (Fisher and Craig 2005), and full community ownership of such projects has been identified as one of two major factors that are positively associated with project success (2001). On-going publicity to maintain community awareness is therefore essential (Fisher and Craig 2004).

5. The management team should be able to build relationships with the wider community, to inform the development and maintenance process, and ensure that the resulting CIS offers a *design and functionality* that meet the community's needs.

While the purpose of each community website is to meet the needs of its specific audience, a range of features and content are common to the majority of community websites. Despite these commonalities, website design and functionality are commonly problematic (Fisher and Craig 2005). Usability discussions highlight the importance of designing for the culture of the target user group (Heldal et al. 2004), however this becomes difficult when trying to meet the varied and competing needs of larger communities due to their heterogeneous

nature (Donovan et al. 2002). Whatever the selected content and features, it is essential that CISs are easy to use (Parameswaran and Whinston 2007), that information is easily accessible to users , and that the CISs provide a set of relevant services (Damsgaard, 2002 cited in Fisher and Craig 2005).

Successful community websites have rich and highly dynamic content, which may be selected and reviewed by community members (Parameswaran and Whinston 2007) or by a commercial entity. The nature of the information (commercial vs. non-commercial) and editorial content (local community control vs. externally sourced content) impacts on the type, tone and quality of the CIS content (Guthrie and Dutton 1992). Maintaining current data has been found to be a significant problem for community websites, with one study finding that contact information listed for 58% of businesses on reviewed community websites was incorrect (Fisher and Craig 2004, 7).

6. The system must be *valuable to the community* in order to engage community members, develop an active membership base and build social capital. This requires that it has a community-focus.

The value offered to users of a CIS has a significant impact on its success (Millen et al. 2002). Benefits may be gained by an individual user, the community, or the CIS management organisation (Millen et al. 2002). The benefits to individuals include the ability to develop a positive reputation through the CIS, a more thorough understanding of the activities of other community members, and an increased level of trust between community members (Millen et al. 2002). Businesses and other existing community groups require perceived value before engaging with a CIS (Fisher and Craig 2004). As Romm and Taylor (2001, 2870) observe, "If members of the community cannot see how the technologies can be of use to them, they are not likely to adopt them". A range of tangible financial benefits and intangible gains (such as increased community presence and higher visibility) are also available to the organisation that runs the CIS (Millen et al. 2002).

From the review of the literature, it is evident that there are a number of pre-requisites for CIS viability. CIS viability is directly affected by factors across *community/social*, *funding* and *technology* areas. The Model of Community Information System Viability Pre-requisite Factors (Figure 1) depicts the six factors from the literature as directly impacting on the viability of CISs.

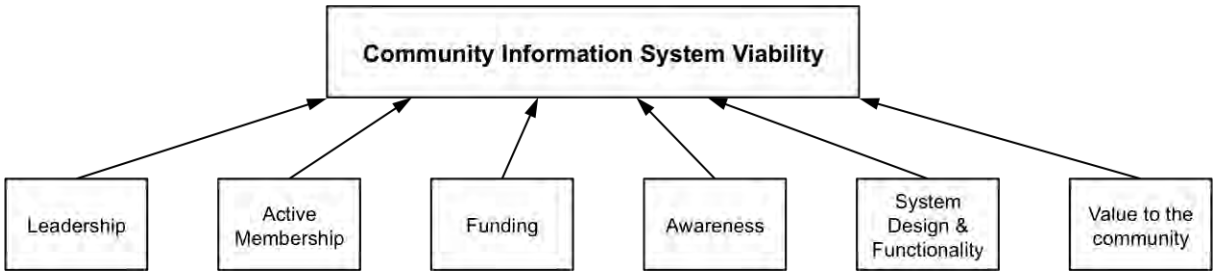

Figure 1. Model of Community Information System Viability Pre-requisite Factors

Findings from the literature suggest that these six factors impact on all CIS projects to some degree. An understanding of these factors, and pro-active management of any areas of deficiency, are necessary before commencing significant development of an CIS. This approach is likely to improve CIS viability. However, ignoring any of these factors is likely to result in medium- and long-term repercussions that will threaten the viability of the CIS. To confirm the relevance of this model to such initiatives, and to more fully explore the relationships *between* factors, we sought to validate the model with three CIS projects.

VALIDATING THE MODEL

Given the diverse nature of communities, the importance of context must be considered in any CIS project. To allow both confirmation of the model and consideration of community context, we engaged with three communities, each of which were participating in the pilot of the same community website scheme. Below, we outline the scheme (which provided consistency and a basis for comparison), describe the three community contexts, and outline the methodology used. We then summarise the key experiences of the communities and consider the validity of the model proposed in Figure 1.

The Scheme and Participating Communities

The Community Geographic Domain Name (CGDN) scheme was established by the .au Domain Names Administrator (auDA), which is the body responsible for all .au domain names. auDA holds sole authority across .au domain name space. The scheme established a set of new second-level domains (2LDs) for the exclusive use of geographic communities (auDA 2005), giving each geographic community group access to a domain name that is representative of their physical location. For example, the suburb of Wollongong in the state of New South Wales is represented by www.wollongong.nsw.au. There are numerous community websites and other CISs

currently active, however the CGDN scheme offered a novel opportunity to conduct a comparison study of multiple communities engaging in a similar process with a common goal, and hence informing our understanding of the role of community context in CIS viability. Comparative research across community projects involving information technology has been very limited (Stoecker 2005), and as a result those involved have struggled to link the experiences of practical projects with generalisable academic outcomes. This research will begin to overcome such weaknesses of CIS projects by conducting case studies on three communities, and comparing these experiences to determine whether identified factors are common to diverse communities. These websites were developed independently and were not provided with any funding.

auDA developed policies to govern the new CDGNs. For the purposes of this study, auDA was viewed as providing ***external management*** of the scheme. To ensure that these policies were comprehensive, three communities with distinctive characteristics were involved in a pilot implementation. The communities were:

- ***Ballarat:*** Large country city (85,000 residents) in Victoria, Australia, facilitated by an organisation answerable to local council
- ***Bathurst:*** Medium-sized country town (30,000 residents) in NSW, Australia, facilitated by a state government body located in the community, and
- ***Wollongong:*** Large regional city (200,000 residents) in NSW, Australia, facilitated by the local university.

For the purposes of this study, the facilitators of each pilot were viewed as providing ***leadership***. The differences between these communities provided the opportunity to observe the impact of community size, type, history, and management on the success of each CIS in this research. With a limited number of case studies, it is not possible to derive statistically meaningful conclusions from the results. However, Walsham (1995) asserts that it is possible to generalise case study findings in the form of rich insights. (Further confirming the generalisability of the findings to at least other communities participating in this scheme, experiences of these three communities have been mirrored in informal feedback provided from some of the 280 communities operating websites under the scheme as of July 2013 (auDA 2013)).

Recording the Experiences

The experiences of the communities were researched using a case study methodology (Myers 2005) through independent and objective observation. Case study research is interpretive research (Creswell 2003), and requires that the researcher become familiar with the participants and the environment in which they operate before analysing "the data for themes or issues" (Creswell 2003). This allowed the issues that impacted on the success and sustainability of the CISs to be identified within their real- life context, without having to pre-define the boundaries of the research (Yin 2003).

Data collected and analysed over a three-year period included observations; interviews with key stakeholders; published documentation; pilot community reports; community surveys; meeting transcripts, minutes and observation; audiovisual materials; and reviews of the community websites. Together, these provided a detailed description of the communities' experiences (Creswell 2003). This approach of triangulating from multiple sources is accepted as the most effective method for evaluating community projects involving information technology (O'Neil 2002; Myers 2005).

To identify common themes and issues experienced by the communities, and the relationships between these issues, an approach inspired by grounded theory was used. This was "based upon the researchers' interpretation and description of phenomena based on the [community participants'] subjective descriptions and interpretations of their experiences" (Akhavan et al. 2006) and the other rich data collected from and about the pilot communities' experiences. All representations of the experiences, and of issues determined by these experiences, are based on information provided by individuals from the participating communities (Creswell 2003). It is important to note that existing literature inspired but did not contaminate the results of this research.

CATEGORISATION OF ISSUES

The issues and experiences identified in this section of the paper refer to the first three years of existence for the community groups engaged in creating community websites. A thematic approach was used to informally categorise issues based on the recorded experiences of the members of the three communities. Many of these categories have similarities to those discussed in the literature. For the purposes of brevity, the presence of issues in each of the communities is shown in Table 1 (below). A discussion of these issues and categories is presented below, and discussed in relation to the validity of Figure 1.

Table 1: Grounded Theory Issues[1]

Description	Ballarat	Bathurst	Wollongong
External Management			
Coordinated support for leadership of the CIS		X	X
Organisational issues within/between management bodies (auDA/auCD)		X	X
Limitations imposed (auDA/auCD)		X	X
Communication between external management & leadership		X	X
Policy poorly enforced (CGDN)	X		
Policy modifications (CGDN)		X	X
Leadership			
Effective facilitator	X		X
Committed management team members	X	X	X
Documentation requirements (excessive)	X	X	X
Management succession planning	X		
Independent managing body	X		
Trust & loyalty (lack of)	X		
Community control (lack of)	X		
Active Membership			
Broad community representation	X	X	X
Community commitment & contribution	X	X	X
Mechanisms for maximising community involvement		X	X
Communication mechanisms	X	X	X
Skilled community members	X	X	X
Shared goals & objectives	X	X	X
Governance policies	X	X	X
Presence of volunteer workers		X	X
Detailed planning		X	X
Funding			
Financial investment from the community			X
Viable level of funding	X	X	X
Competition for available funds			X
Unrealistic financial plans		X	
Awareness			
Local promotion	X		X
National promotion		X	X
Community consultation	X		X
System Design and Functionality			
Technical implementation	X	X	X
Infrastructure	X	X	X
System (i.e. website) content	X		X

All three communities experienced issues related to the ***external management*** of the CGDN scheme (as noted above, ***external management*** refers to auDA's role, which involved development and enforcement of domain name policies and roll-out of the CGDN scheme). This category of issues was *not* identified in the literature, and hence not depicted in Figure 1. While it can be argued that external management issues are not necessarily relevant to all CISs, it is likely that similar types of challenges will be experienced in many such projects due to their nature. Reflecting back on the examples of CISs noted above, they are often coordinated (to some degree) by a single organisation – for example, a local council or a 'collective' drawing together existing resources. The experiences of the communities suggest that any type of external management of a CIS is likely to result in some

[1] An *X* denotes the presence of an issue in the corresponding community.

type of friction that must be addressed. Notably, the Wollongong and Bathurst communities experienced significantly more issues related to external management than did the Ballarat community. These communities both remained in close contact with the managing body and adhered more closely to the CGDN scheme requirements. Ballarat preferred to build their website independently and, in many cases, did not act in accordance with the limitations of the scheme. Also notable was that the Ballarat pilot had all decisions made by a closed Steering Committee rather than through community consultation, and the resulting website was concerned more with business than community issues and information.

This difference between the communities' experiences reveals that the viability of any CIS is heavily influenced by restrictions imposed by an external body (when followed). Operation of CISs under unviable regulations will necessarily negatively impact on each CIS. This is *not* a consequence of the community context. Therefore, this ***external management*** factor is depicted separately to the contextual factors in Figure 2.

Leadership issues were identified in all three communities (as noted above, ***leadership*** refers to the role of the facilitator within each community); the community with the least engaged facilitator and least representative management team experienced the greatest number of issues with leadership (Ballarat). The facilitator of the community with the fewest leadership issues was also employed on the CGDN scheme full time (Bathurst); this dedication to the project was highlighted by community members as a key feature of the CIS's success. Facilitators in the other two communities had responsibility for multiple diverse projects, and had no history of developing similar projects. Dedicated facilitation resources, knowledge of the domain, and a representative community-based management team were confirmed as important in this research.

Therefore, the relationship between ***leadership*** and CIS viability, as depicted in Figure 1, is retained in Figure 2. A relationship between active membership and leadership was also found, with strong community participation and support shown to encourage greater commitment and enthusiasm from the leaders. Additionally, a relationship between funding and leadership was found, with access to resources shown to motivate leaders through their enhanced ability to progress the CIS quickly and meet the community's needs. These relationships between factors have been added in Figure 2, extending Figure 1.

Community context was shown to have a significant impact on ***active membership***. Attempts to develop and maintain a shared sense of ownership and full community representation posed numerous issues. Negative perceptions of CIS projects (due to numerous previous failed projects) created difficulty obtaining community involvement in one community. The economic, social, professional, ethnic and language diversity of one community resulted in difficulty building a management team that was fully representative of that community. It is likely that similar difficulties engaging with all segments of the community will occur in many communities. The lack of participation from some segments of the community also meant it was not possible to build a truly representative group that allowed all community segments to participate in ownership of the CIS. Identifying and contacting key stakeholders was a problem in the largest and most diverse of the three communities. All communities experienced difficulty maintaining community commitment and contribution, with attendance levels at meetings falling after the first few months. Volunteer workers were highly valued; the lack of paid staff (due to limited finances) placed a heavy burden on the volunteer workers, and delays were experienced by two communities because the volunteers had limited time to commit to the CIS. The Wollongong and Bathurst facilitators were focused on building social capital by engaging the broader community and developing resources to support community engagement. These two communities used a variety of communication mechanisms in an attempt to maintain engagement. Despite having access to identical online communication mechanisms, the Ballarat test case did not regularly use them, leading to a break down in communication between members and the facilitator. The lack of communication between the Ballarat facilitator and community members, the other two communities and the external management body, impacted negatively on the morale of the Ballarat community members. The Ballarat Steering Committee did not consult with the broader community before the launch of their website, and did not allow them to contribute ideas or feedback.

The relationship between ***active membership*** and CIS viability, as depicted in Figure 1, is retained in Figure 2. A relationship between active membership and awareness was also found, with broad awareness of, and consultation about, the community website naturally leading to higher levels of community participation through active engagement. Additionally, community websites that offered relevant and useful functionality and information, and that were well designed, were more heavily used (demonstrated through active membership). These relationships between factors have been added in Figure 2, extending Figure 1.

Obtaining a viable level of ***funding*** was problematic for all three communities. The lack of funding was partially attributed to ineffective publicity at both local and national levels. (Despite the communities participating in the CGDN scheme, coordinated promotion was not provided.) The communities were unable to heavily promote their websites independently (to therefore raising awareness and attract funding), as they could not afford to pay for advertising. The communities' approaches to funding varied. Bathurst enjoyed high levels of support from the local community; their website was funded predominantly by their managing organisation and local council.

There was strong competition for available funds in Wollongong, which was exacerbated by the community's low investment in local initiatives. The Ballarat Steering Committee viewed the community website as a money-making venture, to the detriment of the community. In all cases, detailed financial plans developed upon formation were found to be unfeasible due to the absence of financial capital to implement these plans for building social capital. They were delayed to the medium- to long-term.

The relationship between ***funding*** and CIS viability, as depicted in Figure 1, is retained in Figure 2. A relationship between awareness and funding was also found, with greater awareness meaning higher direct financial investment and greater success when applying for grants. This relationship between factors has been added in Figure 2, extending Figure 1.

Achieving high levels of local ***awareness*** of the community websites posed challenges. Broad community awareness was achieved during the formation stage, however there was little publicity after the management team was formed. The amount of promotion, and hence awareness, was reflected in participation levels and community representation on the management team.

The relationship between ***awareness*** and CIS viability, as depicted in Figure 1, is retained in Figure 2. A relationship between funding and awareness was also found, with greater funding allowing stronger promotion of the community website, hence increasing awareness. Additionally, a community website that offered relevant and useful functionality and information, and that was well designed, was talked about and so awareness was raised through informal promotion. These relationships between factors have been added in Figure 2, extending Figure 1.

Agreeing on and committing to ***system design, functionality*** and infrastructure requirements early in the website development process caused concern in some communities, with a lack of funds restricting the options. Poor community engagement was a common cause of frustration and delays. The greatest success was achieved when a basic community website was launched by Bathurst and the broader community were able to contribute suggestions for improvements, reflecting their desires.

The relationship between ***system design and functionality*** and CIS viability, as depicted in Figure 1, is retained in Figure 2. A relationship between leadership and system design and functionality was also found, with an engaged management team being more aware of the community's needs. Additionally, active members provided direct feedback about (and in some cases development of) the CIS. Funding also allowed the development and maintenance of a better system. These relationships between factors have been added in Figure 2, extending Figure 1.

It is important to note that none of the communities directly identified issues related to ***value to the community***. However, reflection on the issues identified and the tone of the discussions with community participants revealed that *value to the community* was implied throughout the process, with communities seeing this as the driver of the CIS. Therefore, *value to the community* was never an *issue* – rather it was the motivation to address and overcome the identified issues/factors, allowing a valuable CIS to be established. Value was seen as inherent to the success of each community website, however the definition of value varied depending on the community context. For example, Bathurst considered that their CIS would add value to the community through enhanced social capital. In contrast, the Ballarat Steering Committee sought financial value (which may not have been truly seen as 'value' by the broader community). *Value to the community* impacted on all other factors; through them, it impacted on the viability of the CIS.

Due to this complex notion of ***value to the community***, the factor is retained in Figure 2. Its relationship has been modified to sit underneath the other five original factors, demonstrating its influence over each of them through its position as the guiding force of the CIS.

In summary, the analysis above has shown that:

- Some issues only affected individual CISs. These issues are likely to be a result of the culture of the group developing the website, or the nature of the community within which it is developed.
- Other issues affected all three communities. These issues are probably due to general environment within which the community websites (as instances of CISs) were developed. However, it is possible that some have arisen due to limitations of the CGDN scheme. Further research is required to confirm whether this is the case.
- A number of issues affected two of the three communities. In many of these cases, the community that did not experience these issues was Ballarat. It is posited that, had Ballarat complied with the CGDN scheme restrictions, it would have experienced these issues as well. Therefore, these issues are likely to be the result of the *external management* imposed.

- The factors identified in Figure 1 were supported by the experiences of the three communities. However, this model did not capture the relationships *between* the six factors. A revised model is proposed below to depict the interdependencies between the factors affecting the viability of CISs, along with the impact of *external management* and the complex role that *value to the community* plays in CIS viability.

REVISED MODEL OF COMMUNITY INFORMATION SYSTEM VIABILITY

The rich data collected from the three communities confirmed the presence of each of the six factors identified in Figure 1. It also demonstrated that each of the pre-requisite factors affecting the viability of a CIS cannot be considered in isolation; that the factors of *leadership*, *active membership*, *funding*, *awareness* and *system design and functionality* are all directly impacted by *value to the community*; and that *external management* (where applicable) can heavily impact on CIS viability. Relationships between the factors were also identified. Figure 2 below depicts the identified interdependencies between the factors.

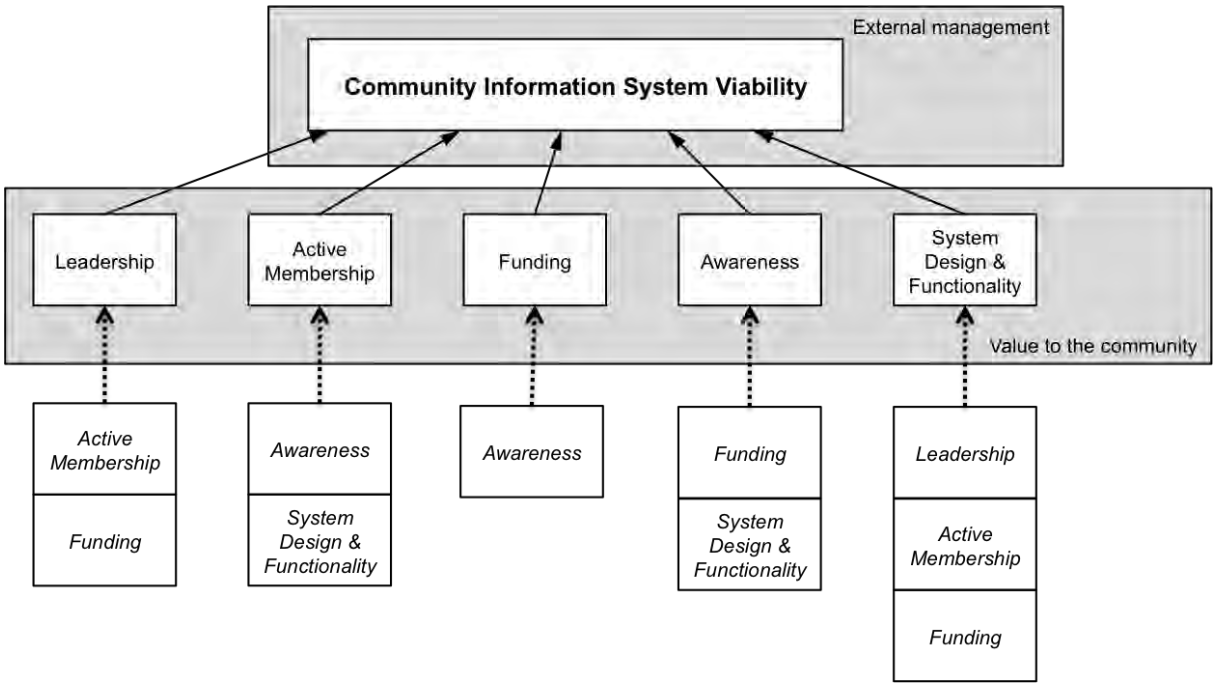

Figure 2. Revised Model of Community Information System Viability Pre-requisite Factors

CONCLUDING REMARKS

The Revised Model of Community Information System Viability Pre-requisite Factors (Figure 2) confirms the relationships described in the literature, but also extends previous discussion by considering the impact of context on CIS viability. Both community context and system context (for example, the impact of broader restrictions on the system) are depicted. Given that the factors impacting on all CISs have been identified as similar in all projects to date, this extended model is proposed as applicable for all CISs. However, it has been developed based on the experiences of community websites specifically. Future research is encouraged to evaluate whether this Revised Model of Community Information System Viability is also applicable to other types of CISs, such as apps that seek to encourage community participation (for example, TimeBanking) and those based on non-geographic communities. Through the establishment of viable CISs, community interactions can be supported, enhanced and extended, with benefits naturally flowing to the community more broadly.

A limitation of the model presented here is its application for use during the start-up phase of a CIS. This limitation reflects the state of the CISs involved in this study. An extended longitudinal study would allow further confirmation and development of this model. Despite this limitation, it is expected that the model would provide a suitable basis upon which to indicate sustained viability of a CIS; this is particularly true in situations where the context of a CIS is impacted by a change in one or more of the factors presented in the model.

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