The Impact of Security Issues on Willingness-to-Share in Community Wireless Networks

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Abstract

Several business models have been proposed to create “wireless cities”, municipalities with complete wireless connectivity throughout. These business models are for-profit, non-profit, or public-private enterprises, but none has proven to be completely successful. Community wireless networks, wherein members of the community provide the wireless infrastructure, are one possible solution to this problem. For this type of model to succeed, however, end-users must have confidence in the security of the wireless infrastructure.

168 residents of a U.S. West Coast city responded to an on-line survey asking them their attitudes about networks, security, and willingness to “share” their home wireless computer network. A surprisingly large number were willing to share their network for no compensation. An even larger number of residents would be willing to share their networks for some type of compensation. This result bodes well for this mode if communities are willing to compensate their residents and secure their networks.

1. Introduction

The topic of community wireless networks has become quite popular in the past couple of years as many municipalities in the United States [1] have begun programs to become “wireless cities”. The ultimate goal of such programs is generally to provide, either for free or for a small monthly payment, wireless Internet access to all city residents. Another possibly large benefit to the municipality is use of wireless Internet access to both mobile and stationary city workers. In any case, community wireless networks can be investigated from a variety of perspectives: business model, financial, technical, social, legal, and political.

2. Literature search

In 2002, in one of the first research projects investigating the rise of home wireless computer networks and associated models for organizing them, Verma and Beckman [2] suggested dimensions along which one could compare possible structures for organizations trying to supply full wireless connectivity in residential neighborhoods. They noted the inception of the commercial model, called a WISP (wireless Internet service provider), and compared it to the non-profit model, called a NAN, (neighborhood area network), which later came to be called a CWN (community wireless network). The authors suggested that both models might co-exist and even compete for the same end-customer. Finally, they examined the impact of technological, financial, legal, and social issues on both for-profit and non-profit organizational models.

In a follow-on research project in 2002, Verma et al. [3] noted that predicting issues or dimensions that would impact future business models in the wireless Internet domain is an unstructured problem. Therefore, they proposed and implemented the Delphi research approach to finding those issues/dimensions. Using the four dimensions of their prior research project (technological, financial, legal, social), the Delphi experts involved in this research project suggested many detailed sub-topics within each of those four dimensions. The experts also suggested two additional topics that were likely to be relevant to the success of future business models: the creation and enforcement of technical standards, and the ability of customers to make micro-payments.

In 2004, Bar and Hernan [4] examined the question of whether localized and decentralized efforts to implement wireless networks would dominate over nationalized and centralized efforts. They argued that the mechanisms that drove the creation and expansion of the wired Internet are fundamentally different than those that will drive wireless access to the Internet. They used a theoretical argument to pose several possible scenarios for the future expansion of wireless Internet access in U.S. cities.
Also in 2004 and from a slightly different perspective, Umali [5], compared community wireless networks and commercial wireless networks in an attempt to predict which would be the dominant model in the future or whether both might survive. This research project used a case study analysis that compared one contemporary viable commercial organization (“Surf and Sip”) and one contemporary viable non-profit organization (NoCatNet). Umali noted that payment and financial issues are the largest difference between these two models. He also predicted that long-term sustainability will hinge, for a NAN, on its user and community support, and for a WISP, on its ability to integrate services.

In a 2004 whitepaper, Lehr et al. [6] examined the impact of emerging wireless technologies on the debate as to whether or not local governments should take an active role in creating and managing the “last mile” of broadband Internet connectivity. They propose several issues that impact this debate, particularly: local government investment increases the value of other local government services, lower technology costs increase the likelihood that private providers will create for-profit solutions, and characteristics of wireless technologies impacts the choice of the “optimal” technology solution for providing “last mile” broadband Internet connectivity.

In a policy position paper of 2006, Ellig [7] examined the role of governmental bodies on wireless broadband projects. The author suggests that the “government vs. commercial” debate will be most influenced by the seven issues of: competition, performance competition, continuous improvement, technological change and lock-in, obsolescence, risk, and uncertainty. The author concluded that, because of the specific characteristics of wireless technologies, governments should not approach the provision of public wireless broadband with the same perspective used with other public utilities such as electricity, gas, water, and roads.

Also in 2006, Bar and Park [8] investigated policy implications of U.S. municipalities embarking on citywide wireless projects. They suggest that these projects are popular because wi-fi technology is relatively inexpensive and cities gain intangible benefits by offering wireless Internet access to city employees, residents, and commercial enterprises. They then examined possible business models, guided by “who owns the network” and “who operates the network”, and came up with 9 different owner/operator business models.

In 2006, Tapia et al. [9] examined the legal and policy issues related to municipalities being early adopters in providing wireless Internet access for their residents. Their research project aimed to answer questions about proposed and attempted business models used by municipalities to provide wireless Internet access. They concluded that the legal issues revolve around cities trying to achieve the three objectives: 1) support of residents, 2) development of a sound financial plan, and 3) ensuring equality among various telecommunication providers. The authors also point out that impending state legislation may induce municipalities to adopt processes or even business models that are inferior, merely to circumvent or beat the deadline of such legislation.

In 2007, Middleton [10] examined the field of wireless Internet access from the perspective of creating a valuable public infrastructure. The author presented a framework that can be used to assess the value of a public wireless computer network. The framework is based on responses to questions related to: the primary purpose of the network, available network bandwidth, users’ need for mobility, devices likely to be used to access the network, and ability for users to pay for network access. The author concluded that “pure” public wireless infrastructure projects are not meeting the needs of users, but that “pure” commercial wireless infrastructure projects are also not likely to meet the goals of the municipalities in which they are created.

Also in 2007, Abdelaal and Ali [11] proposed a typology for identifying six business models that might be used for creating sustainable community wireless networks. They examined this issue from the perspective of “social capital” (such as volunteering, donating money, donating hardware, etc.) and how it plays a role in selecting the appropriate business model for creating a community wireless network. They also noted that the characteristics of the community will have a role in selecting the most appropriate CWN business model. Finally, they suggested that the six business models are not necessarily mutually exclusive and that the creator of a CWN may choose a mix of the six business models.

Perhaps in response to the lack of success of existing business models in creating “wireless cities”, a new business model has arisen in the past couple of years in which individual residents “franchise” their home wireless computer network with the support of a larger organization. Some enterprises will sell (or in some cases, give away) wireless network routers that a resident can install in their own home. By paying the central organization a monthly fee, one can then access the wireless router of any other franchisee. For such a business model to work however, residents must be willing to accept “outsiders” accessing their own home wireless computer network.

The existing literature therefore shows that there have been many business models proposed and
attempted in providing community-wide wireless networks, but none has been an obviously overwhelming success. For-profit, not-for-profit, and public-private models have all been tried with very limited success. Many, if not most, of these projects have failed due to the large cost involved in creating the required wireless infrastructure. One possibility that has not yet been seriously attempted is using the wireless infrastructure that already exists throughout most communities. That infrastructure is the one created by individual wireless network routers installed by residents in their own homes. If a city wishes to use this infrastructure, however, it must know much more about its residents’ attitudes toward network security and allowing others to access their own wireless computer network.

This research project was initiated to find answers from residents to questions such as: do you secure your home computer network? If not, why not? Would you be willing to share your home wireless computer network? If so, would you require some type of compensation for doing so?

By finding the answers to these questions as given directly by the residents of a city, it may be possible to create a viable model that will solve many of the problems inherent in creating a “wireless city” without incurring the costs associated in creating a commercially-generated wireless network.

3. Methodology

3.1. On-line survey

A pilot on-line survey was created and tested with approximately 40 residents of the city of Oakland, California. Using the results of that survey and the comments of the respondents, a larger on-line survey of 16 questions was created. Letters were mailed to 4783 households of Oakland, California requesting the resident respond to the on-line survey. Of those 4783 households, 168 on-line surveys were completed, resulting in a response rate of about 3.5%. To induce residents to fill out the on-line survey, two 4 Gbyte Apple iPod Nanos were randomly given away to respondents who left an email address for contact.

The city of Oakland, California, was chosen because it had neighborhoods of varying income but similar housing density and style (i.e., single-family dwellings). Collecting data from neighborhoods of differing income levels was important because it would not be possible to extrapolate the survey and data analysis results if all data was collected from residents of only one income level. Ensuring that housing density and style were similar across all respondents ensured that data collected about detected residential wireless networks (part of a related research project) would not be skewed by the residential density in one neighborhood compared to another. For example, comparing the number of detected residential wireless networks in a neighborhood comprised mostly of apartments would indicate, ceteris paribus, a higher density of network nodes than the number of network nodes found in a neighborhood comprised mostly of single-family homes. This higher network node density would, however, be due to the higher housing density rather than to the higher number of network nodes per housing unit, which is the unit of measure under investigation in the related research project.

3.2. Survey question topics

The on-line survey asked 16 general questions related to residential wireless computer networks and those who use them. The questions (and the possible responses) were on the topics of:

1. type of home Internet access (Dial-up, DSL, Cable Modem, T1, I don’t know)
2. respondent’s sex (male, female)
3. respondent’s age range (0-20, 20-30, 30-40, 40-50, 50-60, 60-70, 70 and over)
4. other wireless Internet access (yes, no)
5. if “yes” response on 4, what type of other wireless Internet access (free-form text response)
6. is network secured (yes, no, don’t know)
7. if “no” response on 6, why not (I did not know it was possible, I did not know how to make it secure, It was too time consuming to do, It was too difficult to do, I was afraid of locking myself out of my own network, I want to share it with the outside world, Other: please specify)
8. if “Other: please specify” response on 7, specific reason why network not secured (free-form text response)
9. knowledge of respondent concerning wireless computer networks (Not knowledgeable, Slightly knowledgeable, Knowledgeable, Very knowledgeable, An expert)
10. age of wireless network (Less than 6 months, Between 6 months and 1 year, Between 1 year and 3 years, More than 3 years, I do not know)
11. importance of Internet access compared to other household technology expenses such as landline phone, cellular phone, cable/satellite TV (Not important, Slightly important, Average, Important, Very important)
12. willing to leave network unsecured in return for some compensation if doing so did not violate any law (yes, no)

13. if “yes” response on 12, inducement required to leave network open (a reduction in one of my city services bills, a tax write-off, cash, free Internet access at wireless hotspots elsewhere, I would not need anything in return, Other: please specify)

14. if “Other: please specify” on 13, what other inducement would respondent require in return for leaving network unsecured (free-form text response)

15. if “cash” response on 13, how much/month ($5, $10, $15, $20, $25, $30, $35, $40, $45, $50 or more)

16. any other comments about the survey (free-form text response)

4. Analysis

Software from Zoomerang [12] was used to construct the on-line survey and to collect the survey responses. Response data were collected by the on-line survey software and stored on the server website. The survey data were downloaded and stored in a spreadsheet six weeks after the initial letters were sent the city residents. By that point in time, no new survey response sets had been completed in the previous week. Multiple worksheets were then created to store and analyze the specific responses for each survey question.

4.1. Quantitative analysis

Table 1. Type of Internet access

<table>
<thead>
<tr>
<th>Response</th>
<th>I don't have Internet access at home</th>
<th>Dial-up</th>
<th>DSL</th>
<th>Cable</th>
<th>T1</th>
<th>I don't know</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>1</td>
<td>1</td>
<td>77</td>
<td>84</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>0.6%</td>
<td>0.6%</td>
<td>45.8%</td>
<td>50.0%</td>
<td>2.4%</td>
<td>0.6%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 2 displays the results of the responses to question 2 (sex of respondent). Male survey responders out-numbered females survey responders by a ratio of about two to one. Two responders did not indicate their sex.

Table 2. Sex of respondents

<table>
<thead>
<tr>
<th>Response</th>
<th>Male</th>
<th>Female</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>111</td>
<td>54</td>
<td>2</td>
</tr>
<tr>
<td>Percent</td>
<td>66.5%</td>
<td>32.3%</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

Table 3 displays the results of the responses to question 3 (age range of respondent). The age of survey responders varied across all age ranges, with 90% between 30 years of age and 70 years of age.

Survey questions 1-4, 6, 7, and 9-13, and 15 forced the respondent to give pre-defined responses. This was enforced by giving respondents single or multi-selection “radio buttons” from which to choose their responses. Spreadsheet calculations were used to perform simple percentages of responses for each of these questions. The results of those calculations are presented in the quantitative analysis results section below.

4.2. Qualitative analysis

Survey questions 5, 8, 14, and 16 allowed the respondent to give open-ended responses. This was enabled by giving respondents free-form text fields in which to type any response they wished. Spreadsheets were used to store and organize the responses for each of these questions. The results of those summaries are presented in the qualitative analysis results section below.

5. Results

5.1. Quantitative analysis results

Table 1 displays the results of the responses to question 1 (type of home Internet access). Note: data from the respondent who indicated they did not have Internet access at home was not included in the rest of the analysis. This resulted in 167 usable responses for the subsequent data analysis steps.
Note that about 4% of survey responders were over the age of 70.

**Table 3. Age of respondents**

<table>
<thead>
<tr>
<th>Response</th>
<th>0-20</th>
<th>20-30</th>
<th>30-40</th>
<th>40-50</th>
<th>50-60</th>
<th>60-70</th>
<th>Over 70</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>1</td>
<td>8</td>
<td>28</td>
<td>47</td>
<td>47</td>
<td>29</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>0.6%</td>
<td>4.8%</td>
<td>16.8%</td>
<td>28.1%</td>
<td>28.1%</td>
<td>17.4%</td>
<td>4.2%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 4 displays the results of the responses to question 4 (other wireless Internet access available). The split between those who have other wireless access to the Internet was approximately 60:40 in favor of those who do not have another mechanism by which to wirelessly access the Internet.

**Table 4. Other wireless Internet access available**

<table>
<thead>
<tr>
<th>Response</th>
<th>Yes</th>
<th>No</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>62</td>
<td>103</td>
<td>2</td>
</tr>
<tr>
<td>Percent</td>
<td>37.1%</td>
<td>61.7%</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

Table 5 displays the results of the responses to question 6 (is network secured). Approximately one-quarter of respondents knew that their home wireless computer network was not secured. It is reasonable to expect that the 3% who did not know if their home wireless computer network was secured actually did not have secured networks.

**Table 5. Is network secured**

<table>
<thead>
<tr>
<th>Response</th>
<th>Is secured</th>
<th>Is not secured</th>
<th>I do not know</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>121</td>
<td>41</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>72.5%</td>
<td>24.6%</td>
<td>3.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 6 displays the results of the responses to question 7 (why home wireless computer network is not secured). Reasons were split somewhat equally between all possible responses for those 20 respondents who gave pre-defined reasons for not securing their home wireless computer networks. Of possible significance to using community wireless networks to create a “wireless city”, 6 out of the 20 respondents who chose pre-defined responses indicated that they intentionally left their home wireless computer network unsecured because they “want to share it with the outside world”. Also note that no respondents indicated that “It was too difficult to do” was the reason for not securing their wireless network. An additional 20 respondents gave “other” reasons for leaving their networks open.

**Table 6. Why network is not secured**

<table>
<thead>
<tr>
<th>Response</th>
<th>I did not know it was possible</th>
<th>I did not know how to make it secure</th>
<th>It was too time-consuming to do</th>
<th>It was too difficult to do</th>
<th>I was afraid of locking myself out of my own network</th>
<th>I want to share it with the outside world</th>
<th>Other: please specify</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>5.0%</td>
<td>12.5%</td>
<td>10.0%</td>
<td>0.0%</td>
<td>7.5%</td>
<td>15.0%</td>
<td>50.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 7 displays the results of the responses to question 9 (knowledge of respondent concerning wireless computer networks). The vast majority of survey respondents indicated that their knowledge of wireless computer networks was in the middle ranges. Only a total of about 10% of respondents indicated that they were at either extreme end of the knowledge spectrum by labeling themselves “Not knowledgeable” or “An expert”.

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Table 7. Respondents' wireless computer network knowledge

<table>
<thead>
<tr>
<th>Response</th>
<th>Not knowledgeable</th>
<th>Slightly knowledgeable</th>
<th>Knowledgeable</th>
<th>Very knowledgeable</th>
<th>An expert</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>11</td>
<td>79</td>
<td>41</td>
<td>29</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>6.6%</td>
<td>47.3%</td>
<td>24.6%</td>
<td>17.4%</td>
<td>4.2%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 8 displays the results of the responses to question 10 (age of wireless network). Slightly over 80% of survey respondents indicated that their home wireless computer networks had been running for over one year. Less than 15% indicated that their wireless networks had been running for less than one year.

Table 8. Age of wireless network

<table>
<thead>
<tr>
<th>Response</th>
<th>Less than 6 months</th>
<th>Between 6 months and 1 year</th>
<th>Between 1 year and 3 years</th>
<th>More than 3 years</th>
<th>I do not know</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>10</td>
<td>14</td>
<td>77</td>
<td>60</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Percent</td>
<td>6.0%</td>
<td>8.4%</td>
<td>46.1%</td>
<td>35.9%</td>
<td>1.8%</td>
<td>1.8%</td>
</tr>
</tbody>
</table>

Table 9 displays the results of the responses to question 11 (importance of Internet access compared to other household technology expenses such as landline phone, cellular phone, cable/satellite TV). Internet access is apparently very important to the set of survey respondents, as 97.6% indicated that, compared to other household technology expenses (landline phone, cellular phone, cable/satellite TV, etc.), they considered it to be “Important” or “Very important”. Perhaps even more telling about household technology expenses is that absolutely no survey respondents indicated that Internet access was “Not important” or “Slightly important”.

Table 9. Importance of Internet access relative to other technology expenses

<table>
<thead>
<tr>
<th>Response</th>
<th>Not important</th>
<th>Slightly important</th>
<th>Average</th>
<th>Important</th>
<th>Very important</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>29</td>
<td>134</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>0.0%</td>
<td>0.0%</td>
<td>2.4%</td>
<td>17.4%</td>
<td>80.2%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 10 displays the results of the responses to question 12 (is the respondent willing to leave their home wireless computer network unsecured). Slightly less than half of the survey respondents indicated that they would be willing to leave their home wireless computer network unsecured in return for some type of compensation if doing so would not violate any law. The responses to this question get at the heart of creating a “wireless city” by using the wireless networks in the homes of city residents.

Table 10. Respondents willing to leave wireless network unsecured in return for compensation

<table>
<thead>
<tr>
<th>Response</th>
<th>Yes</th>
<th>No</th>
<th>No response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>78</td>
<td>89</td>
<td>0</td>
</tr>
<tr>
<td>Percent</td>
<td>46.7%</td>
<td>53.3%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 11 displays the results of the responses to question 13 (what respondents would require in return for leaving their wireless network unsecured). Note that respondents were allowed to choose multiple responses for this question; therefore no percentages were calculated for this question. Also, table 11 does not show that a total of 72 respondents gave some type of response to this question. It is apparent that respondents would be willing to leave their home wireless computer networks open for a variety of different types of compensation. Note that 38 of the 168 (22.6%) respondents would be willing to accept free Internet access elsewhere in return for giving others Internet access at their own home, which is the essence of the “franchising” business model discussed above.
Table 11. Respondent’s requirement in return for leaving wireless network unsecured

<table>
<thead>
<tr>
<th>Response</th>
<th>reduction in one of my city services bills</th>
<th>tax write-off</th>
<th>cash</th>
<th>free Internet access at wireless hotspots elsewhere</th>
<th>I would not need anything in return</th>
<th>Other: please specify</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>31</td>
<td>48</td>
<td>38</td>
<td>17</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 12 displays the results of the responses to question 15 (amount of cash/month that respondents would require in return for leaving their wireless network unsecured). For those respondents who would accept cash compensation in return for leaving their home wireless computer network unsecured, 2/3 would accept $25 or less while 3/4 would accept $30 or less.

Table 12. Amount of cash/month required by respondent in return for leaving network unsecured

<table>
<thead>
<tr>
<th>Response</th>
<th>5$</th>
<th>10$</th>
<th>15$</th>
<th>20$</th>
<th>25$</th>
<th>30$</th>
<th>35$</th>
<th>40$</th>
<th>45$</th>
<th>50$ or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>2</td>
<td>11</td>
<td>2</td>
<td>9</td>
<td>9</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Percent</td>
<td>4.1%</td>
<td>22.4%</td>
<td>4.1%</td>
<td>18.4%</td>
<td>18.4%</td>
<td>8.2%</td>
<td>2.0%</td>
<td>4.1%</td>
<td>2.0%</td>
<td>16.3%</td>
</tr>
<tr>
<td>Cumulative Percent</td>
<td>4.1%</td>
<td>26.5%</td>
<td>30.6%</td>
<td>49.0%</td>
<td>67.3%</td>
<td>75.5%</td>
<td>77.6%</td>
<td>81.6%</td>
<td>83.7%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

5.2. Qualitative analysis results

Responses to questions 5, 8, 14, and 16 were open-ended and so were not amenable to direct quantitative analysis. Summaries of these open-ended responses are presented in this section. Those responses given by more than one respondent are indicated as such.

Question 5 (what type of other wireless Internet access do you have) resulted in two or more responses each of:
- public airports: NOT the Apple-branded wireless router
- AT&T Uverse
- Blackberry
- Café
- Cellphone
- “Freeloading” on neighbor (5 responses out of 62)
- iPhone
- Starbucks
- Public transit: free WiFi on city buses
- Work (14 responses out of 62)

Question 8 (specific reason why network is not secured) resulted in two or more responses each of:
- Didn’t seem necessary/important/didn’t care/not worth the trouble
- I use a Mac and am not worried about viruses
- And the following singular responses:
  - Don’t b-cast the net name and restrict by MAC addr
  - Had to reboot system and haven’t secured again
  - Haven't taken time to secure. Have secured HW
  - I don't care if others use it.
  - I have both secured and unsecured. Wanna share.
  - It was secured; a network card had a problem.
  - Signal is too weak to access from outside.
  - Question 14 (what other inducement would the respondent require in return for leaving their home wireless computer network unsecured) resulted in the following responses:
    - ability to limit bandwidth on free-net; security
    - access to a community network that would work
    - BART tickets
    - Basically any cooperative venture would be fine.
    - Depending on the cause the use is for!
    - faster connection
    - guarantee that traffic wouldn't be burdensome
    - I support free speech. 'net is designed 2 share.
    - It depends greatly on the reason for the request.
    - no loss of speed or service reliability
    - no reduction in security
    - security of all data and communication
    - security preventing others getting to my computers
    - It relies greatly on the reason for the request.

Question 16 (other comments about the survey) responses ranged from “BORING and useless” and “Nobody in their right mind would leave their wireless network open to strangers!” to “Good luck with your research!!” and “I'm intrigued about the thesis. Interested in learning what you discover.” Many respondents voiced their concern about security, indicating that they would consider leaving their home
wireless networks unsecured, but only if they had a guarantee that it would not jeopardize their own personal data.

Some respondents left more detailed responses such as:

“As it turns out, I work at a small wireless networking company. I have long wanted to set up a series of neighborhood wide access points, sharing the costs network among our neighbors and reducing our overall bills to access the internet. This could be done with security and minimal expense and time, but I haven't had even that much time to set it up.”

and from another respondent whose neighbor apparently did what the previous respondent was considering:

“My home internet service is wireless, too. We have an internet entrepreneur in the 'hood who started by syndicating a T1 line to half a dozen neighbors. He has expanded beyond the neighbors and now has a $3MM/year business. I pay $49/mo for a very fast connection that arrives at my house wirelessly.”

6. Conclusion

Results of the survey show numerous surprising outcomes. With regard to those hoping to implement some type of community wireless network or similarly based business model, there appears to be some hope that residents are or can be persuaded to let others use their home wireless computer networks.

Perhaps most surprising relevant to the community wireless network model is that, of the 40 respondents who did not secure their home networks, 6 directly stated that they wanted to share their Internet access with outsiders. An additional 3 respondents stated this in their free-form response to the question. This implies that many residents would not require any compensation at all for leaving their network open to support a community wireless network. Also, almost 50% of all respondents indicated that they would be willing to leave their network open for some type of compensation if it were legal to do so. Of those who would require cash compensation for leaving their network open, 75% would require $30 or less/month to do so. This also bodes well for communities who are searching for inexpensive ways to become “wireless cities”.

7. Limitations and future research

Certainly the results of this research project are limited by the number of respondents and the geographic location in which the survey was implemented. Researchers in other locations may well obtain different results due to the economic, technological, or geographic vagaries of their respondents. The research is also limited due to the process by which respondents completed the survey. While all known mailing addresses in the survey area were canvassed in soliciting respondents to complete the on-line survey, no control was implemented over those who actually chose to complete the on-line survey. There is therefore an unknown effect on the research results of the actual population of survey responders.

There are also several possible useful avenues for future research in this area. One obvious direction to pursue is to do a more detailed statistical analysis to determine if there are patterns within the data. That is, there may be hidden or underlying relationships that would yield more valuable insights into correlations in the dataset. For example, there may be indications about the type of resident who is more or less likely to leave their wireless network unsecured, based on the age, sex, knowledge, etc., of the resident. Another useful future research direction would be to gather survey data from other cities in other states or countries to see if the attitudes found in this research project are common over a larger audience of users.

In any case, the results of the survey show that there is definitely promise for the future of community wireless networks. Also, it may well be possible to solicit the help of city residents in creating the underlying wireless infrastructure to build the elusive “wireless city”.

8. References


