NET Institute*

www.NETinst.org

Search and the City:
Comparing the Use of WiFi in New York, Budapest and Montreal

Laura Forlano
Yale Law School

Search and the City:
Comparing the Use of WiFi in New York, Budapest and Montreal[1]

Laura Forlano, Ph.D.
Kauffman Fellow in Law
Information Society Project
Yale Law School

Key Words
community wireless networks, municipal wireless networks, wireless fidelity (WiFi),
comparative international research, uses of technology and telecommunications;

JEL Classification Numbers
L96, O33, O57, Y40, Z10

Introduction

Over the past five years, the use of mobile and wireless technology in public spaces of cities

around the country has grown exponentially. Recently, cities including Philadelphia, San

Francisco, Boston, Minneapolis, and Austin have announced plans to build municipal wireless

networks. These projects make a number of assumptions about the payoffs of municipal wireless

networks without the benefit of research on the communication practices of users. To date, there

is little such research. In addition, wireless technology – specifically, wireless fidelity or WiFi --

is often discussed as one of many ways to access the high-speed (broadband) Internet i.e. cable,

digital subscriber line (DSL), fiber etc. Thus, there has been little analysis of the ways in which

the use of the wireless Internet via WiFi may differ from that of the wireline Internet. In order to

understand the potential user patterns that will be observed with respect to emerging

technologies, it is necessary to disaggregate research about the various ways of connecting to the Internet.

This paper compares the results from a six-month survey of the use of WiFi hotspots in New York, Budapest and Montreal. It is hoped that further analysis of these survey results will contribute to a more acute understanding of the ways in which the user patterns of particular modes of Internet access may differ internationally. The major research questions addressed in this paper are: 1) How is WiFi being used in public spaces, by whom, where, for what purposes?; 2) How does the use of WiFi differ from other communication technology?; and, 3) How is the use of WiFi similar or different across cities internationally?

This paper makes the following arguments based on the survey data: first, WiFi is an important factor in attracting people to specific locations; second, the use of WiFi highly localized in that it is often used to search for information relevant to one's geographic location; third, there are significant differences in the way that WiFi is used across a variety of locations including cafes, parks and other public spaces; fourth, at present, WiFi users are, for the most part, young, male and highly educated displaying the characteristics of early adopters of technology; and, fifth, there is a convergence in the ways in which WiFi is used internationally in some respects, however there are also important differences in the reasons for these uses as well divergence in other respects.

These findings may have an important impact in shaping current discussions municipal wireless networks by helping to identify content, applications and services that can be delivered over

mobile and wireless networks. In addition, the answers to these questions are vital to inform a wide variety of legal and public policy issues related to information and communication technologies in addition to being important to the development of content and applications for mobile and wireless technologies. These include policies surrounding municipal wireless networks, spectrum, universal service, community media and network neutrality.

Literature Review

Currently, there is a rapidly growing body of research on the way in which mobile phones are used (Ito *et al.*, 2005; Katz & Aakhus, 2002; Pedersen & Ling, 2005). However, to date, there are only a few studies about community wireless networks (Bar & Galperin, ; Bar et al., 2005; Medosch, 2005; Sandvig, 2004). Furthermore, scholarship in this area tends to focus on the technical, economic or policy aspects of wireless networks rather than exploring the people, technologies and places that make up the social and digital ecologies of WiFi hotspots. While there is some research on early Internet cafes and cybercafes, this research has not developed to include wireless hotspots. Recent studies have included analyses of user behavior – in particular, videogame behavior -- at cafes in Toronto (Middleton, 2003; Powell, 2003), the embedding of local and global culture at cafes in London (Wakeford, 2003), cafes as innovative sites of access to information and communication technology in the United Kingdom (Liff & Laegran, 2003; Liff & Steward, 2003), the significance of place for mobile work (Brown & O'Hara), the relationship between the cybercafe and the community in Scotland (Stewart, 1999) and domestic and public uses of technology at cafes in the United Kingdom (Lee, 1999). However, there are several recent studies of the use of WiFi hotspots (Gupta, 2004; Hampton & Gupta, forthcoming; Hampton et al., 2007).

Methodology

A 40-question online survey on the use of wireless networks in cafes, parks, and other public spaces was conducted with a small grant from Microsoft Research between October 2006 and April 2007 in partnership with local community wireless organizations: NYCwireless (New York), Île Sans Fil (Montreal) and the Hungarian Wireless Community (Budapest). Île Sans Fil translated the survey into French and conducted it bilingually in Montreal and the Hungarian Wireless Community (HuWiCo) translated the survey into Hungarian. These three cities were chosen to exploit the different architectures of their wireless networks, which have been shaped by a number of factors including national telecommunications policy, economic incentives, climate, availability of public space, and local culture.

In New York, the surveys were publicized through fliers, on listservs, via e-mail announcements, and via the login or "splash" pages of the wireless networks of partner organizations. In New York, the Downtown Alliance, a Lower Manhattan business improvement district, placed a link to the survey on their website. The survey was included in New York City Council Member Gale Brewer's monthly e-mail announcement. In Montreal and Budapest, the survey was publicized only online. The survey was conducted using SurveyMonkey[2], an online survey tool. The survey resulted in 1362 responses: New York (614), Montreal (370) and Budapest (378).

---

[2] See SurveyMonkey.com for more information.

The survey asks three types of questions about the use of the wireless Internet: general questions, technology and Internet access-related questions, content and activity[3] related questions and standard demographic questions[4] questions (see appendix for survey protocol). These questions were informed by a number of earlier surveys that have included questions about the use of mass media and the Internet such as the Pew Internet & American Life project and the General Social Survey. More specifically, the survey asks about the location of use, purpose and reason for use, frequency and length of use, types of technologies owned and used, access to the Internet, problems using the network, type of information and websites accessed, and kinds of activities pursued.

WiFi Use Survey

In February 2007, the Pew Internet & American Life Project reported that 34% of all Internet users have used a wireless connection and 27% have logged on from a place other than home or work (Horrigan, 2007). This question asks respondents whether they have ever used a wireless connection so there is no distinction between one-time users, infrequent users and regular users. The following sections will highlight the most important findings from the survey of WiFi hotspots conducted in New York, Montreal and Budapest between October 2006 and April 2007. According to the survey, respondents had used WiFi at Starbucks (34%), Bryant Park (33%), the New York Public Library (23%) and independently-owned cafés (21%) in the previous six months. With the exception of Bryant Park, all of these locations represent multiple sites

---

[3] Questions on activities were adopted from the 2000 Pew Internet and American Life Project's Daily Tracking Survey (www.pewinternet.org) and by an earlier survey by Keith Hampton and Neeti Gupta developed in 2004.
[4] Questions on standard demographic variables were adopted from a February 2005 survey by Knowledge Networks (www.knowledgenetworks.com). Questions on occupation and industry were informed by the 2000 U.S. Census (www.census.gov) and New York City Economic Development Corporation (http://www.nycedc.com).

throughout the city. For example, Starbucks has 153 locations in the New York area (within a five mile radius) where a T-Mobile HotSpot is available.[5]

To learn more about Starbucks, on March 1, 2007, I contacted the company to schedule an interview at their Seattle-headquarters since I was going to be presenting the survey data at Microsoft Research in nearby Redmond. Unfortunately, in response I received a short note from Ryan J. in Customer Service stating, "Thanks for your interest in Starbucks Coffee Company. Unfortunately, due to the volume of student requests we receive, we're unable to grant interview or survey requests or provide information about the company beyond what we make publicly available."[6] That same day, upon a repeated attempted to be introduced to someone in the company's market research department, I was told that I was, welcome to submit my research findings, but that in doing so I would need to sign a Disclosure and Release Agreement and that, "All ideas, suggestions or other information that is submitted will be viewed as the property of Starbucks, to use or dispose of as it wishes. For that reason, we recommend that you do not send prototypes, original artwork, or other valuable materials."[7]

Upon learning that I would not be able to interview anyone at Starbucks corporate headquarters, I attempted to befriend a Starbucks manager at a location in Brooklyn, N.Y. where I had interviewed several regular customers. Unfortunately, he refused to be interviewed, even confidentially, due to the company's strict media relations policies. In the end, I was able to interview Joseph Michelli, the author of *The Starbucks Experience* and a consultant who has

---

[5] See www.starbucks.com for more details. Accessed on June 20, 2007.
[6] E-mail from Ryan J., Customer Service, Starbucks Coffee Company. Received on March 1, 2007.
[7] E-mail from Ryan J., Customer Service, Starbucks Coffee Company. Received on March 1, 2007.

worked closely with the company's senior management. According to him, Starbucks' corporate mission is to, "become the most desirable third place."[8] Along with that, they have a policy never to ask anyone to leave. As a result, they have a problem with WiFi users and homeless people. However, since their business in the United States is 80% take-out, it may not be a problem for their bottom-line; on the other hand, in Asia, their business is 80% sit-down (many people make reservations to sit and have coffee at Starbucks) so the impact of WiFi users might be different there.

Continuing with the description of the sites identified in the WiFi survey, the New York Public Library has 69 locations with free WiFi access in the Bronx, Staten Island and Manhattan; Queens and Brooklyn operate their own library systems.[9] And, certainly, there are hundreds of cafés throughout the New York area that offer either free or paid WiFi access. Many, but certainly not all, independent cafes and selected corporate eateries such as Cosi and Panera Bread offer free WiFi. To access the Cosi network, you must create and login with a user name and password.

In May 2006, at a City Council hearing held by the Committee on Technology in Government, Bryant Park Restoration Corporation Executive Director Dan Biederman testified that their WiFi hotspots attracts 250 users per day. The Bryant Park Wireless Network, which was built in 2002, is one of the first, largest and most widely-used and well-known free, public wireless network in the world. The project was sponsored by Intel in its initial phase and is currently sponsored by

---

[8] Interview with Joseph Michelli conducted on March 19, 2007.
[9] See www.nypl.org for more details. Accessed on June 20, 2007.

Google. The organization invites New Yorkers to "Turn Bryant Park into your new office," according to its web site.

One of the main reasons for the popularity of Bryant Park's WiFi hotspots is that it is outside. Survey respondents said: "It is the best office in the world…I can have my feet in the grass and the world at my fingers," and "I love the park and being outdoors while still feeling like I am getting work done," and that the park allows them "To let the kids play outside while I work." Other popular sites visited by over 10% of respondents include: 60 Wall Street Atrium, Battery Park, City Hall Park, college campuses, JetBlue Terminal and Union Square Park.

In Budapest, however, out of over thirty cafes and restaurants listed, respondents reported that they had used WiFi at Burger King (17%), Don Pepe (13%), McDonald's (11%), Szimpla Kert (16%) and Szóda (11%) with 58% of respondents listing additional locations where they had used WiFi. Don Pepe, Szimpla Kert and Szóda are cafes. I visited Szóda on an almost daily basis while in Budapest in September 2004 as decribed in the narrative above. While New York's WiFi hotspots are distributed between cafes, parks and other public spaces, Budapest's and Montreal's are primarily in cafes, restaurants or bars. The popularity of Burger King and McDonald's in Budapest is striking because only 5% of respondents in New York reported using WiFi at McDonald's at all. In Montreal, out of over twenty cafes listed, respondents reported that they had used WiFi at Second Cup (37%), Laïka (22%), Café l'Utopik (21%), Café Pi (19%), Starbucks (18%), Café Art Java 3030 (14%) and Santropol Café (11%). In addition, 61% of respondents named other locations where they used WiFi.

In New York, Starbucks (15%), Bryant Park (10%) and independently-owned cafés (12%) were the most frequently used hotspots. In Budapest, 16% of Hungarians listed McDonald's. Thus, in these two cities, large corporate establishments were the sites of the majority of WiFi usage respectively. However, in Montreal, 10% used WiFi most frequently at Laïka, 9% at Café Pi, 8% at Café l'Utopik and Starbucks, and 47% indicated that they most frequently used WiFi at another location. While I have not been able to visit Laïka, one of the most popular cafés among WiFi users in Montreal, I was able to spend an afternoon at Café l'Utopik in October 2007. Café l'Utopik is a community-run, bohemian café on the second floor of a building in Montreal's gay neighborhood. It serves vegetarian food and is frequented by students and freelancers. This indicates a great diversity in locations where people use WiFi in Montreal. The remainder of the survey in all three locations was completed based on the respondent's most frequently used hotspot.

One of the most significant findings of the survey is that the availability of WiFi is an important factor in attracting people to the location where they most frequently use the wireless Internet. In New York, 40% of respondents indicated that WiFi is the reason that they went to the location and 30% said that WiFi is sometimes the reason that they went to the location; a smaller 26% indicated that WiFi is not the reason that they went to the location. However, in total, it is possible to argue that WiFi is a factor in attracting over 70% of the respondents to the location.

WiFi is Reason for Going
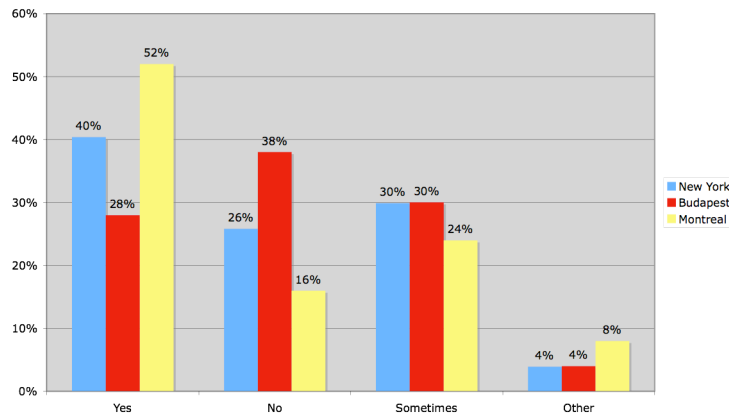
In addition, when choosing between two coffee shops of similar characteristics and quality, 75% respondents answered that they would choose one that provides WiFi access over one that doesn't; 20% say they might; and, 5% said that WiFi would not be a factor in their decision. In Budapest, the results were almost exactly the same, differing only by 1% whereas, in Montreal, 91% responded that they would choose the café that provides WiFi; 8% said they might and only 2% said they would not.

These findings have potential implications for economic development and supports the rationale that WiFi may enable commerce and productivity that would not have occurred otherwise. This is because, to the extent that WiFi draws people out of their homes and into cafes, parks and other public spaces, people may take additional trips on the subway, purchase food and beverages, or do retail shopping. For example, I typically spend far more money at New York businesses on the days that I leave the house than on those that I stay home. Taken as an aggregate, this spending on city businesses and services happens irrespective of the activities that people might be engaged in online while using the wireless network. In fact, in New York, since at least 2002 park organizations and business development organizations have deployed WiFi

hotspots in order to attract people to parks and public spaces. However, to date, there has not been any research to verify that their assumptions are correct. In addition, there are still significant differences between specific WiFi hotspots. While some, like Bryant Park, are incredibly successful; others do not attract nearly as many users. This seems to support the idea that there are multiple factors that draw people to specific WiFi hotspots. For example, one respondent that I interviewed, a full-time employee at a university club in mid-town, commutes 20 minutes each weekend in order to use the Bryant Park hotspot to work on his food and wine web site, from which he eventually hopes to earn a supplementary income. He likes Bryant Park because it is "comfortable" (in particular, he mentions the patented chairs that include a desk and cup-holder) and he is familiar with the area since he goes there after work.

Figures 8-9: New York City's Bryant Park and Patented Chair Design (August 2006)

His weekend trips represent additional subway journeys and potentially money spent on food and beverages or possibly even shopping while he is out and about. In addition, his website may soon generate additional taxable income. As such, it is possible to argue that the WiFi hotspot enables economic development that would not otherwise occur.

Similarly, in Budapest, 28% of respondents indicated that WiFi was a factor, 30% said that it was sometimes a factor and 38% said that it was not a factor. However, when taken together, it is possible to argue that WiFi is a factor in attracting the majority of respondents to the location in both New York and Budapest. In Montreal, 52% of respondents indicated that WiFi was the reason that they went to the location and 24% said that it was sometimes the reason; a total of 76%. Only 16% said that it was not the reason that they went to the location and 8% offered another reason.

According to the survey, the primary purpose for the use of WiFi is for both work and personal use (63%). A smaller number of respondents indicate that they use WiFi for personal use only (28%) and even fewer say that they use WiFi only for work (11%). It is often difficult to separate personal and work activities since laptops and the Internet have become embedded into everyday life. Thus, it makes sense that the majority of respondents use WiFi for both work and personal use. However, respondents who cannot access their personal e-mail at work or prefer to use their own computers for personal e-mail are among those who primarily use WiFi hotspots for personal use. This is an interesting reversal of traditional dichotomies about private and public behavior. Normally, it might be assumed that people conduct personal activities in private

spaces such as homes or offices. However, in this case, people explicitly go to public spaces such as parks and cafés in order to do personal activities. This is also supported by my ethnographic observations at a café on the Lower East Side in May 2006. I found that, in part due to the crowded nature of the café space, people often went outside to make phone calls. While the indoor café space would be regarded as relatively more private as compared to city sidewalks and streets, people went into more public spaces in order to make their phone calls. In addition, since the café was often frequented by regular freelancers, it is possible that while the people inside the café were "familiar strangers", those on the street were completely anonymous and therefore provided a greater sense of privacy. Again, the results from Budapest mirror those in New York with the majority reporting that they use WiFi for work and personal use (57%), a smaller number reporting that they use WiFi only for personal reasons (29%), and the smallest group saying that they use WiFi only for work (13%). In Montreal, 66% of respondents use WiFi for work and personal use, 19% use WiFi only for work, 15% use it only for personal reasons and 7% offer another reason.

In terms of the frequency, length of time and time of day, 42% of respondents reported that they use WiFi at the location weekly; 23% do so monthly; 15% do so daily; 11% only very rarely (less than once a year); 7% do so more than once a day; and, 3% do so annually. Thus, it can be said that the majority of respondents (57%) respondents use WiFi at the location at least once a week (by combining the daily and weekly percentages). In Budapest, 33% use WiFi weekly; 27% do so monthly; 22% do so very rarely; 11% do so more than once a day; 4% do so daily; and, 4% do so annually. In Montreal, 51% use WiFi weekly; 18% do so monthly; 16% do so daily; 8% do so more than once a day; 5% do so very rarely; and, 2% do so annually.

29% use WiFi for an hour; 27% do so for 30 minutes; 26% do so for two hours; 8% do so for 15 minutes or less; 6% do so for 4 hours; and, 5% do so for more than four hours. One respondent that I interviewed reported spending 12 hours per day at a Starbucks Café. While the majority of respondents use WiFi for between 30 minutes and two hours, it is not uncommon to find those who use WiFi for significantly more than four hours, in particular, among freelancers, remote workers, independent contractors and full-time information technology consultants. In Budapest, 32% use WiFi for 30 minutes; 25% do so for an hour; 22% do so for 15 minutes or less; 17% do so for 2 hours; 3% do so for more than four hours; and, 2% do so for four hours. In Montreal, 43% use WiFi for 2 hours, 29% do so for 1 hour, 11% do so for 4 hours, 10% do so for 30 minutes, 6% do so for more than 4 hours, and 2% do so for fifteen minutes or less.

The peak hours for WiFi use are from noon to 3 p.m. (51%); followed by 3 p.m. to 6 p.m. (41%); 6 p.m. to 9 p.m. (29%); 9 a.m. to Noon (27%); 9 p.m. to Midnight (11%); and, lastly, 6 a.m. to 9 a.m. (7%). In Budapest, the peak hours for WiFi use are 3 p.m. to 6 p.m. (43%); noon to 3 p.m. (39%); 6 p.m. to 9 p.m. (35%); 9 a.m. to noon (25%); 9 p.m. to midnight (13%); and, 6 a.m. to 9 a.m. (6%). In Montreal, the peak hours for WiFi use are also 3 p.m. to 6 p.m. (46%); followed by 12 p.m. to 3 p.m. (42%) and 6 p.m. to 9 p.m. (42%); 9 a.m. to noon (25%); 9 p.m. to midnight (24%); and, 6 a.m. to 9 a.m. (5%). On the whole, the frequency, length of time and time of day of WiFi use does not differ significantly between New York and Budapest. However, the Montreal data presents some anomalies.

By combining survey data with statistical log data from the NYCwireless network, which currently monitors usage at 14 public hotspots, it is possible to generalize about trends regarding frequency of use and time of use. The following chart illustrates aggregate hourly network use on the NYCwireless network over the past year.

Graph on network use per hour, weekday and month
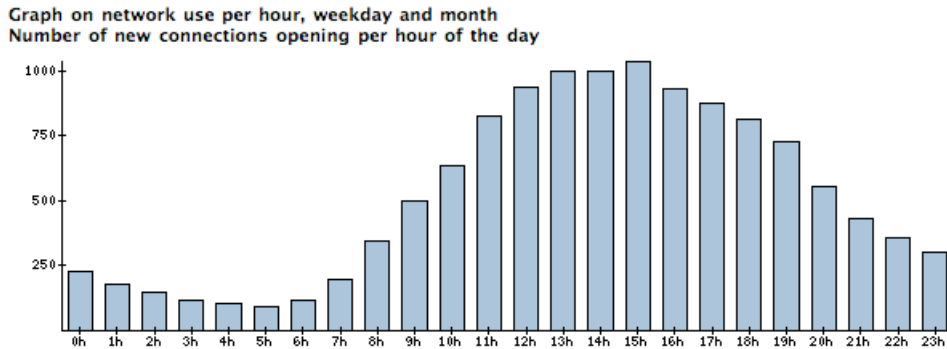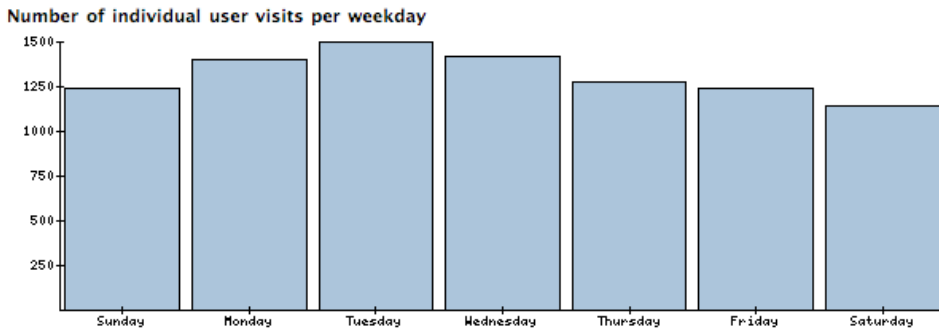**Number of new connections opening per hour of the day**

Chart 1: NYCwireless Hourly Network Usage, June 2007

Furthermore, the log data shows that usage peaks on Tuesdays with nearly 1500 aggregated individual user visits.

Number of individual user visits per weekday

Note: A visit is like counting connections, but only counting one connection per day for each user at a single node

Chart 2: NYCwireless Daily Use, June 2007

Finally, the log data confirms that usage is relatively steady year round with a peak during the summer months. Data from June 2006 is significantly lower than for June 2007 due to the fact that several additional hotspots were installed last summer.

Number of individual user visits per month

Note: A visit is like counting connections, but only counting one connection per day for each user at a single node
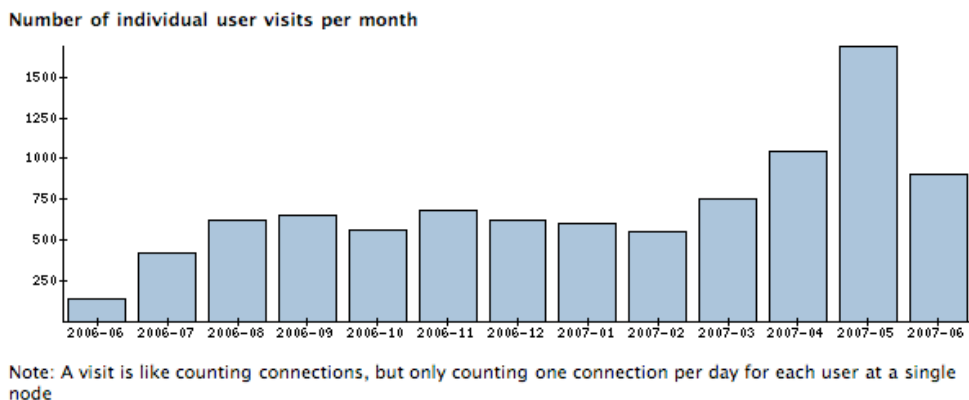
Chart 3: NYCwireless Monthly Use, June 2007

While the NYCwireless log data is based on only a small number of public WiFi hotspots that are currently being monitored with statistical reporting tools, future research may benefit substantially from a combination of log data, survey and qualitative research in order to make conclusions about user behavior.

When asked the reason that they used WiFi, 58% indicated that they wanted to get out of their home or office. 27% replied that they wanted to get information when they were passing by and 23% wanted to see familiar people or be part of a community.

Why Use
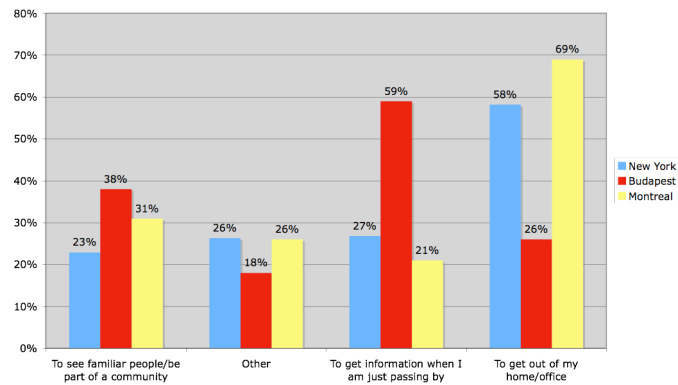
These limited responses do not begin to account for the wide variety of reasons that respondents gave when prodded for more details about their rational for using WiFi. For example, some emphasized that it was convenient to where they lived or worked saying, "I live in Harlem and work at Wall Street. I don't want to carry my laptop all over the city." It is likely that this person was referring to using the Downtown Alliance hotspots, which include City Hall Park, the Wall Street Public Atrium and the Winter Garden at the World Financial Center though it is not possible to tell exactly since these responses were provided in open-ended survey questions. Another person commented, "For work I regularly travel between Baltimore and Boston. Starbucks is ubiquitous and consistent." Others mentioned that a friend lived nearby or that it was a central location for client meetings. Finally, a few mentioned that they liked accessing it from their car. Again, it is not possible to know exactly when or where this person used WiFi in their car. However, I have often seen people sitting in parked cars near WiFi hotspots using their laptops. One place I saw this was in front of a bar called D.B.A. on 1st Avenue and 2nd Street. I have seen people standing outside of apartments using their laptops. My hypothesis is that they have found an open WiFi hotspot to use. There have been accounts in the mainstream press

about the confusion over whether this behavior is legal or whether it is akin to breaking and entering into a person's home. Others said that they used WiFi at home; some didn't have or couldn't afford Internet access at home. For example, one respondent said, "It's near where I am in the mornings and I can't get WiFi access at my house." Others wrote that they used it because it was free and/or easy to use, explaining, "It's free. I'm in Manhattan frequently and my home office is in Brooklyn. It's the only way for freelancers to stay in touch. I can't afford a Blackberry or Treo." Some were having problems with their regular Internet provider. Others were in-between meetings, traveling or waiting for something i.e. flight, train, laundry. For example, one wrote that they needed a place to work between two meetings, another wrote that before they got an EVDO card they "would use these hotspots to check email in between meetings when away from the office," another wrote that they used WiFi, "When I have time between work appointments (free time in schedule and not enough to go home)." Finally, some enjoyed the atmosphere/environment or liked the coffee and/or food at a particular location; and, finally, others wanted to relax or work while having breakfast or lunch.

Interestingly, in Budapest, the majority of respondents, 59% indicated that they used WiFi to get information when passing by; 38% used WiFi to see familiar people or be part of a community; 26% used WiFi to get out of their home or office; and, 18% gave other reasons. In Montreal, like New York, the majority of respondents, 69%, indicated that they used WiFi to get out of their home or office. 31% indicated that they used WiFi to see familiar people or be part of a community; 26% had another reason; and, the minority of respondents, 21%, indicated that they used WiFi to get information when passing by. This question illustrates that, while usage

patterns may be relatively consistent in all three cities, the rationale for using WiFi is very different, possibly for socio-cultural reasons.

With respect to free vs. paid WiFi access, in New York, respondents were highly likely to use WiFi at airports (74%), coffee shops (61%), hotels (79%), parks and public spaces (55%) and train stations (44%) if it were free. These locations may either be free or for a fee, however, the survey illustrates that people are hesitant to use it if they have to pay for it. This finding is most useful in illustrating the different qualities of these spaces in terms of how conducive they are to WiFi use. While you do have to pay a fee to use WiFi at Starbucks, they are still one of the top four locations where people go online. They were much less likely to use WiFi at fast food restaurants (15%) and other restaurants (16%) even if it were free. The reverse is also true. Respondents were highly unlikely to use WiFi at these locations if they have to pay for it. Similarly, in Budapest, respondents were highly likely to use free WiFi in airports (56%), coffee shops (47%), hotels (71%) and libraries (54%) and less likely to use WiFi in bars (25%), fast food restaurants (31%), parks or public spaces (39%), restaurants (18%) or train stations (39%). In Montreal, respondents were highly likely to use free WiFi in airports (57%), coffee shops (82%), hotels (73%) and libraries (80%) and less likely to use WiFi in bars (18%), fast food restaurants (31%), parks or public spaces (41%), restaurants (16%) or train stations (43%). Again, in both cities, the reverse is also true. People are extremely unwilling to pay for WiFi access.

In New York, 59% of respondents indicate that they would be willing to watch a short advertisement in exchange for free access; 14% said they would not; and, 27% say that they

might. However, 48% of respondents answered that they would not be willing to pay a small service charge at a coffee shop, restaurant or bar; only 19% answered that they would; and, 33% say that they might. In Budapest, 58% of respondents indicated that they would be willing to watch a short advertisement in exchange for free access; 13% said they would not; and, 30% said that they might. Similarly, 38% of respondents would not be willing to pay a small service charge; 30% said that they would; and, 32% said that they might. In Montreal, only 39% of respondents were willing to watch a short advertisement in exchange for free access; 24% said they would not; and, 38% said that they might. 56% of respondents would not be willing to pay a small service charge; only 11% said that they would; and, 33% said that they might. In New York and Budapest, the data supports the advertising-sponsored hotspot model that is currently being tested in many locations and pursued by municipal wireless networks. However, WiFi users in Montreal seem more resistant to the idea.

Technology and Internet-related Questions

The following section gives an overview of responses to questions on hardware, applications and Internet access. Overall, answers to these questions seems to indicate that WiFi users are relatively early adopters with respect to a number of related technologies including laptops and broadband Internet access. For example, when asked what computer hardware respondents use to connect to WiFi, 96% used a laptop; 20% used a mobile phone; 19% used a personal digital assistant (PDA); 4% used a gaming device and 2% used another device. In Budapest, 87% used a laptop; 33% used a PDA; 22% used a mobile phone; 4% used another device; and, .5% used a gaming device. In Montreal, 99% used a laptop, 8% used a mobile phone, 7% used a PDA, 2% used another device, and 1% used a gaming device.

In New York, 97% owned a laptop; 90% owned a mobile phone; 79% owned a digital camera; 67% owned an iPod or MP3 player; 44% owned a PDA; 18% owned a gaming device; 5% had another device; and, 5% owned a pager. In Budapest, 91% owned a laptop; 94% owned a mobile phone; 53% owned an iPod or MP3 player; 43% owned a PDA; 28% owned a digital camera; 9% owned a gaming device; 3% owned another type of device; and, .8% owned a pager. In Montreal, 99% owned a laptop; 75% owned a mobile phone; 66% owned a digital camera; 60% owned an iPod or MP3 player; 12% owned a gaming device; 6% owned a pager; and, 4% owned another device.

In New York, when asked what Internet applications were used while connected to WiFi, 82% used web-based e-mail; 67% used an e-mail application; 66% used Microsoft Office; 63% used instant messenger; 46% watched streaming audio/video clips; 23% used voice applications such as voice-over-internet protocol (VOIP); 22% used a virtual private network (VPN); 19% used remote desktop; and, 9% used another application. In Budapest, 72% used an e-mail application; 69% used instant messenger; 66% used web-based e-mail; 47% used VOIP; 42% used Microsoft Office; 32% watched streaming audio/video; 30% used a VPN; 28% used remote desktop; and, 14% used another application. In Montreal, 82% used Web-based e-mail; 66% used Microsoft Office; 64% used instant messenger; 60% used e-mail; 48% used streaming audio/video; 28% used a VPN; 19% used VOIP; 17% used another application; and, 14% used remote desktop.

WiFi is a complementary rather than a substitute good in all three cities. In New York, when asked where else respondents has access to the Internet, 95% had access at home and 89% had

broadband at home; 81% had access at work and 79% had broadband at work; 31% had access at a library and 26% had broadband at a library; 23% had access at school and 19% had broadband at school; and, 5% had another location where they accessed the Internet and/or broadband. The Pew findings support this finding, reporting that in the United States 80% of wireless users have broadband connections at home (Horrigan, 2007).

Where Access Broadband
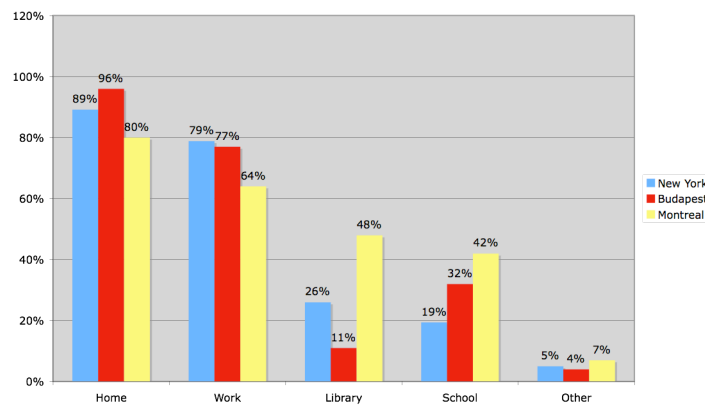
In Budapest, 96% had access to the Internet at home and all of them had broadband connections; 79% had Internet access at work, 77% had broadband; 36% had Internet access at school, 32% had broadband; 15% had Internet access at the library, 11% had broadband; and, 7% had access elsewhere, 4% had broadband. In Montreal, 87% had access to the Internet at home and 80% had broadband at home; 66% had access to the Internet at work and 64% had broadband at work; 47% had access to the Internet at school and 42% had broadband at school; 58% had access to the Internet at a library and 48% had broadband at the library; and, 7% had access to broadband somewhere else. The use of WiFi in cafes, parks and public spaces does not replace the need to subscribe to an Internet service from home. Among the respondents surveyed, perhaps ironically, WiFi users in Budapest were more likely to have broadband at home than those in

New York. On the one hand, this is not surprising due to the low standing of the United States in terms of broadband penetration; on the other hand, it is possible, that the respondents in Budapest were more heavily skewed towards tech-savvy users. This will be explained in more detail in the demographic section of the survey results.

In New York, wireless users have encountered a number of problems using WiFi hotspots. Many (44%) are concerned about the privacy and security of data being transmitted over the wireless network. Others (43%) find the networks to be too slow. Many (22%) don't know that the networks exist due to lack of signage etc. In addition, some (16%) are concerned about the theft of computer hardware. Others (13%) have problems figuring out how to connect to the network. Viewing the computer screen in outdoor locations is also a problem for some (10%) users. Finally, respondents offer a number of other reasons why they have had problems using WiFi including the lack of power outlets, privacy and signage; other technical problems; weak or unreliable signals. 10% of respondents indicate that they have not had any problems using WiFi. In Budapest, 49% of respondent indicate that the network is too slow; 26% have trouble viewing their computer screen; 24% have not had any problems; 22% have concerns about privacy and security of data being transmitted; 21% have concerns about the theft of their computer hardware; similarly, 21% can't figure out how to connect to the network; 14% did not know about the availability of the network; and, 8% have another problem with the network. In Montreal, 33% indicate that the network is too slow; 33% have another problem with the network; 26% have concerns about the privacy and security of data; 25% can't figure out how to connect to the network; 20% have concerns about theft; 17% did not know about the availability of the network; and, 3% have trouble viewing their screen.

Content and Activity Related Questions

In New York, the top websites accessed via WiFi were Google (23%), Gmail (15%), Yahoo! (15%), Hotmail (5%), and the *New York Times* (5%); 26% accessed another website. In New York, respondents report that they access general news (83%), information relevant to their geographic location (61%), weather information (61%), product information (47%), information about hobbies (45%), travel information (45%), financial information (41%) and political news (39%); do research for school or training (37%); search for new job opportunities (30%); access

Information Accessed
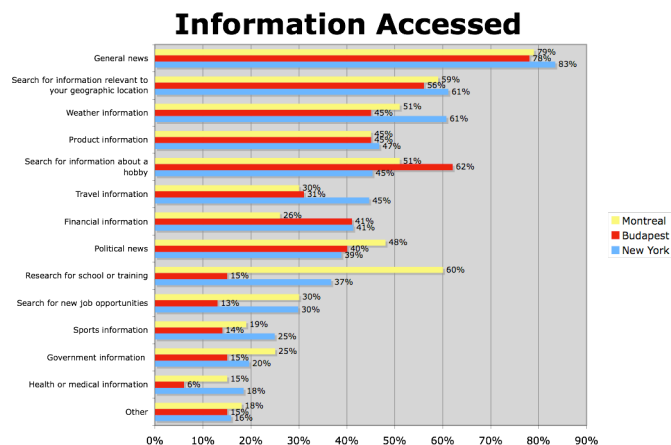
sports information (25%), government information (20%) and health or medical information (18%); and, other information (16%). With respect to searching for information relevant to geographic location, it is not possible to know exactly what kind of information was being accessed. However, I would hypothesize that people sometimes use WiFi to decide where to go and what to do including looking for restaurants, stores and other nearby activities.

In Budapest, 78% of respondents accessed general news; 62% accessed information about a hobby; 56% search for information relevant to their geographic location; 45% accessed weather information; 45% accessed product information; 41% accessed financial information; 40% accessed political news; 31% accessed travel information; 15% accessed government

information; 15% accessed other information; 15% did research for school or training; 14% accessed sports information; 13% searched for new job opportunities; 6% accessed health or medical information. In Montreal, 79% of respondents accessed general news; 60% did research for school or training; 59% searched for information relevant to their geographic location; 51% searched for weather information; 51% searched for information about a hobby; 48% accessed political news; 45% accessed product information; 30% accessed travel information; 30% searched for new job opportunities; 26% accessed financial information; 25% accessed government information; 19% accessed sports information; 18% accessed other information; and, 15% accessed health or medical information.

In New York, the most common types of activities that wireless users engage in are sending or reading e-mail (91%), writing or word processing (59%) and going online for fun or to pass time (59%). They are also likely to send or receive instant messages (49%) and photos (36%), buy products (40%), access their work Intranet (35%), buy or make travel reservations (34%), and download and listen to music (33%) or watch video clips (29%). They are somewhat less likely to contribute content to a blog (21%) or other website (21%), send or receive music files (19%), do graphic or web design (15%), play online video games (7%), buy or sell stock online (7%), take part in a chat room (6%), or do something else (7%). Pew data supports these findings, concluding that wireless users are more likely to check e-mail and get news online than home broadband users and Internet users in general. Specifically, 72% of wireless users check e-mail on a typical day as compared to 63% of home broadband users and 54% of Internet all users. 46% get news online on a typical day as compared to 38% of home broadband users and 31% of all Internet users (Horrigan, 2007).

In Budapest, 88% of respondents use WiFi to send or read e-mail; 67% go online to for fun or to pass time; 53% send or receive instant messages; 40% access their work Intranet; 31% do writing or word processing; 30% download and listing to music; 28% download and watch video clips; 23% contribute content to websites other than blogs; 21% buy products; 20% buy or make travel reservations; 18% contribute content to a blog; 17% send or receive photos; 13% do graphic or web design; 9% play online video games; 9% send or receive music files; 7% take part in a chat room; 7% do something else; and, 3% buy or sell stock. In Montreal, 91% of respondents send or read e-mail; 62% do writing or word processing; 53% send or receive instant messages; 52% go online for fun or to pass time; 37% download and listen to music; 33% download and watch video clips; 33% send or receive photos; 31% buy a product; 28% access their work Intranet; 28% contribute content to a blog; 27% contribute content to a website (other than a blog); 20% do graphic or web design; 18% buy or make travel reservations; 17% send or receive music files; 12% play online video games; 11% take part in a chat room; 11% do something else; and, 4% buy or sell stock online.

In New York, in addition to using WiFi, wireless users make phone calls (66%), eat meals (65%), read (60%), watch people (56%), meet friends (49%), hold work meetings (15%), play video games (4%) or so something else (10%) at the location. In Budapest, in addition to using WiFi, 77% of wireless users eat meals; 66% meet friends; 64% make phone calls; 37% watch people; 31% hold work meetings; 26% read; 9% do something else; and, 6% play video games. In Montreal, 72% of WiFi users eat meals; 69% read; 65% meet friends; 57% watch people; 39% make phone calls; 26% hold work meetings; 25% do something else; and, 2% play video games.

In New York, the majority of wireless users go to the location alone (87%). However, some go with friends (29%), others go with a spouse or partner (17%) or with a co-worker or business colleague (17%). It is not possible to know what accompanying friends, spouses or coworkers are doing, however, I have often seen dyads and triads of groups using their laptops together. Sometimes, there is only one laptop and both people are looking at its while other times, one person is on a laptop while the other is doing something else such as talking on their mobile phone. A small number go with children (4%), other relatives (3%), neighbors (4%), members of a common organization or club (4%) or with someone else (1%). In Budapest, 75% of WiFi users go to the location alone; 48% go with friends; 30% go with co-workers or business colleagues; 31% go with a spouse or partner; 9% go with members of a common organization or group; 3% go with their children; 2% go with other relatives; 2% go with others; and, .6% go with their neighbors. In Montreal, 85% go alone; 53% go with friends; 26% go with co-workers or business colleagues; 24% go with a spouse or partner; 6% go with member of a common organization or club; 5% go with other relatives; 3% go with their children; 3% go with neighbors; and, 3% go with others.

Go to this Location With
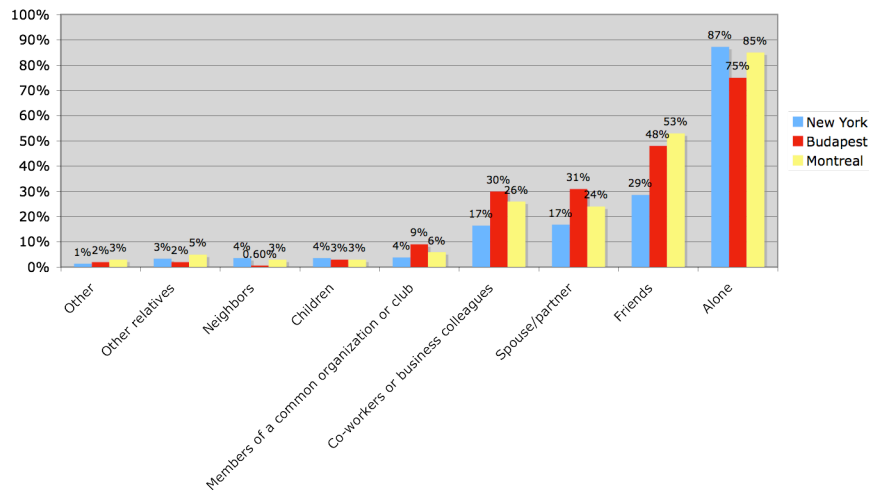
In order to better understand the reasons that people use the wireless Internet, respondents were asked to answer open-ended questions on *what they like about the wireless Internet*. In New York, freedom of movement to work in different places i.e. living room; mobility, portability and flexibility; and, the ability to work outdoors or remotely outside of the home and/or office were cited by nearly one third (29%) of respondents. For example, some write: "I can sit anywhere in my room or apartment or even outside…I don't have to sit at my desk," and "I depend on it. It makes working at home much more pleasant. When I've been on the road, I use open WiFi access points to keep in touch with friends and work."

Others explain: "the ability to work from somewhere that isn't my home/office," "the convenience of being able to get work done in a 'pastoral' setting" and "the location's beautiful…I can do work there instead of in the office or at home." Another group of respondents, 28% of the total, stress the convenience of the wireless Internet; in particular, the lack of wires, cables and cords. They write: "[There are] no wires! I'm a nervous type…like to change positions location a lot. Additionally, I work from home so leaving the house while still

28

being productive is a plus," and "I can get onto the internet without having to plug into anything." 23% of respondents reference connectivity, the ease of access to information and the ease of use. For example, one respondent writes: "the ability to access the wealth of information on the Internet wherever I am. I can always find the answer to a question." 9% cite the widespread availability of the wireless Internet; 8% mention that it is (usually) free of charge; and, 5% say that it is fast.

Demographic Questions

Overall, the survey results show that wireless users are highly educated white males that are under 44 years of age. In New York, 41% of respondents were between 25-34; 25% were between 35-44; 15% were between 18-24; 13% were between 45-54; 5% were between 55-64; and, 1% were over 65. The findings are further supported by Pew data – a representative sample of the population – which showed that 49% of wireless users were between 30-49 in comparison to only 42% of all Internet users in this demographic; 30% were between 18-29 in comparison to only 19% of all Internet users in this demographic; 19% were between 50-64 while 29% of all Internet users were in this demographic; finally, only 3% were over 65 while 11% of all Internet users were in this demographic (Horrigan, 2007). Since the Pew study was conducted in the United States, it is a less relevant comparison for the Budapest and Montreal data. In Budapest, 45% of respondents were between 25-34; 34% were between 18-24; 16% were between 35-44; and, 5% were between 45-54. There were no respondents over 45. In Montreal, 48% of respondents were between 25-34; 24% were between 18-24; 17% were between 35-44; 1% were between 55-64; and, .3 were over 65.

According to the survey, in New York, 64% of the respondents were male and 36% were female. In Budapest, 94% of all respondents were male and only 6% were female while, in Montreal, 67% of respondents were male and 33% were female. My findings are supported by Pew data in that there were more male than female WiFi users. Similarly, the Pew reported that 56% of wireless users were male and 44% were female. However, both my findings and Pew's findings contradicts data on Internet users in general. Women are more likely to use the Internet overall. Pew found that only 46% of all Internet users were male while 56% were female (Horrigan, 2007).
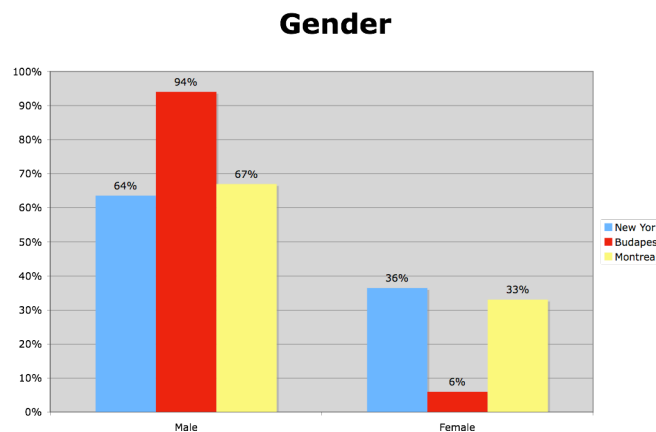
Gender

Preliminary analysis indicates that there are substantial differences between the way that men and women use WiFi hotspots. One hypothesis, based on literature about gender and public space, is that men and women have varied ways of spending time in public and semi-public spaces. In fact, while I was out distributing my surveys in Starbucks, Bryant Park and independently-owned cafés throughout the city, I found it much more difficult to find women working on laptops in public spaces. In addition, one person that I interviewed had a female friend that had been harassed at a WiFi hotspot in a café and, thus, discontinued their use of the

hotspot. Finally, it is possible that my own gender was a factor in biasing the survey towards men in that men were more likely to respond to a survey being distributed by a woman. In fact, this hypothesis is substantiated by some of the feedback left by men in the survey itself.

In terms of the respondent's racial background, in New York, 62% of respondents were White, non-Hispanic; 15% were Asian; 7% were Hispanic; 5% were Black, non-Hispanic; 2% classified themselves as other, non-Hispanic; and, 9% did not answer this question. My findings on White, non-Hispanic WiFi users are supported by Pew data, which indicates that 67% of wireless users are white as compared to 79% of all Internet users. However, my survey under-represents Blacks and Hispanics and over-represents Asians as compared to the Pew data, which finds that 12% of wireless users are Black as compared to only 7% of all Internet users; and 14% of wireless users are Hispanic as compared to only 8% of all Internet users (Horrigan, 2007). While both surveys confirm that the majority of wireless users are White, the Pew survey illustrates an interesting trend with respect to the wireless Internet: Blacks and Hispanics are *more likely* to use the wireless Internet than they are to use the Internet in general. One possible explanation for this is that the Pew survey does not distinguish specifically between WiFi or cellular access to the Internet. Instead, it asks whether devices such as laptops, PDAs and mobile phones have been used to connect to the wireless Internet. Blacks and Hispanics are more likely to have cell phones than to have laptops, PDAs or access to broadband. Thus, it is possible that the majority of these respondents are using their cell phones to connect to the Internet.

At the recommendation of the Hungarian Wireless Community (HuWiCo), the question on racial background was not asked on the Budapest survey. In Montreal, 72% of respondents were

White, non-Hispanic; 15% preferred not to answer; 6% were form another, non-Hispanic background; 4% were Hispanic; 2% were Asian; and, 1% were Black, non-Hispanic.

Wireless users are a very highly educated demographic. In New York, 43% have a bachelor's degree; 27% have a master's degree; 13% have some college but no degree; 5% have a professional degree; 5% have a doctorate degree; 4% have an associate's degree; 2% have graduated from high school with a diploma or equivalent (GED); 2% have some high school but no diploma; and, .2% have less than a high school education. My data is supported by Pew data, which shows that WiFi users are very highly educated, reporting that 42% have more than a college education as compared to 32% of all Internet users; 30% have some college as compared to 26% of all Internet users; 22% have graduated from high school as compared to 34% of all Internet users; 19% are currently students as compared to 12% of all Internet users; and, 6% have less than a high school education as compared to 8% of all Internet users (Horrigan, 2007).

In Budapest, 41% have graduated from high school; 30% have a bachelor's degree; 28% have some college; and, only 1% have less than a high school education. The master's degree, professional degree and doctorate degree responses were omitted at the recommendation of HuWiCo. In Montreal, 43% of respondents had a bachelor's degree; 15% had a master's degree; 14% had some college but no degree; 13% had an associate's degree; 6% had a doctorate degree; 4% had a professional degree; 4% graduated from high school; and, 1% had some high school.

As expected based on their high levels of education, wireless users are relatively well paid. For the sake of ease of comparison to Pew data, I have condensed the income brackets into four

categories. 33% of respondents reported making over $75K; 24% made less than $30K; 23% made over $50K; and, 21% made over $30K. It should be stated that because this question did not allow respondents to "opt-out" some respondents admitted to lying on this question in order to protect their privacy despite the fact that the survey results are anonymous and all responses are analyzed in aggregate as is customary according to ethical academic research guidelines. Despite this discrepancy, Pew reported that 34% of respondents made over $75K as opposed to only 20% of all Internet users; 18% made between $50-75K as opposed to only 13% of all Internet users; 14% made less than $30K in contrast to 23% of all Internet users; 13% made between $30-50K in contrast to 24% of all Internet users; and, 21% refused to answer in contrast to 20% of all Internet users (Horrigan, 2007). In Budapest, 28% of respondents made less than $3K[10][11]; 18% made between $6K and $12K; 16% made between $12K and $17K; 13% made between 17K and $29K; 12% made between $3K and $6K; 8% made between $29K and 58K; and, 5% made over $58K. In Montreal, 58% made less than $30K[12]; 19% made over $30K; 12% made over $50K; and, 11% made over $75K.

According to the survey, in New York, 57% of respondents are full-time employees; 16% are self-employed, freelance workers or independent contractors; 9% are full-time students; 5% are entrepreneurs, owners or partners in a small business, professional practice or farm; 4% are part-time employees; 4% are unemployed and looking for work; 1% are retired; 1% are homemakers; .4% are unemployed but not looking for work; .4% are disabled; and, 3% are not in any of these categories. In Budapest, 42% of respondents were full-time employees; 25% were self-

---

[10] 1 USD = 173 Hungarian Forints (HUF), XE.com. Accessed on January 8, 2008.
[11] Results rounded to the nearest thousand USD.
[12] Results were not converted from Canadian Dollars (CAD) due to relative parity of CAD to USD. 1 USD = 1 CAD, XE.com. Accessed on January 8, 2008.

employed, freelance workers or independent contractors; 23% were full-time students; 4% were part-time employees; 3% were not in any of these categories; 2% were unemployed and looking for work; .3% were unemployed and not looking for work; .3% were entrepreneurs; and, .3% were homemakers. In Montreal, 29% were full-time employees; 27% were full-time students; 22% were self-employed; 9% were part-time employees; 5% were entrepreneurs; 4% were in another category; 4% were unemployed and looking for work; 1% were homemakers; and, .6% were unemployed and not looking for work.

Of those that are employed, in New York, 15% are in media and entertainment industries; 13% are in finance and banking; 11% are in telecommunications and information technology; 11% are in the non-profit sector; 9% are in professional services (consulting, accounting, law); 8% are in education; 4% are in health and medical; 4% are in the government sector; 3% are in hospitality and travel; 2% are in insurance and real estate; 2% are in science and research; 2% are in manufacturing and industry; and 16% are in another industry. In Budapest, 41% of respondents were in telecommunications; 16% were in another category; 9% were in media; 8% were in education; 8% were in manufacturing; 5% were in science; 4% were in the government sector; 3% were in finance; 2% were in health; 2% were in hospitality; 2% were in professional services; 1% were in the non-profit sector; and, .3% were in insurance and real estate. In Montreal, 26% were in another category; 15% were in telecommunications; 14% were in media; 11% were in education; 9% were in professional services; 8% were in science; 4% were in health; 4% were in the non-profit sector; 3% were in hospitality; 2% were in finance; 2% were in the government sector; and, 2% were in manufacturing.

Conclusion

This paper presents a comparative analysis of WiFi use in three cities – New York, Budapest and Montreal. Since there is limited information about WiFi users, this survey begins to describe the way WiFi is being used in public spaces in order to identify the similarities and differences in usage patterns internationally. In addition, by analyzing WiFi use discretely, rather than as a component of broadband Internet use, this paper advances the idea that different modes of Internet access allow for different uses of technology.

This paper has argued the following: first, WiFi is an important factor in attracting people to specific locations; second, the use of WiFi highly localized in that it is often used to search for information relevant to one's geographic location; third, there are significant differences in the way that WiFi is used across a variety of locations including cafes, parks and other public spaces; fourth, at present, WiFi users are, for the most part, young, male and highly educated displaying the characteristics of early adopters of technology; and, fifth, there is a convergence in the ways in which WiFi is used internationally in some respects, however there are also important differences in the reasons for these uses as well divergence in other respects.

As cities worldwide struggle with business models to support the building of municipal wireless networks and businesses attempt to identify content, services and application for mobile and wireless users, this paper provides an early look at the people, places and technologies driving the current phenomenon of WiFi use in cafes, parks and other public spaces. In the near future, the use of these technologies will become increasingly important as our cities and towns are blanketed with an invisible information layer comprised of radio frequency identification (RFID)

tags, wireless sensors and communication networks. Thus, it is vital to better understand the complex uses of existing WiFi networks worldwide.

Bibliography

Bar, F., & Galperin, H. Building the Wireless Infrastructure: Alternative Models.

Bar, F., Galperin, H., & License, C. (2005). Geeks, Cowboys, and Bureaucrats: Deploying Broadband, the Wireless Way. *The Network Society and the Knowledge Economy in Context, Lisbon*.

Brown, B., & O'Hara, K. Place as a Practical Concern of Mobile Workers. Glasgow: University of Glasgow.

Gupta, N. (2004). *Grande WiFi: Understanding What WiFi Users are Doing in Coffee-Shops*. Massachusetts Institute of Technology, Cambridge.

Hampton, K. N., & Gupta, N. (forthcoming). Community and Social Interaction in the Wireless City: Wi-Fi use in Public and Semi-Public Spaces. *New Media & Society*.

Hampton, K. N., Livio, O., & Trachtenberg, C. (2007). Is WiFI use Compatible with Public Spaces? Wireless Internet Use, Sociability, and Social Networks.

Horrigan, J. (2007). *Wireless Internet Access*. Washington, D.C.: Pew Internet & American Life Project.

Ito, M., Okabe, D., & Matsuda, M. (2005). *Personal, Portable, Pedestrian: Mobile Phones in Japanese Life*: MIT Press.

Katz, J. E., & Aakhus, M. (Eds.). (2002). *Perpetual Contact: Mobile Communication, Private Talk, and Public Performance*. New York, NY: Cambridge University Press.

Lee, S. (1999). Private Uses in Public Spaces. *New Media & Society* **1**(3): 331-350.

Liff, S., & Laegran, A. S. (2003). Cybercafes: Debating the Meaning and Significance of Internet Access in a Cafe Environment. *New Media & Society* **5**(3): 307-312.

Liff, S., & Steward, F. (2003). Shaping E-access in the Cybercafe: Networks, Boundaries and Heterotopian Innovation. *New Media & Society* **5**(3): 313-334.

Medosch, A. http://theoriebild.ung.at/view/Main/FreeWavelength

Medosch, A. (2005). http://theoriebild.ung.at/view/Main/HiveNetworks

Middleton, C. (2003). Broadband Internet Usage Outside the Home: Insights from a Study of Toronto Internet Cafes: Ryerson University.

Pedersen, P. E., & Ling, R. S. (2005). *Mobile Communications: re-negotiation of the social sphere*: Springer.

Powell, A. (2003). Space, Place, Reality and Virtuality in Urban Internet Cafes: Ryerson and York Universities.

Sandvig, C. (2004). An Initial Assessment of Cooperative Action in Wi-Fi Networking. *Telecommunications Policy* **28**(7/8): 579-602.

Stewart, J. (1999). Cafematics: The Cybercafe and the Community: University of Edinburgh.

Wakeford, N. (2003). The Embedding of Local Culture in Global Communication: Independent Internet Cafes in London. *New Media & Society* **5**(3): 379-399.