



The National Regulatory Research

Residential Perceptions of Internet Service Quality: Results of a Survey



**RESIDENTIAL PERCEPTIONS OF INTERNET SERVICE QUALITY:
RESULTS OF A SURVEY**

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January 2003

This paper was prepared by the National Regulatory Research Institute (NRRI) with funding provided by participating member commissions of the National Association of Regulatory Utility Commissioners (NARUC). The views and opinions of the author do not necessarily express or reflect the views, opinions or policies of the NRRI, NARUC or NARUC member commissions.

EXECUTIVE SUMMARY

The National Regulatory Research Institute in late 2001 conducted an in-depth survey of 14,000 internet users that revealed their service quality experiences and preferences. This survey, in concert with other recent surveys of subscriber behavior, indicates that customers' evaluation of broadband connections is tempered by perception of a variety of technical and service problems, resulting in a user base that appears to have little technology or provider loyalty.

NRRI survey respondents awarded their respective internet service providers (ISPs) with only an average letter grade of C+ on the academic scale, with similar averages earned by both broadband and dialup providers. Review of grade distributions indicates that the averages for broadband providers were weighed down by the high percentages of dissatisfied users.

The letter grades were confirmed by detailed responses to specific survey questions regarding perceived issues involving both technical operations and business transactions. Among the study's many conclusions:

- About half of all subscribers, regardless of connection type, complain about internet service quality.
- Consumer satisfaction ratings for dialup may meet or exceed those for broadband.

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FOREWORD

The internet has quickly become a medium of communication that Americans rely on socially, politically and economically. This study finds that as of the fall of 2001 a surprising percentage of internet users, whether dial-up or broadband customers, were dissatisfied with their service. In fact, dial-up customers were more satisfied than broadband customers. The study is notable for its novel methodology as well as its results. BIGresearch conducted the survey for the NRRRI over the internet and received over 14,000 responses. The NRRRI plans to continue to use this methodology, beginning this winter with a study of consumer satisfaction with utility services.

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January 2003

INTRODUCTION AND METHODOLOGY

The National Regulatory Research Institute in late 2001 conducted an in-depth survey of 14,000 internet users that revealed their service quality experiences and preferences. This survey, in concert with other recent surveys of subscriber behavior,¹ indicates that customers' evaluation of broadband connections is tempered by perception of a variety of technical and service problems, resulting in a user base that appears to have little technology or provider loyalty.

NRRI survey respondents awarded their respective ISPs with only an average letter grade of C+ on the academic scale, with similar averages earned by both broadband and dialup providers. Review of grade distributions indicates that the averages for broadband providers were weighed down by the high percentages of dissatisfied users.

The letter grades were confirmed by detailed responses to specific survey questions regarding perceived issues involving both technical operations and business transactions. The methodology is described below in this report, which focuses on the perceptions and behavior of those users who said they were not satisfied.

In November 2001 the NRRI commissioned an innovative survey of the service quality experiences of residential internet customers. The purpose of the survey was to gain an understanding of service quality from the perspective of internet users in general and broadband subscribers in particular.

This report consists of the cross-tables of national survey results and the statistical validation of all conclusions presented. The basis for the study is a set of 20 substantive questions (reproduced in the appendix) augmented by five demographic and geographic questions. The demographic and geographic results are not analyzed in the report. The substantive questions both determine the nature of ISP connection and assess ISP performance along technical and procedural dimensions; the problem resolution and complaint processes received additional attention.²

BIGresearch, Inc., of Worthington, Ohio, conducted this survey for NRRI. While

¹ Pew Internet and American Life Project, *The Broadband Difference: How Online Americans Behavior Changes With High-Speed Internet Connections at Home*, 2002.

² Further analysis of the data by state, zip code or for demographics is available. Contact Vivian Witkind

BIGresearch performed the actual survey online via a website, it selected participants through its network of over 900 special-interest and professional electronic mailing lists encompassing 62 million subscribers. Through BIGresearch, the NRRI survey quickly amassed a sample of over 14,000 responses representing all U.S. states and nearly all varieties of internet service.

This report continues a line of NRRI research into telecommunications service quality. It fits into the framework of multi-faceted service quality published by Lynch, Buzas and Berg.³ The framework extends service quality beyond traffic engineering to incorporate provisioning, technology in use, billing, repair, and complaint handling. This framework is oriented more toward customer perceptions of quality than toward objective engineering measures.

The research methodology for this project consists of comparing statistics from various subgroups of survey responses. Survey answers were coded by respondents and stored within a relational database for later extraction via structured query language (SQL). Thus, the statistic of interest could be computed upon a particular set of database records; more frequently, a statistic or score was computed on mutually exclusive subsets drawn from a complicated “join” of multiple queries that met specific criteria.

For instance, we have considered the incidence rate of complaints by (a) the type of technology for connection, and (b) the classification of the firm that bills. For this question and others, responses were categorized by the type of access or connection technology: dialup, DSL, cable modem, and so on. Responses to these same questions were often analyzed by whether the billing entity for this service was the local exchange carrier (LEC), competitive LEC (CLEC), interexchange carrier (IXC), and so on. In general, the survey indicates that we can in this analysis equate DSL with LECs and cable modems with cable system operators, but this observation may not hold in the future.

Tests for confidence at the 95 percent level have been calculated for each sample population presented in this report, where each is assumed to have a normal

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³ Witkind Davis, Vivian, et al, Telecommunication s Service Quality, Columbus, OH: NRRI, 1996.

distribution and must have a minimum population to be considered. Where appropriate, the chi-squared probability is taken for a subgroup population compared to the sample from which it has been drawn.

This survey methodology analysis has been validated independently by Dr. Jerome Friedman at Stanford University.⁴ Conceptually, a survey of this type can contain bias due to self-selection of respondents, but Dr. Friedman has assessed this possibility and deemed it insignificant because of the extremely large sample size.

⁴ Friedman, Jerome H., "Technical Review of Statistical Aspects of BIGresearch Methodology," undated correspondence received from BIGresearch, March 20, 2002.

TECHNICAL AND MARKET CONTEXT

No analysis of the effects of technology is complete without at least some technical frame of reference. The distinctions between different internet connection technologies are clear, even if the companies that offer, brand and bundle them are not.

DSL operates on the local telephone loop and is normally provided by a local exchange carrier or competitor. A voice telephone connection and data circuit can coexist on the same wire pairs but operate in different frequency ranges. The connection is private and not shared and can be run at a variety of datarates. Normally, a DSL connection is considered asymmetric – downlinking at speeds up to T-1 (1.544 megabits per second, Mbps) and uplinking at some fraction of that speed. Installation at the customer premises is technically straightforward, but delivering the service to the home can be problematic. DSL customers must be within 18,000 feet of DSL concentration equipment that is usually racked in a central office. Even then, the wire pairs must be free of loading coils – artifacts used to enhance voice quality on long runs, and whose presence and location may be undocumented.

Most cable systems have the capability to provide two-way communications with customer premises. The presence of over 100 cable television channels indicates that a cable system has been rebuilt with a two-way fiber optic interior, terminating at nodes that serve a hundred or more dwellings. Spare cable broadcast channels provide “forward” and “return” paths whose bandwidth is shared among subscribers. The forward datarate delivered to customer equipment is nominally 10 Mbps and the return path datarate may approach 320 kbps; traffic on the return path is encrypted.

Residential ISDN solutions are limited in datarate to a modest 128 kilobits per second (kbps) and are connected on demand; both of these factors make it less preferable than the DSL or cable modems.

Digital cellular providers offer internet-enabled telephones, but their datarates are considered “narrowband” (limited to 19.2 kbps) and their usage is strictly metered.

The next, third generation of mobile telephony (“3G”) is designed to deploy two-way broadband connections over 128 kbps.

Point-to-point and multipoint wireless technology is available to deliver to broadband internet, but lack of capital has prevented network buildout to reach most residential locations. Informal wireless access networks that use unlicensed frequencies and have data rates up to 54 Mbps are popular. Such approaches are widely used in concert with DSL and cable modem access for home networks, but resale of service is typically prohibited. Two-way satellite internet service has also re-emerged in the marketplace but was not detected in the survey.

NRRI data indicate that DSL and cable modem users collectively account for 26 percent of survey responses. This breakdown differs somewhat from research conducted by the Pew Trust (cited above) and Harris Interactive showing that over 20 percent of all U.S. households encompassing nearly 80 million adults subscribed to broadband internet access.⁵ A more recent analysis by the *Christian Science Monitor* places the total number of broadband subscriptions more conservatively at 15 million, with cable modems leading DSL by a ratio of 2:1.⁶ These estimates dwarf those summarized from FCC Form 477 as of December 2001, which concluded that there were only 12.8 million subscribers with data service in excess of 200 kbps in either direction (and that only 7.4 million subscribers had such service in both directions).⁷ The FCC data do not include services such as ISDN whose data rates fall under the reporting threshold.

Table 1 shows the connection type respondents said they were using to access the internet.

⁵ Stump, Matt, “Service Still Gives Headaches,” http://www.broadbandweek.com/news/020708/020708_content_3.htm, accessed July 12, 2002.

⁶ Paul, Noel C., “Broadband Breakthrough,” *The Christian Science Monitor*, August 19, 2002.

⁷ *High Speed Services for Internet Access: Status as of December 31, 2001*, Federal Communications Commission Wireline Competition Bureau, July 2002.

TABLE 1: CONNECTION TYPE

Type of Connection	Respondents (percent)
Dialup	70%
DSL	8
Cable Modem	18
ISDN	1
Wireless	1
None Specified	2

Source: NRRRI Survey on Internet Service Quality, November 2001

The market for internet service via ISP is truly fragmented. Table 2 shows that no ISP has more than 12 percent of the national market share, and that “others” account for the majority of DSL subscriptions. In these cases, the ISP is less likely to be a registered data LEC than to be a reseller of the incumbent’s DSL transportation service, which would use the carrier’s DSL Access Multiplexer (DSLAM) but the ISP’s own internet routers.

TABLE 2: DSL PROVIDER SELECTION

DSL Provider	Selection
BellSouth	12%
Verizon	12
AOL	11
Earthlink	8
MSN	4
Others	53

Source: NRRRI Survey on Internet Service Quality, November 2001

More structure exists in the market for cable modem service. Similarly to DSL, the name most frequently mentioned for providers is “other,” but national brands do account for half of this space. Since the time of the survey, Excite@Home has folded – its user base would have transferred either to AT&T (its parent) or a non-cable ISP. Note also that Road Runner, in layman’s terms, is a brand or franchise fulfilled by the local cable system operator over its facilities, and that it is used by companies other than subsidiaries of Time Warner, its corporate parent.

Additional confusion stems from the fact that, in order to retain a screen-name or an email address, some broadband customers may maintain two accounts: one for access and another (e.g., AOL) for identity.

TABLE 3: CABLE MODEM PROVIDERS

Cable Modem Provider	Respondents (percent)
Road Runner	20%
Excite@Home ⁸	16
AT&T	11
AOL	9
Comcast	6
Other	38

Source: NRRRI Survey on Internet Service Quality, November 2001

⁸ Since the survey was conducted, Excite@Home has ceased operation.

SERVICE QUALITY

The following conclusions about the quality of internet service may be drawn from NRRI survey data:

- Sixty-two percent of all respondents considered their service easy to order, where one telephone call accomplished everything. This statement was also true for 53 percent of DSL customers and 68 percent of cable modem customers. Of the five connection types studied, cable modem service was the easiest to order, and DSL the hardest.
- Eighty-eight percent of all respondents were able to use their internet service in two weeks or less, which was true for all types of service except DSL, where the fraction was 67 percent. Nine percent of DSL installations took over 45 days to complete, compared to one percent for the entire population and two percent of cable modems.
- Twelve percent of all installations took more than one visit by the installer to complete, but this figure is skewed by the fact that only five percent of a very large population of dialup users needed more than one visit. Twenty-eight percent of DSL customers and 31 percent of cable modem customers required more than one visit. Ninety-nine percent of broadband were reported as complete, so we were not necessarily detecting work-in-process.
- While 24 percent of all respondents reported frequent interruptions to service. Thirteen percent and eleven percent of DSL and cable modem users respectively reported such interruptions, statistically a tie. Dialup users fared the worst, with 29 percent noting frequent interruptions.
- Overall, 77 percent of all respondents reported at least occasional interruptions to service, although broadband providers fared significantly better. Sixty percent of DSL and 61 percent of cable modem users respectively reported occasional interruptions, statistically a tie. Dialup users fared the worst, with 84 percent noting occasional or frequent interruptions.

- The vast majority (88 percent) of DSL and cable modem users were satisfied with the speed of their internet service, much better than the 60 percent of dialup users that agreed with that statement and the 68 percent proportion of all subscribers in agreement.

In July 2002, the Harris Interactive survey cited above reported the following relevant results:

- One third of broadband subscribers noted that it took several calls to resolve a problem, and the majority of that group (20 percent) considered that time to be too long. Seven percent reported that their problem was never resolved.
- The first ten days of service generated up to three calls for support, often with “self-installation” procedures.

Harris indicated that, once early problems were solved (and, like NRRI, half of their respondents reported problems), 75 percent of subscribers were satisfied with their service – yet 90 percent were reluctant to acquire additional services from their current provider. The Harris survey focused, interestingly, on issues described as problems, support, and service, while the NRRI survey considered only complaints.

COMPLAINTS

Complaints Directed to Providers

Nearly half (48 percent) of all respondents claim that they have complained to their provider directly. The complaint rate does not appear to be driven by the type of connection. The order of rankings of ISPs intermixes dialup, cable modem, and DSL subscribers (see Table 4).

Perhaps the most important interpretation of this ranking is that AT&T, primarily a dialup service and Road Runner, a cable modem service, generate significantly fewer complaints than other providers. This result is supported by a recent J.D. Power survey, which reached the same conclusion through a different battery of questions. J.D. Power and Associates surveyed customers of national ISPs.⁹ Their survey rated each ISP based on five overlapping factors: cost/value/integrity, capabilities/privacy, connection/reputation, e-mail and customer service/technical support. Their survey identified Road Runner as the top broadband provider, largely due to customer satisfaction with its high datarate.

Statistically, large margins of error prohibit most pairwise comparisons of firms based on complaint rate alone. Yet AT&T and Road Runner are clearly distinguished statistically from other paid services; incorporating the J.D. Power analysis, we may also conclude that these two firms establish the benchmark for excellence among national ISPs.

The high ranking of free and low-cost ISPs is an anomaly that merits some discussion. When subscribers assigned letter grades to overall service in the NRRI/BIGresearch survey, two of the top four ISPs are Juno and BlueLight.com (the other leaders are CompuServe and MSN). Juno, BlueLight and Netzero provide little or no personal contact, service or support; their technical support appears limited to the

⁹ J.D. Power and Associates Reports, Agoura Hills, CA, press release, August 22, 2001.

contents of their websites. Subject to reduced expectations at reduced cost, the customers of Juno, BlueLight and Netzero appear to appreciate the value of service provided.

Table 4 shows the complaint rate for the 15 largest ISPs at the time of the survey. Except with the most extreme pairings (i.e., Juno vs. MSN), these rankings lack statistical significance at the 95% level. At the 68% level, there are some clear distinctions between cohorts of ISPs with similar scores.

TABLE 4: PERCENTAGE OF ALL SUBSCRIBERS WHO COMPLAINED, BY PROVIDER

Provider	Subscribers who Complained
Netzero	27%
BlueLight	38
Juno	40
AT&T WorldNet	41
Road Runner	41
BellSouth	46
Earthlink	46
Prodigy	46
Comcast	47
CompuServe	47
“Other”	47
MSN	49
Verizon	49
AOL	53
Excite@Home	56
Gateway	62

Source: NRRI Survey on Internet Service Quality, November 2001

Respondents with complaints were able to identify one or more reasons for complaining. Proportions of complaints can be attributed to the categories in Table 5.

TABLE 5: BREAKDOWN OF COMPLAINTS

Complaint Type	All Subscribers	DSL Subscribers Only	Cable Modem Subscribers Only
Outages	33%	27%	34%
Speed and fluctuations	23	23	25
Technical Support	19	16	17
Order, installation, billing	15	27	17
Other (as a group)	10	7	7

Source: NRRI Survey on Internet Service Quality, November 2001

Statistics indicate that DSL subscriber data in Table 5 differs significantly from the population of subscribers as a whole. The DSL group has a chi-squared score of 12.06 on four degrees of freedom; the probability of this statistic is .017, which strongly indicates that the proportion of complaints by DSL customers is different from the population's.

This permits us to conclude that, while DSL customers complain at about the same rate as others, they complain somewhat less about outages. Instead, they complain at a higher rate about installation and billing.

Cable modem subscriber data in Table 5 is in proportion with the population of all subscribers. The cable modem group has a chi-squared score of 1.58 on four degrees of freedom; the probability of this statistic is .81, which indicates that cable modem customer complaints are in proportion with the population of all subscribers.

No provider type appeared to have an advantage in regard to problem resolution. All ISP provider types mirrored the population average by having a one-sixth proportion of dissatisfied or very dissatisfied customers. This applies to dialup ISP's as well as DSL and cable modem providers. No distinction was apparent among LEC, CLEC, IXC, and other ISP types of firms.

In addition to complaints, survey respondents were able to assess the billing and marketing processes of their internet providers. Across all services, the rate of errors in billing was 11 percent. DSL subscribers reported that bills were sometimes or often wrong 16 percent of the time, and for customers of incumbent local telephone companies in general the rate was 14 percent. Survey respondents reported much less satisfaction with the clarity of marketing materials. While the survey average for dissatisfaction with marketing materials was 15 percent over all types of service, the rate for broadband customers was much higher, as shown in Table 6.

TABLE 6: SUBSCRIBERS DISSATISFIED WITH MARKETING MATERIALS

Type of Connection	Percentage Dissatisfied
Wireless, Satellite	61%
ISDN	57
Cable Modem	29
DSL	26
Dialup	8

Source: NRRI Survey on Internet Service Quality, November 2001

Complaints Directed to Government Agencies

Respondents reported that their rate of complaining to government agencies (46 percent) was nearly equal to their rate of complaining to their respective providers (48 percent).

This result is not necessarily indicative of an escalation process that begins with a complaint to the respective ISP. Only one-third of complainants to government indicated that they were dissatisfied with the problem resolution by the ISP. Stated differently, two-thirds of complaints to government agencies were not based on a breakdown in the problem resolution process of the ISP. Table 7 shows the government agency that respondents complained to.

TABLE 7: WHERE COMPLAINTS WERE DIRECTED

Government Agency	All Subscribers	DSL Subscribers Only	Cable Modem Subscribers Only
State Regulator for Telephone	16%	42%	3%
Another State Agency	14	0	19
Municipal Regulator for Cable	16	4	31
Another Municipal Agency	7	0	12
FCC	17	17	19
Other Agency	21	29	11
Unusable Response	9	8	5

Source: NRRI Survey on Internet Service Quality, November 2001

Among DSL customers only, the number of complaints generated to public agencies other than regulatory commissions was very small. Clearly, DSL customers perceive their broadband service as closely integrated with telephone service. Some respondents reported not complaining to government while simultaneously identifying some agency that they contacted; those responses were not used.

Among cable modem customers, a different pattern for complaints to government emerges. Municipal officials receive twice as many complaints as state agencies, with the state telephone regulator nearly overlooked.

In each case, the chi-squared probability of the subgroup matching the population are minute, less than 10^{-6} , from which we infer that the subgroup populations are not indicative of the population as a whole; The differences in what agency subscribers complain to is statistically significant.

CONSUMER BEHAVIOR

Subscribers across all connection technologies agree: their service earns average marks, perhaps a C+ on an academic scale and most are willing to try a different access technology or even a different provider of their current one. A minority of subscribers, including dialup users, indicated strongly that they would not switch.

Table 8 provide the average score on the four-point academic scale, where A=4.0, B=3.0, and so on. The overall weighted score (or “grade point average”) by number of subscribers across all connection types is 2.34, normally interpreted as a C+.

**TABLE 8: “GRADE-POINT” SCORES
ASSIGNED BY RESPONDENTS**

Type of Connection	Average Score
Dialup	2.39
DSL	2.30
Cable Modem	2.19
ISDN BRI	2.28
Wireless, Satellite	2.26

Source: NRRRI Survey on Internet Service Quality, November 2001

The survey polled which internet applications were most important to home users. Interestingly, the results in Table 9 below were true whether discussing all subscribers, broadband subscribers only, or dialup customers.

TABLE 9: HOME USES OF THE INTERNET

Type of User	Percent Responding
Electronic Mail	28.3%
Web Browsing	26.9
Online Shopping	16.8
Audio and Video	13.6
Online Chat	7.9
Maintain a Web Page	4.6
Voice over the internet	1.9

Source: NRRRI Survey on Internet Service Quality, November 2001

The business uses of residential internet subscribers were also polled. Thirty percent of residential internet subscriptions have some business use, and ten percent of all residential subscriptions are for a business located at the home. Results shown in Table 10 did not differ when studying all subscribers, only broadband subscribers, or only dialup customers.

TABLE 10: BUSINESS USES OF RESIDENTIAL INTERNET

Type of User	Percent Responding
None	67.0%
Occasional work at home	17.5
Home-based business	7.3
Regular telecommuter	3.3
Run internet business	2.1
Response unusable	2.8

Source: NRRRI Survey on Internet Service Quality, November 2001

Many patterns appeared among those respondents who said they would definitely switch providers:

- Dialup users would migrate to DSL and cable modem connections equally.
- Only half of DSL users would retain service, but perhaps change providers.
- Half of cable modem users would migrate to DSL.
- Half of ISDN users would migrate to cable modem, twice their rate to DSL.
- Half of wireless users would migrate to DSL, twice their rate to cable modems.
- Many broadband users appear to be considering a return to dialup service.

If subscribers are interested in switching, we would like to know what type of service they think they prefer. Table 11 contains a matrix of the preferences expressed by users that would change their access technology. When treated as one-step transition probabilities, these proportions invite further analysis as a Markov process. Specifically, whether states (i.e., connection types) can be classified as transient or absorbing would be interesting.

TABLE 11: PREFERENCES FOR SUBSCRIPTION TO A DIFFERENT SERVICE AND PROVIDER

	Future Service			
	DSL	Cable Modem	ISDN BRI	Wireless, Satellite
Current Service				
Dialup	26%	29%	1%	9%
DSL	46	31	0	11
Cable Modem	48	27	3	5
ISDN BRI	25	50	6	19
Wireless, Satellite	50	25	13	13

Source: NRRI Survey on Internet Service Quality, November 2001

Due to the fact that transitions from non-dialup services back to dialup were not

explicitly coded within the current survey, not all rows sum to one. If the survey is repeated, this condition will be studied and an explanation sought. It will be important to know if price is a significant factor for subscribers that cease broadband service.

CONCLUSIONS AND FUTURE RESEARCH

Despite broadband's attributes of high datarates and instant connections, subscribers on average are unhappy with their service, as evidenced by the following conclusions:

- About half of all subscribers, regardless of connection type, complained to their provider.
- Consumer satisfaction ratings for dialup may meet or exceed those for broadband.
- Broadband subscribers show little affinity for their ISP or access technology.

The following other survey results are among those that were statistically significant and likely to be of interest to policy makers:

- ISPs can receive high ratings regardless of the access or connection technology that they employ (e.g., dialup, DSL, cable modem, etc.).
- Broadband service was occasionally difficult to acquire, with a notable proportion of DSL installations taking over six weeks to complete.
- DSL customers were somewhat less likely than cable modem users to complain to their provider about outages but much more likely to complain about ordering, installation or billing.
- All connection technologies generate complaints to government agencies at about the same rate; the complaint rate is between 40 percent and 50 percent.
- Customers do not necessarily exhaust all avenues of problem resolution with their ISP before contacting government agencies. Customers have "reached their limit" with their ISP in only one-third of the complaints to government agencies.

- While a minority of customers is very dissatisfied with their current ISP, the majority would consider changing to a different ISP that provides broadband.

At least in urban and suburban locations, internet users may select among a variety of service offerings and pricing levels. The high complaint rate may be of interest to regulators, since many commissions are the recipients of the complaints. The patterns of complaints may or may not be deemed acceptable for discretionary services in a market setting, especially among early adopters of new technology. Some commissions may wish to consider whether they have a technology neutral role to play regarding internet service quality from a universal service or consumer protection perspective.