

# MEASURING PRINT AUDIENCES VIA THE INTERNET

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## Synopsis

IntelliQuest has conducted a controlled experiment comparing three possible Web-based versions of their Computer Industry Media Study (CIMS™) questionnaire with the paper version now in use. The study found that although all three Web-based readership measures were highly correlated with the paper-based estimates, response rates were materially lower, and readership estimates were materially higher on average.

## Background

Despite the advent of numerous computer-assisted interviewing technologies, traditional paper-and-pencil mail questionnaires still play an important role in media research. The benefits offered by computer technology – standardized interviewing, controlled skip patterns, order randomization, accurate data entry, and the like – have traditionally been offset by matters such as cost of implementation, limited storage capacity, and potential bias among early technology adopters. These concerns have often been substantial enough to prevent suppliers from abandoning paper-and-pencil methods.

The meteoric rise of the World Wide Web as a medium for communication, information delivery, and commerce has forced marketing research companies to re-evaluate their data collection efforts and once again consider the role of computer technology in this industry. Many companies such as IntelliQuest have been quick to capitalize on Web-based interviewing as a method for surveying specific segments of the online population. Other firms have adopted Web-based surveying as a replacement for traditional polling (Thompson, 1999). While the legitimacy of Internet sampling and projection is still quite controversial, there is no question that the Web offers an intriguing vehicle for questionnaire delivery.

IntelliQuest, a marketing and advertising research firm that specializes in analyzing the technology industry, has been using disk-based and Web-based surveys for a number of years. One of the company's few remaining paper-and-pencil efforts is the Computer Industry Media Study (CIMS™), which measures readership of computer and non-computer publications as well as the viewing of broadcast media. The study employs a two-phase interviewing procedure: telephone screening to identify business and household computer purchase decision-makers, followed by a questionnaire mailed to qualified respondents. While part of CIMS is administered on computer disk, the media section has remained on paper to accommodate a large publication list and the presentation of logos.

Web administration of the media questionnaire has the same advantages as a disk-based survey over a pencil-and-paper format, but does not have the problem of squeezing the questionnaire (and responses) into 1.4 megabytes of data. Since CIMS is a study of technology purchase influencers, the potential bias associated with excluding non-users of the Web is substantially lower than for other target audiences. As of this year, 92% of CIMS business influencers already have Internet access.

For these reasons, IntelliQuest conducted the following study in the Spring and Summer of 1999 to explore the feasibility of data collection via the Internet and to compare the response rates and audience estimates obtained using three alternative Web-based questionnaires with those obtained using the customary paper questionnaire. Our goal was to explore the feasibility of various Web-based questionnaire designs in terms of their burden on the respondent and the comparability of their readership estimates.

## Study Design

Since the goal of this study is to compare results using paper and Web modalities, no effort was made to create a sample that would be projectable to the total population of computer influencers. Instead, in order to maximize screening efficiency, we drew the sample from a database of those who had registered a computer or computer-related product in the past year. IQ2.net, a database marketing firm that until recently was owned by IntelliQuest<sup>1</sup>, provided a list of 27,848 records selected at random from their computer software and hardware registration database.

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<sup>1</sup> IQ2.net now operates independently of IntelliQuest as part of Naviant Technology Solutions.

IntelliQuest screened these 27,848 prospective respondents by telephone to produce 2,760 who agreed to cooperate. In order to qualify, respondents had to be reached at a residential phone number, be 18 years of age or older, and supply postal mailing and email addresses. Refusing to supply the postal mailing address terminated the interview and precluded asking for an email address. The percent of attempts that resulted in a completed telephone interview was significantly lower than would have been possible using a much longer field period as is customarily the case. The final distribution of the 27,848 phone numbers in the original sample is shown in Table 1.

Table 1.  
DISPOSITION OF THE PHONE SAMPLE

	<u>Respondents</u>	<u>Percent</u>
Qualified complete	2,760	9.9%
Callbacks (incomplete data)	4,135	14.8%
Non-contacts (no answer)	7,629	27.4%
Refusals, mailing address	1,481	5.3%
Refusals, email address	1,438	5.2%
Refusals, other	8,041	28.9%
Ineligible numbers	<u>2,364</u>	<u>8.5%</u>
TOTAL SAMPLE	27,848	100.0%

Those who agreed to cooperate were then assigned at random to receive one of four questionnaire versions, yielding approximately 690 completed phone interviews per version. Once IntelliQuest obtained the telephone respondents' email and post office addresses, we sent them a "thank you" letter and a two-dollar participation incentive. A quarter of the sample received a paper questionnaire along with the letter and incentive. The remaining three-fourths received a separate email advisory with a Web link and password to one of three randomly-assigned questionnaire Web sites. These sites were: (1) the vertical Web site, (2) the horizontal Web site, and (3) the modified horizontal Web site. Each respondent failing to respond received up to two additional mail or email follow-ups as appropriate.

Regardless of whether the questionnaire was Web-based or paper-based, the respondent had to supply an email address. When attempting to contact these respondents electronically, 18% of their email addresses turned out to be invalid. In order to ensure comparable samples, all recipients of the paper questionnaire were also sent an email to verify their email address. Those who failed such validation were removed from the respondent base so that all four groups were known to have valid email addresses.

**The Web-Based Questionnaires**

The Web-based questionnaires were all programmed using SPSS's Quancept Web interviewing product. Only one order of title presentation was employed across all versions since there was no intention of comparing the audiences of individual titles. The publication order matched that used for the paper-based questionnaire. The three Web versions were as follows:


The horizontal version represents the closest possible visual representation of the paper-based media questionnaire. Respondents received the screening and three follow-up questions for each publication before going on to the same sequence for the next publication until all 94 publications were completed. As with the paper-based format, all publications were represented by a black-and-white logo with publication frequency shown prior to the screening question. Respondents had to provide a "yes" or "no" to the six-month screening question, and were expected to provide reading frequency and two qualitative evaluations (referred to collectively as "follow-up questions") for each publication screened-in. An example of the Web-based horizontal version (and, by proxy, its paper counterpart) appears in Figure 1.

Due to design considerations inherent to the Web modality, the horizontal Web version differed from the paper questionnaire in a few ways. First, only 7 publications appeared on screen at a time compared with the 21 shown on each page of the paper version. This formatting constraint stemmed from a limitation in some versions of America Online's Web browser. Second, the horizontal Web version did not allow inconsistent or incomplete responses as did the paper version. The Quancept Web surveying program does not currently allow respondents to continue to the next screen if a question remains unanswered on the previous one. This means that the follow-up questions could not be left blank, even in the instance where a respondent claimed not to have read the publication in the past six months.

Figure 1.  
THE HORIZONTAL WEB VERSION

**This section is about some of the publications that you, yourself, may read or look into. When answering whether you have read or looked into each of the publications, please include any issues you may have read at work, at home, at school or elsewhere, as well as those you happen to glance through. Beginning with the first publication in the list, please fill out the entire row of questions from left to right before moving to the next publication in the list.**

**If you do read a publication, answer "YES" to the first question. Please note, that if you do not answer every question on the screen, you will be returned to this screen with an error message. If you do not read a publication, answer "NO" to the first question and leave the rest of the questions as "NA".**

Publications	Frequency	Have you read or looked into any issue of this publication in the past six months?	How many issues (of the publications listed below) do you usually read or look into out of every four that are published? [Click on the appropriate answer]	How closely do you read or examine the advertising for computer hardware, software, and communications related products and services in this publication? [Click on the appropriate answer: 1=not at all closely 2=Somewhat closely 3=very closely 4=extremely closely.]	What percentage of the pages do you usually look at or read in the course of your reading a typical issue? [Click on the appropriate answer: 1=just a few 2=about 25% 3=about 50% 4=about 75% 5=all or most.]
	Monthly	<input type="radio"/> Yes <input type="radio"/> No	<input type="radio"/> Less than one <input type="radio"/> One <input type="radio"/> Two <input type="radio"/> Three <input type="radio"/> Four <input checked="" type="radio"/> NA	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input checked="" type="radio"/> NA	<input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input checked="" type="radio"/> NA

To reduce the respondent's burden but still provide complete responses, the horizontal Web version included an "NA" (not applicable) category at the end of each follow-up question. The "NA" button was the default selection for each question, meaning that the respondent did not have to actively select that response for all non-screened publications. The programming did not permit the respondent to go to the next set of publications unless all questions were answered completely and consistently for the ones previous.

**The modified horizontal version** was identical to the horizontal version except that it assumed an answer of "no" for the six-month screen. This allowed respondents to move past publications they had not read in the last six months, similar to the way respondents typically fill out paper questionnaires. As in the Web-based horizontal version, only seven publications appeared on each screen.

**The vertical version** differed most from the original paper-based horizontal format and maximized our ability to enforce skip patterns on the Web. Respondents were first subjected to a six-month screen using only black-and-white logo reproductions. After all 94 publications were screened, respondents received follow-up questions (frequency of reading and the two qualitative questions) for only those titles screened-in. It was assumed that hiding the presence of follow-up questions on the Web would lead to higher average screen-ins similar to the findings of Appel and Pinnell (1995) using a disk-based format and Bain, et al (1997) using Computer-Assisted Self-Interviewing.

For the vertical version, each respondent was asked to indicate those publications they had read in the past six months. To indicate non-readership of all seven publications on a screen in a manner consistent with Quancept programming requirements, a "none of the above" option must have been selected. This appeared as a checkbox following the seventh publication, displayed in a horizontal format to facilitate maximum exposure on the average computer screen. The respondent must have selected at least one publication or the "none of the above" box to continue. An example of the vertical Web version appears in Figure 2.

Figure 2.  
THE VERTICAL WEB VERSION

**This section is about some of the publications that you, yourself, may read or look into. When answering whether you have read or looked into each of the publications, please include any issues you may have read at work, at home, at school or elsewhere, as well as those you happen to glance through.**

**Have you read or looked into any issue of these publications in the past six months?**  
[Check each publication read]

<input type="checkbox"/> <b>COMPUTER SHOPPER</b>	<input type="checkbox"/> <b>PC MAGAZINE</b>	<input type="checkbox"/> <b>Smart Computing</b>
<input type="checkbox"/> <b>HomeOffice Computing</b>	<input type="checkbox"/> <b>PCWEEK</b>	<input type="checkbox"/> None of the above
<input type="checkbox"/> <b>PCComputing</b>	<input type="checkbox"/> <b>PCWORLD</b>	

**Response Rates**

The response rates to the email solicitations and paper questionnaires are shown in Table 2, from which it can be seen that the paper-based questionnaire generated the highest response rate – 54.3%, or 376 respondents. The Web vertical questionnaire generated the next highest response rate (47.8%) and the two horizontal versions were statistically indistinguishable from one another in third place (37.4% and 39.7%).

Table 2.  
MAIL AND EMAIL RESPONSE RATES

VERSION	<u>Base</u>	<u>In-Tab</u>	<u>Percent</u>
Paper, Horizontal	693	376	54.3%*
Web, Horizontal	690	258	37.4%**
Web, Modified Horizontal	688	273	39.7%**
Web, Vertical	<u>689</u>	<u>329</u>	<u>47.8%*</u>
TOTAL (E)MAILED	2,760	1,236	44.8%

\* Significantly different from all other versions at the 95% confidence level

\*\* Significantly different from vertical Web and horizontal paper versions at the 95% confidence level

The fact that the vertical Web questionnaire generated higher response rates than either of the horizontal Web versions was not unexpected. Theoretically, the vertical Web format is superior to the two horizontal formats because the respondent has no way of knowing that there is a penalty to be paid for screening-in. The penalty appears after the screen-in questions in the form of follow-up questions to be answered.

Although we were aware of the impact this might have on readership estimates, we could not be sure to what degree it would translate to a response rate increase. One of the benefits of performing surveys on the Web is the ability to determine how many individuals started the questionnaire and where they dropped out. We now know that a vertical format has a significant advantage in terms of retaining respondents, although the vertical Web format’s response rate still falls short of that achieved by the horizontal paper format using the same incentive and number of contacts.

**Paper Editing Rules**

One of the primary disadvantages of a paper-and-pencil questionnaire is that respondents are allowed to provide incomplete or inconsistent information. This characteristic required a number of editing procedures be employed prior to tabulating the readership data. Given the greater control provided using online error prevention, none of these editing rules were applied to the three Web versions.

The first editing rule eliminated respondents who provided exaggerated readership claims. Any respondent identified as reading all or nearly all 94 publications was considered not to have returned a valid questionnaire, and removed from the base. In most cases, this behavior seemed indicative of confused respondents who provided reading frequencies for all publications regardless of whether or not they read them. This confusion only occurred with the paper format, as no Web respondents exhibited exaggerated readership claims. Nine paper questionnaires (in addition to the 376 reported in-tab) were excluded for this reason.

For each remaining respondent, the editing rules for the paper questionnaire allowed for three mutually-exclusive contingencies:

- 1) Any title left completely blank (i.e. no screening or follow-up information was provided) was considered not to be read by that respondent in the past six months. The screen-in response was set to "no" for that publication.
- 2) Any title whose screening question was either answered "no" or left blank but had an answer for the frequency question was re-categorized as having screened-in.
- 3) Any title which screened-in but did not have an answer to the frequency question had the answer to the frequency question ascribed. The ascription was done in such a way that the ascribed frequency distribution was the same as was the distribution actually reported by those individuals who completed the question for each title.

The extent of such editing is presented in Table 3, which may be read as follows: 376 respondents were supposed to answer questions about 94 publications resulting in a gross number of 35,344 questioning occasions ( $94 * 376 = 35,344$ ). On 3,115 occasions (8.8% of all possible occurrences) the respondent left a title's row on the questionnaire completely blank. In this instance, the respondent was assumed to be a non-reader with a reading frequency of zero out of four.

Table 3.  
NECESSARY PAPER EDITS

	Gross Number of Titles Edited (Number)	(% of 35,344)*	Edits per Respondent**
Blank rows set to non-screener	3,115	8.8%	8.3
Screener changed to "yes"	93	0.3%	0.2
Reading frequency ascribed	<u>115</u>	<u>0.3%</u>	<u>0.3</u>
TOTAL NECESSARY EDITS	3,323	9.4%	8.8

\* (94 titles)(376 respondents) = 35,344

\*\* Edits per respondent = total number of edits / 376

The right most column of Table 3 takes the number of editing occasions and divides them by the number of respondents returning a questionnaire (in this case 376) to produce the average number of edits per respondent. The average questionnaire contained completely blank rows for 8.3 titles. The second and third rows of Table 3 are interpreted the same way. When the rows are summed we see that 9.4% of the questioning occasions required some form of editing, or 8.8 edits per respondent on average.

### Readership Comparisons

The screen-in data generated by all four versions are shown in Table 4. These results indicate that, consistent with theory, the vertical Web version produced the highest mean screen-ins per respondent (12.2) and the modified horizontal Web version produced the lowest (7.9). The paper version and the modified horizontal Web version produced mean screen-in levels that were statistically indistinguishable from one another (8.6 vs. 7.9).

Table 4.  
AVERAGE NUMBER OF SCREEN-INS PER RESPONDENT

	Paper <u>Horizontal</u> (376)	Web <u>Horizontal</u> (258)	Web <u>Mod. Horiz.</u> (273)	Web <u>Vertical</u> (329)
(Base)				
Mean	8.6**	10.0*	7.9**	12.2*
Standard Deviation	6.8	7.5	6.5	7.4

\* Significantly different from all other versions at the 95% confidence level

\*\* Significantly different from horizontal Web and vertical Web versions at the 95% confidence level

The horizontal paper and modified horizontal Web questionnaires not only produced a similar number of screen-ins, but these readers look similar to one another in terms of reading frequency as well. Table 5 contains the distribution of reading frequency among all screen-ins. The base for these estimates is the total number of respondents multiplied by the average number of screen-ins per respondent (from Table 4).

Table 5.  
DISTRIBUTION OF READING FREQUENCY

FREQUENCY (Observations Base)	Paper <u>Horizontal</u> (3,213)	Web <u>Horizontal</u> (2,568)	Web <u>Mod. Horiz.</u> (2,168)	Web <u>Vertical</u> (4,023)
4 out of 4 issues	22.5%	17.8%	26.3%	16.4%
3 out of 4 issues	11.3%	9.1%	11.0%	8.7%
2 out of 4 issues	19.9%	21.3%	18.3%	18.0%
1 out of 4 issues	22.5%	25.5%	22.0%	24.1%
Less than 1 issue	23.8%	26.3%	22.4%	32.9%

The pattern of frequency responses follows an expected pattern. The vertical Web version – the version with the highest number of average screen-ins – produced the screen-ins with the lowest reading frequency. Conversely, the most frequent readers are those from the modified horizontal Web version, which also registered the fewest average screen-ins per respondent. The paper and modified horizontal Web versions have comparable reading frequency distributions which are congruent with their similar screen-in levels.

In order to produce average issue audience data, each respondent was assigned a probability of reading the average issue of each title using the following probabilities associated with each frequency claim:

<u>Frequency claim</u>	<u>Probability</u>
4 out of 4 issues	1.00
3 out of 4 issues	0.75
2 out of 4 issues	0.50
1 out of 4 issues	0.25
Less than one	0.10
Non-screeners	0.00

For each of the 94 publications, for each questionnaire version, these probabilities were summed and divided by the sample size to produce an estimated rating (or coverage percentage). The coverage percentages for each of the three Web-based versions were then indexed using the coverage percentage for the paper-based version as the base.

The vertical Web version – the version that produced the highest Web version response rate – produced ratings which, on average, were 49% higher than were the paper-based ratings. The horizontal and modified horizontal Web ratings were, on average, 38% and 22% higher than the horizontal paper version, respectively. Depending upon which Web version is employed, the Web estimates are between 22% and 49% larger than these provided by the horizontal paper version. These mean indices are shown in Table 6.

Table 6.  
MEAN AUDIENCE RATINGS INDEXED TO PAPER

	Paper <u>Horizontal</u> (94)	Web <u>Horizontal</u> (94)	Web <u>Mod. Horiz.</u> (94)	Web <u>Vertical</u> (94)
Mean index across titles	100*	138	122	149
Standard deviation	NA**	185	132	112

\* Index of 100 is based on an average coverage of 4.4% per magazine

\*\* All paper titles are indexed to 100, thus producing no variation in this estimate

If the 94 indices that comprise these means can be regarded as independent observations, they are all highly statistically significant (the t-ratios range from 12.8 to 7.2). The substantial elevation of indices across all three Web versions demonstrates that while aggregate differences in screen-ins and reading frequency may have been marginal, the impact on individual publications was distributed unevenly. Table 7 restates the indices shown in Table 6 within two divisions of publications grouped by audience coverage.

Table 7.  
MEAN AUDIENCE RATINGS INDEXED TO PAPER

	Paper <u>Horizontal</u>	Web <u>Horizontal</u>	Web <u>Mod. Horiz.</u>	Web <u>Vertical</u>
47 larger titles	100*	98	92	114
47 smaller titles	100**	179	152	186

\* Index of 100 is based on an average coverage of 7.3% per magazine

\*\* Index of 100 is based on an average coverage of 1.5% per magazine

Among the most widely read publications, the three Web versions produced estimates that were most comparable to those produced by the paper version, ranging from an 8% decline to a 14% increase on average. Readership levels were substantially higher among smaller publications. The horizontal Web version eventually produces the greatest overstatement among the smallest titles, explaining why its standard deviation is the highest of the three Web versions in Table 6.

Despite this general overstatement of smaller publications by the Web-based questionnaires, there is a strong relationship among audience levels produced by these three Web-based versions with the levels produced by the paper questionnaire now in use. Table 8 shows the product-moment correlation of the audience levels produced by the three Web versions with the audience levels produced by the paper horizontal version. All of the correlation estimates are uniformly very high, ranging from +.95 to +.97.

Table 8.  
CORRELATION OF AUDIENCE ESTIMATES

	Paper <u>Horizontal</u>	Web <u>Horizontal</u>	Web <u>Mod. Horiz.</u>	Web <u>Vertical</u>
Paper Horizontal	1.00			
Web Horizontal	.95	1.00		
Web Mod. Horiz.	.97	.97	1.00	
Web Vertical	.95	.95	.95	1.00

## Conclusion

We have just demonstrated that it is possible to develop magazine audience estimates using the Internet that generally correlate very well with the estimates produced using a standard paper questionnaire. Web administration of a media questionnaire offers numerous benefits, including interview standardization, controlled skip patterns, and consistent data entry. Since nearly 10% of all paper responses require some form of editing after the fact, the Web offers a substantial reduction in back-end processing and a potential increase in response accuracy.

Measuring magazine audiences over the Web, however, has two additional consequences. First, Web surveys result in a material reduction in response rates, both from the loss of respondents from invalid email addresses and an increased failure to complete the self-administered questionnaire. Further training of phone interviewers and greater exposure to email formats and standards among the general public will ameliorate the screening problem over time, but it is doubtful that it will ever be fully eliminated. As for responses to the Web and paper questionnaires, further experimentation with contact methods and incentives will need to be done to determine the intransigence of the disparity between the two modalities.

The second consequence concerns a material increase in average issue audience levels. In the present study the increase ranged from 49% for the vertical Web version – the most theoretically defensible format which also had the highest response rate of the three Web versions studied – to 22% for the modified horizontal Web version which permitted respondents to screen-in comparably to the paper version. These increases were largely exhibited among the publications with the lowest audience coverage estimates in all three Web versions.

Since all three Web versions shared the characteristic of only displaying 7 titles per screen rather than the 21 shown on each page of the paper questionnaire, perhaps asking respondents to focus on fewer titles increases audience estimates more so than any difference between vertical or horizontal approaches. To the extent that this is driven by space limitations of computer presentation (at least until 21" monitors are the norm), it seems unlikely that any Web-based approaches to readership estimation will completely overcome this. Further analysis into this issue should reveal more insight into the impact of Web formatting.

From this study, we have learned a great deal about moving a paper questionnaire to the Web. One of our most consistent and important findings was that it is virtually impossible to replicate a survey from one format to the other. Differences between paper and Web questionnaires can never truly be isolated to the modality itself, since numerous divergences dictated by each approach appear along the way to confound the issue. Since response patterns are affected by uncontrollable factors such as by

respondent familiarity with the Web medium (Jeavons, 1999), we must face the fact that Web and paper surveys will almost always produce different results, no matter how much care is taken to make the two appear similar. Thus the requirements to adopting the Web as a survey modality are thoroughly understanding all the forces that drive these differences and creating comfort and understanding among the industries that produce and use such data.

IntelliQuest has a six year history of supplying the computer industry with audience estimates which it accepts and with which it is comfortable. Any change in procedure that lowers response rates and substantially raises average issue audience levels among select publications runs the risk of harsh criticism while questioning the credibility of both sets of estimates. In the States we have a saying that goes: "If it ain't broke, don't fix it." In our opinion, we should heed that dictum ... for now. We say *for now* because we have another saying that goes: "If you build a better mousetrap, the world will beat a path to your door."

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