

# Impact of Shopping via Internet on Travel for Shopping Purposes

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## ABSTRACT

This paper presents an empirical study of the impact of shopping via the Internet on traditional shopping behavior. It applies a research framework that had been previously used in studies of computer mediated communications (that is, the integration of computer and telecommunications) to organize likely effects as one of three types of phenomenon ---substitution, add-on, or expansion. Our analysis uses data from a recent household travel surveys to examine whether Internet shopping reduces, increases, or has no effect on shopping trip making. We conclude that shopping via the Internet does not substitute for traditional shopping trips but in fact, may lead to increased trips for shopping purposes.

## INTRODUCTION

Current theories of travel suggest that people travel as derived demand; they travel to get from activity to activity. The locations at either end of a trip may be less important to the understanding of travel than the activities being performed at those locations (1). Information Technology (IT) has invaded all domains of our society: at work, at home, and in public places. Modern culture is profoundly technology-oriented (2). We expect that the increasing use of IT to carry out activities in the home, at work or in public spaces will impact people's travel behavior. IT enables people to do activities, which in theory involve travel such as work or shopping, without travel. The logical consequence of this idea is that IT will increasingly become a substitute for trip making.

However, prior assessments of forecasts of the long-term implications of IT have shown that IT rarely leads to the logical consequences that are forecast (3). Reviews of the performance of forecasts over the last few decades suggest a frequent tendency to overestimate the degree and rate of IT application, and therefore, the effect (4). We are beginning to understand why. Social scientists have noted that the societal change process is extremely complicated: a host of social trends and technological innovations will interact to determine the applications of IT in everyday life. Some trends are unlikely to be influenced by new ways of life made possible by IT; others may be directly influenced by IT.

There is little doubt that rapid advances in modern telecommunication and computers are changing the way people carry out activities, but as research on prior technologies have indicated, the direction of change is unpredictable. While most of these products and services are not specifically designed to affect travel behavior, they do. The telephone, for instance, was not specifically designed to affect travel behavior, but it has. Murdock discussed how the telephone helped to support the maintenance of links with family and friends irrespective of distances enabling families to move farther apart (5). Miles, Bessant, et. al., also noted that the telephone may have displaced personal mail, but has encouraged greater mobility (4). People live further from their families and friends because they can maintain regular contact with them. There is reason to believe that new technologies will also have such unanticipated effects.

As Golob indicates, "Each person who shops at home on the Internet, or uses a handheld Internet device to gather information about the transportation system before embarking on a trip, might only change his or her overall pattern of travel behavior just a little." (6). Researchers not focused specifically on technology impacts on trip rates, for example, may overlook the consequences for a particular metropolitan region. Yet, the impact of such small changes on the region's transportation system could be significant.

Forecasting and/or assessing the impacts of IT on travel behavior is not new. Social scientists have examined the impacts of technologies such as the telephone, computer, television, teleconferencing, and videoconferencing. Such studies support the notion that predictions of impacts are difficult due to the fact that these are complicated social processes. Hiltz studied the substitution of telecommunications for travel in her 1984 book, *Online Communities* (7). She found that telecommunications did not significantly impact attendance at professional society meetings. Among her respondents, 80% reported “no effect”. Among those who perceived an effect, increases in travel were just as likely as decreases. Although in theory, the use of telecommunications should reduce travel, further research conducted by Hiltz found that the more time spent online, the larger the number people in one’s virtual community. This situation prompted rather than reduced, more personal meetings.

Nilles, as quoted in *The Network Nation*, estimated that as of 1970, 38 million information industry workers would be candidates for telecommuting to work. The exponential growth in the number of workers who would fall into this category suggested to him that the majority of all workers would soon be telecommuters (8). His prediction was that this would reduce the negative impacts of car travel on the environment. While current estimates of telecommuters vary from three to seven million depending on the source of the estimate, evidence indicates that telecommuting is in fact not impacting traffic conditions (9). While telecommuting is on the rise, so is the number of vehicle miles traveled. Reymers highlights Nille’s conclusion that the conventional wisdom that telecommunications could be a substitute for transportation was erroneous.

Thus, we know that recent innovations in telecommunications and computer technologies are changing the way in which people carry out their daily activities. In the two examples presented here, social scientists found that predicted substitution effects did not occur. However, we have only vague notions of the precise effects.

## Research Framework

In her research on Computer Mediated Communication (CMC), Hiltz identified three types of phenomena associated with the usage of CMC. This typology can prove very useful as a framework for research on travel-telecommunications interactions. Hiltz states that CMC effects can be categorized as one of three types:

1. Substitution – this takes place when CMC replaces an alternate method of communication, such as the telephone.
2. Add-on – This occurs when people keep their use of alternate communication methods constant and just use CMC as another method.
3. Expansion – This occurs as an extension of add-on when the use of CMC actually stimulates additional communication via alternate methods (7).

Table 1 indicates how this typology can be applied to the context of travel-telecommunications interactions. The typology implies that the use of telecommunications can have one of three effects on travel – reduced travel, no change in travel, or increased travel.

**Table 1**  
**Framework for Research on Travel-Telecommunications Interactions**

	<b>Substitution</b>	<b>Add-On</b>	<b>Expansion</b>
Travel	Reduced	Stays the Same	Increased
Telecommunications	Used	Used	Used

We applied this framework to the question of the impact of telecommunications no travel for shopping purposes. We are interested in whether people's use of the Internet for shopping either at work or home affects their shopping trip making.

Golob indicated that activity-based surveys are necessary for the study of telecommunications and travel interaction (5). He legitimately cites the concern that most household travel surveys collect little or no data on in-home activities primarily because the agencies that fund these surveys are generally not focused on telecommunications. In addition, the collection of in-home activities and telecommunications activities (in- and out-of-home) is judged too burdensome on respondents, which negatively impacts response rates and the overall cost of data collection. While not perfect, several recent household travel surveys that included questions on in- and out-of-home Internet use enabled us to conduct nascent examinations of the complex interactions that may occur between travel and telecommunications. These data were used for the analyses conducted for purposes of this paper.

### **Household Travel Survey Data Sources**

Data from a household travel survey of residents of Sacramento, California, are reported upon in this paper. Using a stratified and disproportionate random sampling technique, the sample elements were drawn in pre-determined disproportions to the overall population by geographic areas and/or household size and number of vehicles. The survey focused on weekday travel (Monday through Friday). The survey sample was allocated evenly across the days of the week; within a narrow range (2 percentage points); each day (Monday to Friday) had 20% of the allocated sample.

The survey was executed in two stages. The first stage was a recruitment interview that included questions about household demographics, household member demographics, and household vehicle information. The second stage was a one-day travel diary in which each household member recorded where he/she went and what he/she did. Parents were asked to complete diaries for children under age 12. The diary followed a sequence of 1) place 2) activities, and 3) descriptive trip information.

The study area included six counties in the greater Sacramento, California region. This survey collected data on out-of-home and some in-home activities from a sample of 3,930 households and 9,132 persons. Internet use was captured in two ways. First, in the recruitment interview, each person in the household was asked if he/ she used the Internet at home, work, or school for shopping. Other Internet activities were captured that were not the subject of this paper. These other activities included banking, gathering information/doing research, communicating with friends or family and communicating with colleagues. In addition, the travel diary was designed to capture the following types of activities: Internet Use (in-home or out-of-home) and telecommunications (teleconferencing, video conferencing, etc.) instead of travel.

## Findings on Internet Use for Shopping

We designed our analysis to segment the persons comprising the household travel survey samples into Internet shoppers and non-Internet shoppers. With the Sacramento region data, this was done via the item in the recruitment questionnaire. Thirty-seven percent (37%) of the sample were Internet shoppers either at home or work/school. More persons reported using the Internet to shop at home (26%) than at work/school (11%). Twelve percent of persons indicated that they carried out Internet shopping *both* at home and work/school. The Internet shopping at home percentage was comparable to what we found in a continuous survey of U.S. households that NuStats is conducting for the U.S. Postal Service. In fall 1999, 23% of U.S. households reported that they had made at least one online purchase in the preceding 12 months. In winter 2000, which included the three weeks prior to Christmas, this percentage increased to 28%.

For those of us interested in the impact of Internet shopping on trip rates, it is important to understand who Internet shoppers are as much as how many of them there are. Because many of the statistics about Internet shoppers are provided by *e-Commerce* “insiders”, it is sometimes difficult to get a statistically reliable, consistent profile of Internet shoppers. In January 2000, ACNielsen conducted a survey of 40,000 individuals ages 12 or older in U.S. households. The results indicate that Internet users are most likely to be male and between the ages of 25 and 44. A May 2000 *Parade Magazine* survey found the average age of Internet shoppers was 42, and that some 55 percent of shoppers were male. Both this survey and the ACNielsen survey showed that the gender gap is narrowing at a rapid rate.

The ACNielsen study also found that males between the ages of 25 and 34 tend to be heavy Internet users, while women and younger respondents were light users. Most Internet users log on from home. The first thing most Internet users get on-line for is email; general web surfing and product/service research were second. Purchasing a product or service was a distant third. The stated rationale for buying online runs the gamut from savings to ease of use and convenience. The *Parade Magazine* survey cited a variety of reasons for shopping online, including the ability to shop during off-hours, saving time, avoiding trips to the store, being able to buy from non-local merchants, better prices, and easier comparison shopping.

In December 1999, Scarborough Research released a study that found E-shoppers view convenience and time management as key elements in their active lifestyles. The study also found that the majority of E-shoppers were male, college educated and employed in white-collar positions. According to this study, E-shoppers lead an active, “on the go” lifestyle.

These findings from various research providers are comparable to the demographics of Internet shoppers as found in the Sacramento Household Travel Survey.

**Table 2**  
**Total Person Trip Rates by Household Income**

<b>Income Category</b>	<b>Internet Shopper</b>	<b>Non-Internet Shopper</b>	<b>Total</b>
Less than \$25,000*	5.6%	18.7%	17.1%
\$25,000 to \$49,999*	19.8%	31.3%	29.9%
\$50,000 to \$74,999*	43.0%	31.3%	32.7%
\$75,000 or more*	31.5%	18.7%	20.3%
<b>Age Category</b>			
Age 16 to 20	4.7%	6.1%	6.0%
Age 21 to 35*	19.9%	11.9%	12.8%
Age 36 to 65*	67.2%	42.4%	45.4%
Age Over 65*	5.9%	21.5%	19.6%
<b>Gender Category</b>			
Male*	54.3%	48.4%	49.1%
Female*	45.7%	51.6%	50.9%

### Findings on Trips rates of Internet shoppers

Internet shoppers were found to have higher trip rates than non-Internet shoppers.

**Table 3**  
**Total Person Trip Rates – Sacramento Household Travel Survey**

Internet Shopper	Non-Internet Shopper	Total
4.47	3.62	3.72

Table 4 indicates that income is positively related to trip rates, as are age and gender.

**Table 4**  
**Total Person Trip Rates – Sacramento Household Travel Survey and 1995 NPTS**  
**by Household Income, Age, and Gender**

<b>Income Category</b>	<b>Sacramento Data</b>	<b>NPTS Data</b>
Less than \$25,000*	2.93	
\$25,000 to \$49,999*	3.60	
\$50,000 to \$74,999*	3.96	
\$75,000 or more*	4.33	
<b>Age Category</b>		
Age 16 to 20	3.77	
Age 21 to 35*	3.85	
Age 36 to 65*	4.21	
Age Over 65*	3.01	
<b>Gender Category</b>		
Male*	3.67	
Female*	3.77	
Total*	3.72	

When we look at tables 5 and 6, we find that even within the categories of high trip makers, such as persons with annual household income of \$75,000 or more, Internet shoppers make more trips than non-Internet shoppers.

**Table 5**  
**Total Person Trip Rates by Household Income, Age, and Gender**

<b>Income Category</b>	<b>Internet Shopper</b>	<b>Non-Internet Shopper</b>	<b>Total</b>
Less than \$25,000*	4.10	2.88	2.93
\$25,000 to \$49,999*	4.42	3.53	3.60
\$50,000 to \$74,999*	4.43	3.87	3.96
\$75,000 or more*	4.68	4.24	4.33

<b>Age Category</b>			
Age 16 to 20	3.90	3.76	3.77
Age 21 to 35*	4.20	3.77	3.85
Age 36 to 65*	4.59	4.13	4.21
Age Over 65*	4.64	2.95	3.01
<b>Gender Category</b>			
Male*	4.29	3.57	3.67
Female*	4.70	3.66	3.77
Total*	4.47	3.62	3.72

**Table 6**  
**Shopping Trip Rates by Household Income, Age, and Gender**

<b>Income Category</b>	<b>Internet Shopper</b>	<b>Non-Internet Shopper</b>	<b>Total</b>
Less than \$25,000*	.41	.40	.40
\$25,000 to \$49,999*	.58	.46	.47
\$50,000 to \$74,999*	.49	.41	.42
\$75,000 or more*	.63	.41	.45
<b>Age Category</b>			
Age 16 to 20	.27	.21	.21
Age 21 to 35*	.48	.34	.36
Age 36 to 65*	.60	.50	.52
Age Over 65*	.58	.55	.55
<b>Gender Category</b>			
Male*	.43	.38	.39
Female*	.69	.47	.49
Total*	.55	.42	.44

## Discussion of Results

The typology presented earlier in this paper indicated that the use of telecommunications could have one of three effects on travel – reduced travel, increased travel, or no change in travel. Based on our analysis, there is no evidence of reduced travel or trip substitution. We appreciate the fact that to accurately measure an “effect” on behavior, longitudinal data are more robust than cross-sectional data such as ours. However, the cross-sectional findings presented here indicate that Internet shoppers do not appear to make fewer shopping trips non-Internet shoppers, as one might expect.

When we examine the demographics of the persons who reported use of the Internet for shopping purposes, we found that they tended to be male, between the ages of 25 and 34, and reside in higher-income households. These are not typically the demographic segments that make the most trips for shopping purposes (10). This finding suggests that shopping via the Internet may lead to increased travel.

In fact, a recent Harris Interactive e-Commerce Pulse study indicated that during the fourth quarter of 1999, Internet users spent more than double shopping in retail stores, by phone, or by catalog what they spent online (*Wall Street Journal*, Monday, April 17, 2000). These data suggest that Internet “shopping” may in fact be “browsing” that enhances the volume of traditional shopping travel instead of reducing it.

The same *Wall Street Journal* article reported on a recent McKinsey study, which concluded that a vast majority of people with Internet access barely goes on line at all. Only 8% of online users were “aficionados,” who lavished many hours on the Web. The study found that the single largest group of online users was still struggling to figure out what the Internet would do for them. This implication might be important in future studies of the interactions between travel and telecommunications. When Hiltz used the research framework reported in this paper to study the effect of CMC on telephone usage, she observed, “Whether substitution, add-on, or expansion phenomenon are observed will vary with amount of system use” (7). She found that there was generally an “add-on” effect, but as system use increased, the “substitution” effect became more prominent.

## Conclusion

This paper develops the hypothesis that shopping via the Internet does not substitute for traditional shopping trips but in fact, may lead to increased trips for shopping purposes. Whether shopping via the Internet leads to “add-on” or “expansion” effects is difficult to ascertain without longitudinal data. Our data are insufficient to support a conclusion regarding the long-term effect that shopping via the Internet will have on shopping trip making. Not only is the experience of shopping via the Internet an infrequent one (and therefore difficult to capture in a one-day travel diary), but also the technology architecture is still changing. As the retail e-Commerce marketplace coalesces, we will have the opportunity to leverage the understanding gained by continuing studies of this phenomenon.

This paper also introduces and uses a research framework borrowed from social studies of technology to focus investigations of the effects of telecommunications on travel behavior. We feel that this framework has merit for travel behavior researchers who are interested in the interaction between travel and telecommunications. Repeated studies of the effects of telecommunications on travel with outcomes organized as substitution, add-on, or expansion might build a sufficient body of evidence to draw credible conclusions and to make accurate forecasts.

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