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INFORMATION TECHNOLOGY AND FUNCTIONAL TIME DISPLACEMENT

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ABSTRACT

(Data Available)

According to the "functional equivalence" argument that has been applied to the diffusion of earlier communication technologies, one should expect decreases in daily activities that perform the same functions as the Internet. An effective, comprehensive method for testing which activities seem most affected by the Internet is through 24-hour time-diary studies, in which all daily activity is recorded.

When one compares the time diaries of Internet users and nonusers in a combined 1998–2001 national telephone diary study, one finds consistent declines in TV use and sleep times among Internet users, but no consistent declines in reading or other activities. This finding suggests some ways that the Internet may affect some communication activities more than others. This lack of strong changes is a rather different pattern from what seems to have been the case for television, as predicted by the functional-equivalence hypothesis.

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This article examines the various ways in which new IT technologies seem to have affected peoples' use of daily time. It examines these differences in the context of the "functional equivalence" hypothesis, as it has been used to explain the previous influence of television, which appears to have affected other mass media, social life and other ways of spending time.

Earliest personal communication technologies, like simple conversation, evolved into more long-distance forms with the development of postal mail and the telephone as examples. More recently mass "broadcast" forms of communication began to emerge, first with the cinema and later the radio, but most prominently today in the form of television.

Exhibit 1 shows these contrasting formats in its two off-diagonal cells, in the chronological order of their initial diffusion prior to the Internet. The two-way, personal format appears in the upper-right cell of Exhibit 1, and the contrasting one-way, mass formats in the lower-left cell. Exhibit 1, then, shows that one-way communications have been primarily the province of "broadcast" media. Radio, television, newspapers and the like are broadcast to those people or groups of people who choose to receive them.

If one uses this four-fold typology to think about the Internet, what stands out is that the Internet can combine and meld the functions and features of both personal and mass forms of communication. When one turns to the question of how Internet use impacts daily activities and communication activities in particular, it becomes clear that as Internet usage becomes an end in itself, its displacement of alternative activities becomes more substantial.

THE FUNCTIONAL-EQUIVALENCE ARGUMENT

As implied in Exhibit 1, IT did not arrive in a social vacuum. The most prominent and accepted framework in which to describe and understand how the technologies that preceded IT played a role in changing communication and other behavior patterns is called *functional equivalence.* According to the functional equivalence argument, a new technology will replace those activities that most closely perform the same functions for users as the old technologies did.

When television first appeared in the U.S., it was immediately clear that it impacted other mass media that provided light entertainment. Thus, audiences abandoned their radio sets, movie theaters closed and magazines that featured the type of content now prevalent on television (such as the light fiction in *Collier's* and the *Saturday Evening Post*) ceased publication. The general

EXHIBIT 1: PRE-INTERNET COMMUNICATION MEDIA TYPOLOGY

	One-Way	Two-Way
Personal	Soliloquy Pager	Conversation Mail Telegraph Telephone
Mass	Books Journals Newspapers Movies Radio Television	Ham Radio Citizens' Band Radio

explanation offered for these effects was that television content now more efficiently performed functions that were equivalent to those being abandoned (Weiss 1969). Both Coffin (1954) and Bogart (1956) document how times spent on the movies, radio and print fiction were displaced by television (with Coffin's study being based on a pre-post panel design that is ideal for measuring social change). The focus on media, rather than social, activities was largely true of academic research into television's effects as well (Schramm, Lyle and Parker 1959).

When complete time-diary data covering all daily activity became available in the 1965 Multinational Time-Budget Research Project (Szalai 1972), it was clear that television's apparent impact extended well beyond these directly functionally equivalent activities. These first diary data were collected from more than 25,000 respondents in twelve countries in which the diffusion of television ranged from 28 percent to 95 percent (Bulgaria and the United States, respectively).

As shown in Exhibit 2 (reprinted from Robinson 1972), there were systematic differences in the daily activities of television owners vs. nonowners. These differences, replicated in almost each country, show major declines in the most functionally equivalent activities. Thus, radio listening was 60 percent lower, movie attendance 52 percent lower, book reading 41 percent lower and magazine reading 28 percent lower. In terms of the social lives of individuals and families, Exhibit 2 shows that time spent in out-of-home socializing among

EXHIBIT 2: DIFFERENCES IN ACTIVITIES OF TV OWNERS VS. NONOWNERS 1965 (IN MINUTES PER DAY, INTERNATIONAL DATA)

	TV Owners	Nonowners	Difference
Non-Free Time Activities			
1. Main job	254.2	253.2	1.0
2. Second job	3.7	4.1	-0.4
3. At Work other	10.6	10.8	-0.2
4. Travel to job	28.2	28.4	-0.2
Total Work			0.2
5. Cooking	55.0	56.7	-1.7
6. Home chores	57.9	58.1	-0.2
7. Laundry	27.9	32.9	-5.0*
8. Marketing	18.1	18.1	0.0
Total Housework			-6.9
9. Animal, garden	11.5	17.6	-6.1*
10. Shopping	7.7	6.4	1.3
11. Other house	19.1	20.8	-1.7
12. Child care	29.4	26.9	2.5
Total Household Care			-4.0
14. Personal care	55.0	59.5	-4.5*
15. Eating	84.7	84.6	0.1
16. Sleep	479.3	491.8	-12.5*
Total Personal Needs			-16.9
17. Personal travel	18.4	19.0	-0.6
18. Leisure travel	16.4	20.5	-4.1*
Total Non-Work Travel			-4.7
Free-Time Activities			
19. Study	15.7	18.1	-2.4
20. Religion	3.5	6.2	-2.7*
21. Organizations	5.3	3.6	1.7
Total Study and Participation			-3.4
22. Radio	5.2	13.2	-8.0*
23. TV (home)	86.5	7.3	79.2*
24. TV (away)	1.1	4.0	-2.9
25. Read paper	15.2	15.3	-0.1
26. Read magazine	3.9	5.4	-1.5*
27. Read books	8.3	14.1	-5.8*
28. Movies	3.1	6.5	-3.4*
Total Mass Media			57.7
29. Social (home)	14.6	11.7	2.9
30. Social (away)	22.4	33.9	-11.5*
31. Conversation	14.5	19.5	-5.0*
32. Active sports	2.4	2.6	-0.2
33. Outdoors	15.8	17.5	-1.7
34. Entertainment	3.9	3.9	0.0
35. Cultural events	1.0	1.1	-0.1
36. Resting	23.8	24.8	-1.0
37. Other leisure	16.7	21.9	-5.2*
Total Leisure			-21.8
Total Minutes per Day	1440.0	1440.0	0.0

television owners was lower by 33 percent and conversation in the home lower by 25 percent, with the combined 16+ minutes of lower amounts of social life in these two activities almost equaling the 19-minute decline in other mass-media use.

Perhaps surprisingly, Exhibit 2 shows that other free-time activities were not significantly different between television owners and nonowners. That fact further supports the functional-equivalence argument: the activities displaced are the ones to which the technology offers a functional equivalent. Other declines in grooming, laundry and pet/garden care are more difficult to defend from the functional-equivalence perspective, however. Because the differences in television use shown in Exhibit 2 are taken from single-time surveys, they can hardly be taken as causal evidence—although many are consistent with Coffin's (1954) panel results. The unanswered question remains whether these were pre-existing differences among purchasers that existed before their television was acquired. At the same time, the differences are consistent across countries with widely varying access to television—and widely differing broadcast philosophies about viewer choice of television programming.

At the same time, as many of the activity differences in these 1965 data do not fit under the functional-equivalence umbrella, many of the changes predicted by it are found. One should not be surprised, then, to find the present data on the Internet to have uneven predictive power.

PREVIOUS STUDIES OF INTERNET'S IMPACT ON MASS MEDIA AND OTHER ACTIVITY

Speculation in initial publications on the impact of the Internet has tended to focus on the two areas highlighted in Exhibit 1 and with greater differences in Exhibit 2: social life and personal communication on the one hand and mass communications on the other. Again, the content of communication in both types of channels can be seen to be possibly more effectively or attractively conveyed by the Internet, so that there are reasons to expect many of the same sorts of differences for the Internet as found in Exhibit 2 for television. Specifically, one should find declines in usage of mass media among Internet users.

Two widely publicized studies of early Internet impact report results consistent with that hypothesis of declining media use. Both Cole et al. (2001) and Nie and Erbring (2000; reprinted in this issue) conducted national studies with more than 2,000 respondents that suggest declines in TV viewing and other activities. An issue arises with the Nie-Erbring survey questions that required respondents to report retrospectively on the *changes* that had occurred in their lives, rather than simpler questions on the time spent on this or that activity. It is recognized that survey respondents find it difficult to act as objective psychologists in perceiving changes happening in their lives (Robinson and Godbey 1999). Indeed, most Nie-Erbring respondents reported that they could see no change in their media or other activities.

Studies that have used a less ambitious set of questions and research designs have produced more mixed results. The Pew Center for Public Opinion Research has been conducting national surveys related to IT since 1995, with periodic updates on certain questions on almost a monthly basis. The Center's most complete surveys were conducted in 1995 and 1998 with nearly 3,000 respondents in 1995 and nearly 4,000 respondents in 1998 (response rate information is unfortunately not provided for these surveys). One value of these data is that they ask intensive questions about media activity "yesterday," as well as their behavior over longer time periods.

Robinson and his colleagues (1997, 1999, 2000) have published several articles based on these Pew data, as well as on data about Internet users from the 1997 *Survey of Public Participation in the Arts* (SPPA). Based on the 1995 Pew data, Robinson et al. (1997) found that 1995 Internet and IT users were significantly *more* likely to use print media, radio newscasts and movies than non-users, and not significantly *less* likely to be television viewers of either entertainment or news content. These results were robust, remaining after statistical controls for gender, age, education, income, race and marital status were introduced to the analyses.

Moreover, these results were largely replicated by Robinson and Kestnbaum's (1999) analysis of the 1997 SPPA national data, which asked about weekly Internet use for hobbies or recreational uses, rather than about news media use. Again, the self-described general Internet users were significantly *more* likely to read books and literature and to use the media for arts content, even after control for other factors. They were also more likely to attend arts events and to participate in a wide variety of other free-time activities, such as attending sports events or movies, playing sports and doing home improvements. They were no more likely to do gardening or to watch less television.

In their examination of the more recent 1998 Pew data, Robinson et al. (2000) showed that the proportion of Internet users had grown in the interim, with somewhat different results. Print media use, while still greater among Internet users, was no longer significantly greater among Internet users. Television use was lower among users, but not statistically significant, after introducing multivariate controls. However, when only earlier Internet users (3+ years of use) in the 1998 survey were examined, the results were much the same as in 1995. That is, Internet users' use of print media was notably higher, consistent with the 1995 results. That meant that later adopters of the Internet were neither more nor less likely to use other news media than were nonusers.

Overall, then, these analyses provide little support for time displacement following the functional equivalence argument and the results in Exhibit 2. Internet users not only use news and other media less, but many of them use print media more, and they are more active in a wide variety of other more active free-time pursuits as well. Their television times tend to be lower, but not significantly so.

At the same time, these results are based on single-time surveys that have limited capacity to identify causal processes or to monitor dynamic relations between IT use and other activity, as the Coffin study did. Moreover, they provide no clue about what other activities are being replaced by the Internet. IT time must be replacing other activities not covered in these studies. Perhaps the ideal data source, then, is one that covers all daily activity. The 1998–2001 time-diary study described below has such a feature, although it too is a single survey that does not allow examination of the cross-time dynamics of activity displacement.

STUDY METHODOLOGY

The source of the time-use evidence in the present article is a comprehensive set of time-diary data, as reported by a 1998–2001 national probability survey of 1775 respondents aged 18 to 64 in the form of 24-hour recall time diaries. The first half of the survey was done in 1998–99 and the second half with a parallel but separate national 2000-2001 diary sample. Comparisons of the two data sets showed remarkably similar results across the two years, and that forms the basis for using the combined file in the analyses below.

In these 1998–2001 diary accounts, respondents provided complete accounts of what they did for the full twenty-four hours of a particular day. Respondents in these surveys describe exactly when they went to bed, when they got up and started a new day, and all the things they did until midnight of that day. In these accounts, the analyst can learn not only what people did, but also *where* people spent their day, *who* they were with and what *other activities* they were doing in addition to these activities. Because they represent complete accounts of daily activity, diary data collected from cross-section samples allow one to estimate how much societal time is spent on the complete range of human behavior—from work to free time, from travel to time spent at home.

FEATURES OF THE TIME DIARY AND A SAMPLE DIARY

The measurement logic behind the time-diary approach follows from that employed in the most extensive and well-known of diary studies—the Multinational Time Budget Study of Szalai (1972). In that study, roughly 2,000 respondents aged 18–64 in urban employed households from each of twelve different countries kept a diary account of a single day. The same diary procedures and activity codes were employed in each country in 1965. Respondents were chosen so that each day of the week was equivalently represented; in subsequent U.S. studies, all seasons of the year were covered as well.

Figure 5 in Robinson and Godbey (1999) and *Appendix A* (from Kestnbaum et al. 2002) shows how the diary was filled out by two (pre-Internet)

respondents. Here, it can be seen that the diary keepers may have had some recall difficulties in performing this task, but a diary report is fundamentally different from the task of making long-term time estimates. The diary keeper's task is to recall only a single day's activities in sequence. This reporting approach may be similar to the way the day was structured chronologically for the respondent and to the way most people store their activities in memory. Rather than having to consider a long time period, the respondent needs only focus attention on a single day (yesterday). Rather than working from some list of activities whose meanings vary from respondent to respondent, diary respondents simply describe in their own words the day's activities as recalled.

The diary procedure thus avoids most of the pitfalls of the alternative "time estimate" approach (Robinson and Godbey 1999). There are still problems of memory, as when respondents have trouble piecing together a particular period of the day. However, few diary accounts are beset by such structural reporting problems once underway. Automatic procedures were built into the diary-recording protocol that was implemented using Computer Assisted Telephone Interviewing (CATI) to ensure accurate reporting. Whenever respondents reported consecutive activities that involved different locations, they were reminded to connect them with a travel episode. Activity periods that last more than two hours automatically involved the probe, "Were you doing anything else during that time, or were you doing (activity) for the entire time?" Moreover, all periods across the day had to be accounted for so that the diary account totaled all 1440 minutes of the day (across the twenty-four hours).

As in earlier diary surveys, these largely open-ended diary reports were then coded with the basic activity-coding scheme developed for the 1965 Multinational Time Budget Research Project (as described in Szalai 1972). As outlined in Appendix B, the Szalai code first divides activities into non-free-time activities (codes 00–55) and free-time activities (codes 56–99). Non-free activities are further subdivided into paid work (00-09), family care (10-39), personal care (40-49) and education (50-54). Free-time activities are further subdivided under the five general headings of other education activities (55-59), organizational activity (60-69), social life (70-79), recreation (80-89) and communication (90-99).

Activity categories 56 (Internet use), 57 (computer games) and 58 (other computer use) were coded in minutes per day and then converted into hours per week, after ensuring that all days of the week were equally represented. In other words, the sampling units involved are in person-days rather than persons, since the latter were interviewed about only a single day's activities. The data are weighted by demographic variables to match 1998–2000 U.S. Census Bureau characteristics (e.g., gender, age, education, income and employment status).

Multivariate controls for demographic differences were introduced by using Multiple Classification Analysis or MCA (Andrews, Sonquist and Morgan 1973). In short, MCA provides differences in average values for each category of a predictor variable that make the statistical effects of other predictors equal.

Internet or IT use, the major independent measure, was operationalized in two different ways to capture both single-day and longer-term use. The *single-day* measure was developed from the time diary, defined by whether respondents explicitly mentioned Internet or IT usage as a primary activity at any time during the diary day. The *long-term* general Internet use measure was developed from responses to a questionnaire item asking how many hours per week respondents used the Internet. As shown in Table 1 below, 1,521 respondents did not report using the Internet or other IT in their diary, whereas 254 reported such usage "yesterday." In contrast, as shown in Table 2 below, 889 of these respondents said they had used the Internet in a typical week and 866 said they had not.

RESULTS

Comparison of the daily diary activities of IT users versus nonusers on that same day is shown in Table 1 for the "yesterday" diary users and, in Table 2, for general, long-term Internet users. Data are shown in extrapolated weekly hours that add to 168 hours per week in order to aid in interpretation. Statistically significant differences ($p < 0.05$) at the bivariate level were then subjected to MCA adjustment for the demographic control measures and the adjusted differences and adjusted correlations with IT time shown in the final columns (where significant).

Daily Differences: Turning first to "yesterday" comparisons for non-free time activities in Table 1, it can be seen in the top row that IT users did report 6.6 fewer hours worked outside the home than nonusers across the week after MCA adjustment (correlation = -.07). IT users' time on education, however, is some 2.3 hours *higher* on average, a difference that is also statistically significant and can be seen to offset about a third of that work deficit (correlation = +.08). After MCA adjustment, the work difference is statistically significant and thus does show IT users doing less paid work. This could be due to heavier IT users being interviewed on days off from work, or doing work at home on that day.

In terms of household work and family care, IT users spend about one half hour per week doing more housework than nonusers, but childcare and shopping differences are very small. None of these family-care differences are statistically significant.

One notable difference consistent with the differences in Table 1 for TV is that IT users sleep 4 fewer hours per week—or about one half hour per day. IT users' grooming time is also lower, significantly so after MCA adjustment at about an hour a week. Eating times are identical for the two groups.

TABLE 1: DIFFERENCES IN ACTIVITIES "YESTERDAY" BY IT USERS AND NONUSERS (IN EXTRAPOLATED HOURS PER WEEK)

	IT Users (n = 254)	Nonusers (n = 1521)	Bivariate Difference	After MCA	Correlation w/ IT use
NON-FREE TIME					
Work	26.2	31.8	-5.6*	-6.6*	-.07
Education	4.3	1.7	2.6	2.3*	.08
Housework	13.8	13.2	0.6	NS	
Child Care	4.2	4.3	-0.1	NS	
Shopping	3.6	3.5	0.1	NS	
Sleep	52.5	56.6	-4.1*	-3.0*	-.07
Eat	7.8	7.8	0.0	NS	
Groom	4.9	5.8	-0.9	-1.2*	-.05
FREE TIME					
Fitness/Sport	1.7	1.9	-0.2	NS	
Hobby	1.4	1.6	-0.2	NS	
TV	10.4	13.9	-3.5*	-2.5*	-.05
Radio	0.1	0.3	-0.2	NS	
Read	2.2	1.9	0.3	NS	
Events/Movie	0.9	1.1	-0.2	NS	
Think/Relax	1.0	1.6	-0.6*	-0.2NS	
Other	0.1	0.2	-0.01	NS	
Social Life	7.5	8.2	-0.7	NS	
IT Use	14.4	0.0	14.4*	12.8*	.60
Travel	10.1	11.3	-1.3	-1.8*	-.06

** Significant at .05 level*
NS Not Significant

What free-time differences, then, are found? Are there activities to which IT users devote less time—given their average 14.4 weekly extrapolated hours they spend with IT, as shown near the bottom of Table 1? As shown in Kestnbaum et al. (2002), the social activities engaged in by Internet users and nonusers take up about the same time. Indeed, hardly any differences exist among social activities (like religion, organizations, or attending social events), or other such free-time activities as fitness/sports, hobbies, and other media activities like radio, reading and movies (and other social events)—none of which are statistically significant. IT users report about one half hour less time relaxing and thinking, and about one hour less in traveling, both of which are significant, but not very time-consuming activities.

The free-time activity that *is* notably lower among IT users is TV time, 3.5 hours (about half an hour a day) before MCA adjustment, and 2.5 hours after taking the lower education, older age, and other demographic differences of nonusers into account. However, the main differences between users and nonusers, then, come from non-free time activities, like sleep and work, rather than from free-time activities. Put another way, perhaps because of their IT use, IT users have more free time, but they use less of it for TV (even if they stay home more).

Long-term Differences: Many similar patterns are found in the comparison of general Internet users and nonusers shown in Table 2. Here, many more of these comparisons are statistically significant. As found in Kestnbaum et al. (2002), social life is *higher* for Internet users, but by less than only an hour a week for all forms of socializing combined. In contrast to the uses of free time shown in Table 1, Table 2 shows that the free-time hours of users and nonusers are now very similar, largely because the IT-use differences are here less than 3 hours per week.

In terms of non-free-time activities, Table 2 shows that the paid work hour differences are again statistically significant *but in the opposite direction*—Internet users work 4 *more* hours than nonusers. In addition, they spend twice as much time in classes and related educational activity, although only half an hour more after MCA adjustment.

In contrast to Table 1, Table 2 shows Internet users report significantly less housework than nonusers (by more than 2 hours a week), but not significantly less time on other family care of shopping and caring for children. Consistent with Table 1, users again spend 2 hours less time sleeping and about 40 minutes less time grooming. The latter is offset by more eating and meal time (no difference being found in Table 1).

Table 2 reveals more significant differences for free-time activities than does Table 1. The largest difference, however, continues to be for TV—more than 4 hours less TV after MCA adjustment. Both Tables 1 and 2 show that users spend less time than nonusers thinking, relaxing and performing "other" free-time activities. To some extent, these deficits are offset by the significantly greater fitness/sport, reading and cinema-going times of Internet users.

In terms of overall mobility, long-term Internet users now travel significantly more than nonusers, even after MCA adjustment, but they travel *less* when examined on a daily basis, as shown in Table 1.

Thus, some eleven activity differences (shown in Table 2) between Internet users and nonusers are statistically significant after MCA adjustment compared to only seven in Table 1. The largest and most consistent differences that are shown in both tables are the Internet and IT users' lower figures for TV viewing, thinking/relaxing, sleeping and grooming, and their higher figures for adult education. In the diary-day comparisons, Internet users work and travel less than non-users, but in the long-run comparison they work and travel more.

TABLE 2: DIFFERENCES IN DAILY ACTIVITIES BY LONG-TERM INTERNET USERS AND NONUSERS (IN EXTRAPOLATED HOURS PER WEEK)

	Internet Users (n = 889)	Nonusers (n = 866)	Bivariate Difference	After MCA	Correlation w/Internet use
NON-FREE TIME					
Work	33.1	29.6	3.5*	4.0*	.06
Education	2.8	1.4	1.4*	0.5*	.02
Housework	11.5	14.8	-3.3*	-2.4*	-.08
Child care	4.3	4.4	-0.1	NS	
Shopping	3.7	3.3	0.4	NS	
Sleep	54.5	57.5	-3.1*	-2.1*	-.07
Eat	8.8	7.4	1.4*	-0.8*	-.06
Groom	5.5	5.9	-0.4*	0.7*	.05
FREE TIME					
Fitness/Sports	2.0	1.5	0.5*	0.3NS	
Hobby	1.3	1.8	-0.5*	0.4NS	
TV	11.5	15.2	-3.7*	-4.2*	-.08
Radio	0.2	0.2	0.0	NS	
Read	2.2	1.6	0.6*	0.7*	.07
Events/Movies	1.3	0.8	0.5	NS	
Think/Relax	0.9	2.1	-1.2*	-0.7*	-.07
Other	0.1	0.8	-0.7*	-0.5NS	
Social Life	8.5	7.9	0.6	NS	
IT Use	3.2	0.5	2.7*	2.5*	.16
Travel	11.9	10.5	1.4*	0.7*	.05

** Significant at .05 level*
NS Not Significant

In the long-run comparisons, Internet users spend significantly more time eating, doing sports/fitness activities, and reading, but less time in other activities.

Secondary Activities: Table 3 shows secondary activities in this data set, between nonusers and Internet users who are either "yesterday" users or "general" users. In general, the differences are either insignificant or inconsistent.

TABLE 3: IT USER VS. NONUSER DIFFERENCES IN SECONDARY ACTIVITIES (IN EXTRAPOLATED HOURS PER WEEK)

	Yesterday IT Use			General Internet Use		
	Nonusers (*n*=1521)	IT Users (*n*=254)	Difference	Nonusers (*n*=866)	Internet Users (*n*=888)	Difference
Secondary Activities						
Housework	2.3	2.7	+0.4	2.3	2.4	+0.1
Child care	2.3	2.2	0.1	2.5	2.1	-0.4
Eating	6.0	4.4	-1.6	5.7	5.7	0.0
Radio/stereo	9.5	10.3	0.8	10.3	9.4	-0.9
TV	5.1	5.8	0.7	5.1	5.6	+0.5
Reading	2.3	1.5	-0.8	2.7	2.6	-0.1
Relax/write	0.5	0.5	0.0	1.3	0.7	-0.6
Other	33.2	34.7	1.5	28.6	37.2	8.6
Total Secondary Activity	61.2	62.1	0.9	58.5	65.7	7.2

** Significant at the p<.05 level*

The largest difference is for secondary eating, which is an hour and a half lower among IT users; however, long-term there is no difference. A similar result is found for the lower reading times among IT users on the daily basis. Conversely, IT users report almost 10% more radio listening on a daily basis, but the reverse is found long-term.

The one consistent activity difference between Internet users and nonusers is that Internet users view 10% more TV as a secondary activity than do nonusers—both on a daily and a long-term basis. Internet users view 10% more TV as a secondary activity than do nonusers—both on a daily and a long-term basis. At the bottom of Table 3, total time on these secondary activities is summed, and it can be seen that IT users report more such multi-tasking, especially in the long-term comparisons.

SUMMARY AND CONCLUSIONS

In this analysis of recent differences between the daily diary activities of IT users and nonusers, several patterns are consistent with the 1965 comparisons between television owners and nonowners, in which TV owners reported notably lower use of prior media and lower sleep and grooming. The more active lifestyles of IT users are further suggested by their higher reporting of reading, and of all secondary activities, as well as their lower sleep time and time thinking and relaxing. Table 2 (but not Table 1) also suggests that Internet

users work longer hours and travel more, consistent with the "Newtonian model" of Robinson and Godbey (1999).

In terms of the historical and theoretical issues raised at the outset of this article, then, IT in its initial stages seems to mimic certain dramatic displacement effects found with television (and perhaps earlier media). Internet use seems to function both as a time displacer (one in which people do give up other activities to accommodate it) and as a "time enhancer" (as in the case of reading, which is consistently higher among Internet users in both this study and earlier articles). Indeed, Internet use may allow one to be more productive in use of time—such as enriching uses of old media, and replacing less active forms of free time and personal care with more active and interactive uses of time.

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APPENDIX A: SAMPLE OF COMPLETED TIME DIARY

Female, Cook, Age 40, Married with 2 children. Friday, December 3, 1965

What did you do?	Time Began	Time Ended	Where?	With Whom?	Doing Anything Else?
Watch TV	12:00	12:15	Home	—	No
Went after daughter at work	12:15	12:30	Transit	Daughter	No
Got ready for bed	12:30	12:50	Home	—	No
Sleep	12:50	4:00	Home	—	No
Got up—made lunches for husband and son and also breakfast	4:00	4:30	Home	—	No
Got ready for work	4:30	4:55	Transit	—	No
Left for work (car)	4:55	5:00	Transit	—	No
Work	5:00	8:00	Restaurant	Employees	No
Coffee break	8:00	8:15	Restaurant	Friend	Talked
Work	8:15	12:00	Restaurant	Employees	No
Ate lunch	12:00	12:15	Restaurant	Employees	Talked
Work	12:15	1:30	Restaurant	Employees	No
Off Work—drove home	1:30	1:35	Transit	—	No
Visited with neighbor	1:35	2:00	Yard	Neighbor	Talked
Cleaned house	2:00	5:15	House	—	Listened to radio
Went after daughter at school	5:15	5:45	Transit	Daughter	No
Took shower	5:45	6:00	Home	—	No
Made supper	6:00	7:15	Home	—	—
Took Daughter to school	6:25	7:00	Transit	Daughter	—
Served Meal	7:00	7:15	Home	Family	—
Ate supper	7:15	8:00	Home	Family	Talked
Did dishes	8:00	8:30	Home	Daughter	Talked
Washed clothes	8:30	9:00	Home	—	No
Sat down and watched TV	9:00	10:15	Home	Family	No
Went after daughter at work	10:15	10:30	Transit	Daughter	No
Got ready for bed	10:30	10:45	Home	—	No
Went to bed; sleep	10:45	12:00	Home	—	No

APPENDIX B: BASIC TWO-DIGIT ACTIVITY CODE

0-54 Nonfree-Time Activities

00-09 Paid Work
- 00 (Not Used)
- 01 Main job
- 02 Unemployment
- 03 Work travel
- 04 (Not Used)
- 05 Second job
- 06 (Not Used)
- 07 (Not Used)
- 08 Breaks
- 09 Travel/to-from work

10-19 Household Work
- 10 Food preparation
- 11 Meal cleanup
- 12 Cleaning house
- 13 Outdoor cleaning
- 14 Clothes care
- 15 Car repair
- 16 Other
- 17 Plant
- 18 Pet care
- 19 Other household

20-29 Child Care
- 20 Baby care
- 21 Child care
- 22 Helping/teaching
- 23 Talking/reading
- 24 Indoor playing
- 25 Outdoor playing
- 26 Medical care—child
- 27 Other child care
- 28 (Not Used)
- 29 Travel/child care

30-39 Obtaining Goods/Services
- 30 Everyday shopping
- 31 Durable/house shop
- 32 Personal services
- 33 Medical appts
- 34 Govt/financial services
- 35 Repair services
- 36 Other services
- 37 Other
- 38 Errands
- 39 Travel/goods, services

40-49 Personal Needs and Care
- 40 Washing, hygiene, etc.
- 41 Medical care
- 42 Help and care
- 43 Eating
- 44 Personal
- 45 Night sleep
- 46 (Not Used)
- 47 Dressing
- 48 Not Ascertained activity
- 49 Travel/personal care

50-59 Educational
- 50 Attend classes
- 51 Other classes
- 52 (Not used)
- 53 (Not Used)
- 54 Homework

55-99 Free-Time Activities
- 55 Library use
- 56 Internet use
- 57 Computer games
- 58 Other computer use
- 59 Travel/education

60-69 Organizational
- 60 Professional/union
- 61 Special interest
- 62 Political/civic
- 63 Volunteer helping
- 64 Religious groups
- 65 Religious practice
- 66 Fraternal
- 67 Child/youth/family
- 68 Other organizations
- 69 Travel/organizational

70-79 Entertainment/social
- 70 Sports events
- 71 Entertainment
- 72 Movies
- 73 Theater
- 74 Museums
- 75 Visiting
- 76 Parties
- 77 Bars/lounges
- 78 Other social
- 79 Travel/social

80-89 Recreation
- 80 Active sports
- 81 Outdoor
- 82 Exercise
- 83 Hobbies
- 84 Domestic crafts
- 85 Art
- 86 Music/drama/dance
- 87 Games
- 88 Computer use games
- 89 Travel/recreation

90-99 Communications
- 90 Radio
- 91 TV
- 92 Records/tape s
- 93 Read books
- 94 Magazines/etc.
- 95 Reading newspaper
- 96 Conversations
- 97 Writing
- 98 Think/relax
- 99 Travel/communication