WHERE DOES TIME SPENT ON THE INTERNET COME FROM?

TRACING THE INFLUENCE OF ICT USE ON DAILY ACTIVITIES

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Abstract

We explore from a time-use perspective how private use of computers and the Internet (ICTs) is transforming everyday life. Data from the Swedish 2010–2011 Time-Use Survey reflect a situation in which Internet use has spread widely and become routine for many. Using covariate analysis, we analyze differences in general time use between four groups of ICT users ranging from non-users to heavy users. The theoretical departure point is a nuanced discussion of the time-displacement concept. Results indicate that private time spent using ICTs is associated primarily with individuals' available free time, i.e., is elastic relative to time for paid work (i.e., contracted time). Heavy ICT users spend more time on activities carried out alone, are more home centred, and less mobile. Heavy use is associated with somewhat less *committed time* spent, for example, on maintenance work or taking care of children. Regarding *personal time*, time for meals is negatively related to heavy use, while night-time sleep is unaffected. Concerning *free time*, heavy use takes time from *sports and outdoor recreation*, but has no effect on off-line *media use*, *entertainment and cultural activities*, or *reading*. Heavy use does not affect time spent on *social activities*, for example, for social interaction with family and friends or time spent on voluntary associations. Observed differences become significant at certain thresholds of ICT-related time use, involving heavy users who spend one hour or more on computers and the Internet every day.

Where does time spent on the Internet come from? Tracing the influence of ICT use on daily activities

1. Introduction

People are spending an increasing amount of time using information and communications technologies (ICTs). For example, in Sweden, Internet users report spending an average of thirteen hours per week online at home, work or school use excluded.[1] This potentially transforms their daily activity patterns and social life with consequences for individual welfare, society, and the environment (e.g., Wajcman, 2015; Wellman & Haythornthwaite, 2002). A crucial issue concerns what people did before the Internet consumed so much of their time. In other words, where has the time spent using ICTs come from? This seemingly simple question becomes more complicated when one considers that Internet use is far from a homogenous or isolated activity. It is relational and often serves as a vehicle for individuals to achieve a variety of goals: seeking information, socializing, playing games, working, buying things, obtaining services, reading books, watching TV, seeking distraction, etc. Many such activities, for example, banking, listening to music, and reading newspapers, were obviously also performed before the Internet began to take up our time, but always used to be done offline as opposed to online. While the goals of these activities remain largely the same, the medium of execution has changed. A more precise question concerns what happens to daily activity patterns offline when people increasingly spend their time online. A closely related question, recognizing the space-transcending and communicative power of the ICTs, concerns what happens to the use of space, place, and social relations in terms of where and with whom time is spent.

In this paper we explore the complex relationships between ICT use and other daily activities. By ICT use we then denote Internet use and other computer use. We use data from a recent Swedish survey of people's daily use of time for various purposes. The

[1] This approximate usage figure is derived from the World Internet Project survey 'Swedes and the Internet' (Findahl and Davidsson 2015) using telephone interviews including the question: 'How many hours and/or minutes per week do you usually use the Internet in the home?' The figure is not based on the comprehensive time-use diary data that constitute the empirical basis of this paper.

survey was conducted in 2010–2011 and therefore, unlike most previous research in the field, captures conditions at a time when daily ICT use had already spread widely and become a mainstream routine among most people. The explicit aim of the paper is to explore how time spent on daily activities differs between various groups of ICT users – ranging from non-users to light, medium, and heavy users – and thereby to indicate the transformative capacity of ICT use in daily life. Furthermore, we highlight differences between these groups in time spent at home, on the move, and alone, aspects that might have wider socio-spatial and environmental implications. Starting from the established time-displacement perspective (see, e.g., De Waal & Schoenbach, 2010; Gershuny, 2003; Robinson, 2011a; Robinson et al., 2002), we frame the analysis within a nuanced discussion of how observable differences (or similarities) can be interpreted from a theoretical perspective.

The study contributes to previous time-use research by examining the heterogeneity of Internet use implications, comparing different groups defined by their actual time spent using ICTs. Unlike earlier studies, which generally examine the initial phases of digitalization, we employ data capturing conditions at a time when Internet time use had already taken off. A substantial fraction of the population now uses ICTs to a large extent (i.e., hours a day), enabling us to go beyond the simple user/non-user binary and consider the full range of activities performed during the day by different types of users. Furthermore, we contribute to the literature by examining particular socio-spatial characteristics of time use regarding the dimensions of home centeredness, mobility, and sociality.

2. Literature review and theoretical concern

Previous research into ICTs and the changing use of time in everyday life often takes the concept of time displacement as a theoretical point of departure (Gershuny, 2003; Nie, 2001; Robinson, 2011a). Time displacement refers to the assumption that time spent on a new activity (e.g., computer use) must be taken from time spent on existing activities, which consequently are reduced or replaced. The perspective assumes that time use is a zero-sum phenomenon in that activities compete within a limited, 24-hour

time budget. Accordingly, an increasing amount of time spent online necessarily displaces time spent on traditional offline activities. Comparison is often made to the implications of the spread of television watching, which took time not only from closely related (i.e., functionally equivalent) activities such as reading, radio listening, and going to the cinema, but also from less similar activities such as socializing, housework (e.g., clothes washing and grooming), and sleep (for overviews, see Robinson & Martin, 2006; Robinson, 2011b). Similarly, some time-use studies have examined the time-displacement effects of Internet use, often focusing on its implications for activities considered functionally equivalent, such as media use (e.g., watching television, reading newspapers, and listening to radio) and social activities (e.g., face-to-face social time). These studies were often motivated by assumptions and fears about the serious second-order consequences of displacement, for example, concerning social isolation, decreased social contact, reduced well-being, and diminished social capital (Hampton & Ling, 2013; Putnam, 2000; Wang & Wellman, 2010). Another assumption was that replacing traditional media with Internet-based media encouraged 'egocentric' news seeking in which people only seek information that supports their current values, interests, and preconceptions (De Waal & Schoenbach, 2010).

What is known about the direct time-displacement effects of increased ICT use in daily life? Early studies suggested that ICT use negatively affected social life and mass media use (Cole & Robinson, 2002; Kraut et al., 1998; Nie 2001; Nie & Erbring, 2002; Nie & Hillygus, 2002). Results suggested less time spent both socializing and on other social activities offline as well as less time spent watching television, when initial Internet users were compared with non-users. However, several studies have since reported contrasting findings indicating hardly any differences between ICT users and non-users (Gershuny, 2003; Hampton, 2007; Kestnbaum et al., 2002; Kraut et al., 2006; Robinson et al., 2002) or between frequent users and less frequent users (Robinson & Martin, 2009, 2010; Robinson, 2011a).

Most studies note one systematic difference, namely, that a high level of private ICT use is associated with less time spent in paid work. These main findings concerning the implications of ICT use for media use, social life, and work were recently corroborated in an overall exploration of 2003–2011 American Time-Use Survey data (Robinson &

Lee, 2014). That study also reported some weak (and uncontrolled) indications that night-time sleep, housework, and childcare were negatively correlated with increased time spent using ICTs, while, for example, shopping, reading, and music listening were positively correlated. Overall, however, previous research found that the time-use implications of Internet use have so far been minimal and not as revolutionary as initially expected at the turn of the century (Kraut et al., 2006; Robinson, 2011b; Robinson & Lee, 2014; Wang & Wellman, 2010). This is somewhat explained by the fact that the spread and level of ICT use were still comparatively limited when these studies were conducted, meaning that ICT use had not yet had the opportunity to displace time spent on other activities.

From a theoretical perspective, it is important to give the concept of time displacement a second thought. While the notion appears intuitively reasonable, it nevertheless entails uncertainties and limitations. This fact calls for more nuanced reflection on how to interpret the interactions and influences between ICT use and other activities of everyday life. The negative relationship, i.e., that time devoted to offline activity is reduced when ICT use increases, emphasized by the displacement perspective can be understood in at least three ways. First, as priorities change regarding what activities to engage in, less important, marginal activities and functionally similar activities that less effectively satisfy the same needs as do their online alternatives are crowded out by ICT use. Second, an online activity may entail that a related offline activity be performed in a more efficient, less time-consuming way. Third, the ratio between increased online and reduced offline time depends on overall shifts in the balances between contracted, committed, personal, and free time that occur at certain times in life. Besides such negative relationships, the relationship between online and offline activities can also be positive, for example, when Internet use encourages the spending of time on other activities. Needless to say, the relationship could also be nonexistent, when no direct association exists between ICT-based time use and other activities. These potential interactions are elaborated on below to frame our subsequent empirical study.

Negative relations – The displacement perspective often implies that Internet use, or online time, should be viewed as an activity in itself that crowds out time spent on existing offline activities. This can be understood as suggesting that Internet use

promotes a shift in the daily habits and priorities of people as regards how they want to spend their spare time. For example, this is the case when younger people would rather sit in front of their computers than engage in other leisure activities, such as watching television, reading, playing sports, going to the cinema, or meeting friends at a cafe. Such changes in daily time use for specific activities may also be associated with vital social and spatial shifts concerning with whom and where activities are undertaken. In particular, these changes concern the balance between time spent alone and time spent with other people, between time spent in and away from the home, and between sedentary time and time spent in motion (Vilhelmson & Thulin, 2008; Kwan, 2002). Changes in these relational dimensions of time use are in turn associated with more general discussions of how digitalization potentially transforms people's lifestyles, for example, enhancing individualization and fostering loneliness and social isolation, with potentially far-reaching consequences for people's well-being, health, and environment (see, e.g., Hampton & Ling, 2013; Wellman & Wang, 2010).

However, a negative relationship between ICT and offline time use can also be interpreted as reflecting an effort to conduct activities more effectively in daily life. People often adopt technology because it provides new and better ways to perform existing activities. This may have to do with saving time, money, or effort, or with performing activities in a more satisfactory manner. Earlier technology-related examples are when people replaced traditional means of transport (e.g., walking and cycling) with newer and faster ones (e.g., driving cars), or when the use of household appliances (e.g., dishwasher and washing machine) fully or partially replaced the time spent doing such activities manually (Robinson, 2011b). The efficiency argument also applies to digital technology, obviously when it is 'branded' as a tool for 'speeding up', 'saving time', and facilitating everyday life in general (as discussed by Wajcman, 2015). Internet-based alternatives such as online shopping, online banking, and instant messaging can potentially be used to increase efficiency and save time previously devoted to more traditional offline activities, such as in-store shopping, going to the bank, and meeting friends (Andreev et al., 2010; Mokhtarian & Tal, 2014).

Besides being associated with changes in priority and efficiency, increased Internet use may relate to overall changes in the regulation of the *available time* and available time

windows in a day (Vilhelmson & Thulin, 2008). As mentioned above, previous studies suggest a clear negative association between private Internet use and time spent in paid work (i.e., working hours) (Vilhelmson & Thulin, 2008; Robinson, 2010; Robinson & Lee, 2014). However, it is unreasonable to view this as the Internet crowding out working time, which is largely a form of contracted time use. The process is likely the reverse, with ICT use and online activities 'filling up' the time windows available when other more fixed and mandatory commitments of everyday life are fulfilled. This emphasizes that a narrow focus on one-directional displacement effects could be problematic, and that Internet usage in this case should likely be regarded as an *elastic activity*. Compared with many other activities, it can easily be adjusted – reduced or increased – depending on the current time window fluctuation. Another, more concrete example is when people use what is perceived as 'leftover time', 'waiting time', or 'empty moments' of the day to go online (Bittman et al., 2009; Mokhtarian, 2005). Studies also find that private Internet time use is relatively easy to reduce if life circumstances change and leisure time becomes more limited.

Positive relationships – There are also positive relationships between Internet use and various offline activities. Studies demonstrate, for example, that Internet users are often more socially active, both online and offline, than are non-users (Larsen et al., 2006; Shen & Williams, 2011; Shklovski et al., 2006; Tillema et al., 2010; Wang & Wellman, 2010). Internet use can accordingly be assumed to intensify contacts with others and even to strengthen social ties. Some media research finds that Internet users often spend more rather than less time using traditional media (e.g., De Waal & Schoenback, 2010), reinforcing the long-established 'the more, the more' hypothesis (Meyersohn, 1968). Generally, this has led to the overall hypothesis of augmentation, meaning that Internet use in certain ways supports and reinforces, rather than competes with and crowds out, offline activities. Other examples are when online social contact intensifies social networking and encourages face-to-face socializing and meeting (Wang & Wellman ,2010) or when the Internet is used for inspiration in relation to offline interests, for example, for obtaining updates about concerts, theatrical performances, and restaurants (Thulin & Vilhelmson, 2016; Mokhtarian & Tal, 2014; O'Reilly, 2006). The mixed findings of previous research, as well as the still-evolving relationships between online and offline activities, point to a sustained need to update and nuance the study of

everyday living and time use among different groups of ICT users. This includes the need to relate expanding Internet use to other potential shifts in people's daily activities, whether they are increasingly in-home or out-of-home, mobile or stationary, and performed alone or with others.

3. Data and methods

Data – Empirically, we use data from the Swedish Time-Use Survey (TA2010/11) carried out between 1 April 2010 and 31 March 2011 by Statistics Sweden. The sample was representative of all people 15–84 years old registered in Sweden at the time and included 7366 individuals. In all, 2998 people finally participated, for a response rate of 41%; the response rate was somewhat lower among younger respondents and single women with children.

In the survey, each person kept a time-use diary for two separate days: one weekday and one Saturday or Sunday, chosen in a random week during the year of measurement. This diary work was then followed up by a personal interview performed by professional interviewers from Statistics Sweden. In the diary, the day is divided into 10-minute periods. For each period, respondents were asked to describe in their own words what they were primarily doing. The information was then coded into 115 main activities typical of everyday life. The coded activities included tasks involving *private* computer and Internet use.[2] These activities – here referred to as private ICT use – constitute the departure point of this paper and enable an analysis of associated patterns and differences in overall time use.

Comparison groups – For the purpose of the study, we distinguish four groups of users in terms of how much time they spend privately on computers and the Internet every day. The classification derives from examining the actual distribution of ICT time use in the population during the two diary-keeping days (see Table 1): the group of *non-users* constitute 38% of the total population, while *light users*, *medium users*, and *heavy users*

[2] In the data and in this paper, ICT use denotes the following coded activities: private Internet use, such as information seeking, social communication (e.g., email, chatting, and blogging), and other computer use (e.g., games and video); computer programming and maintenance; and other unspecified uses. Notably, ICT use at work or at school was not included in the survey.

each constitute 20%. Light users spend nearly a quarter of an hour per day using ICTs, medium users nearly 40 minutes, and heavy users about two hours on average.

/TABLE 1 HERE/

Time use – In examining overall time use and its distribution between different types of everyday activity, we adopt to a time-use classification scheme originally developed by Ås (1978) and also used by, for example, Robinson & Godbey (1997). We discern five primary spheres of activity in everyday life: contracted time for paid work, time for housework and maintenance, personal time devoted to the self, time for organized studies, and free-time activities. In the analyses, we further aggregate activities according to characteristics other than activity content, as follows: whether activities were carried out in-home or out-of-home, on the move or in one place, and alone or with other people. Time use is examined by calculating mean durations of activities separately for each comparison group.

Control variables – Control variables include individual-level socio-demographic, economic, and geographic factors and access to ICT. Socio-demographic factors include gender (i.e., female or male), respondent age and family status (i.e., living with a partner or not and having children under 17 years old at home or not). Economic factors concern income and occupation (i.e., gainfully employed, studying, and other, including being retired). Living region is classified according to population density and distance to nearest city (so-called H-regions) and ICT access is measured in terms of whether one has an Internet connection at home.

Methods of analysis – We use cross tabulation for describing the characteristics of the ICT user groups and covariate analysis for comparing differences in time use. The latter is used for controlling the background factors when differences in time use between user groups are estimated.

4. Results

4.1 The characteristics of the comparison groups

A main observation is that the characteristics of the defined ICT user groups – i.e., light, medium, and heavy users – differ trend-wise, while the non-users largely resemble the total population, apart from being older and having less access to computers and the Internet. Among the *users*, increased levels of ICT use systematically involve higher proportions of men, younger people, childlessness, non-cohabitation, unemployment, and lower income earners, and a lower likelihood of living in rural areas or small towns. Internet and computer access, however, does not differ between these user groups and reaches almost 100%. These results are largely consistent with findings of earlier studies of the prevalence of digital gaps. However, compared with the results of earlier time-use studies (e.g., Vilhelmson & Thulin, 2008), they clearly indicate that ICT use has diffused into the larger population and is no longer a question of forerunner behaviour, indicated in our cross-sectional data by the fact that a significant fraction of the elderly are included among the heavy users. Overall, however, the actual divergences, for example, the fact that employed people are less likely to be heavy users, indicate the importance of taking background factors into account.

/ TABLE 2 HERE/

4.2 ICT and time use

Implications for activities

We then examine the relationship between private ICT use and overall time use by comparing the groups of non-, light, medium, and heavy users (Table 3). We assume that time use varies with various background factors, which are controlled for using covariate analysis. The results therefore indicate estimated time use.

Contracted time – Overall, heavy ICT use is associated with less contracted time use, which mainly represents gainful employment. This observation is in line with findings of previous research (e.g., Robinson, 2010). As discussed above, obviously, this is not likely a matter of prioritizing private ICT use at the expense of paid work; instead, heavy users generally have more free time available to spend on ICT-based activities. Still the difference remains, as indicated by the comparison presented in Table 3, where type of occupation (i.e., whether or not one is employed) is controlled for. This might be because the daily extent of work time is not controlled for, i.e., part-time work might be more common among heavy users. Furthermore, no differences are found between the groups in terms of time spent commuting.

Committed time – Concerning the sphere of committed time use, that is, for non-paid work and household obligations, we find few and quite small differences between the ICT user groups. Negative associations are found as regards time for childcare (also observed by Robinson, 2010) and household maintenance (e.g., construction and repairs). In most cases, however, there are no differences at all, for example, as regards time spent on housework (e.g., cooking and cleaning) and time spent shopping, countering expectations that on-line shopping would partly displace in-store shopping.

Personal time – As regards personal time, no differences are found in night-time sleep, the dominant activity of this sphere and often perceived as vulnerable to high levels of private ICT use, or in grooming, while the groups of heavy and medium ICT users tend to spend less time on meals than do others. High levels of ICT use, on the other hand, are associated with more time spent on studies, even when controlling for whether or not the respondent studies. This could be an example of mutual reinforcement (i.e., augmentation) between activities.

Free time – In the survey, private ICT use is systematically classified as belonging to the free-time sphere of daily activities. In reality, though, ICT use is sometimes linked to other spheres, for example, to committed time when shopping for groceries online. Partly as a consequence, large and significant differences between the groups (heavy and medium users in particular) are found in total time spent on free-time activities,

even when controlling for background factors, including occupational status. If ICT use is excluded from the total free-time sphere, these differences disappear. This mirrors the fact that total available free time largely frames and affects the time spent using ICTs, which to a lesser extent comes from the spheres of contracted, committed, and personal time.

To what extent do differences exist between the ICT user groups in terms of other types of free-time activities, such as outdoor activities, cultural activities, media use, and social life? Such activities are more under individual control and less fixed in time and space, and therefore could more easily adapt to ongoing changes in daily time use. A first observation is that heavy ICT users travel significantly less for free-time activities than do the other user groups. They also spend less time on sports and outdoor recreation. Taken together, this could mean that ICT use to some degree reduces time spent on physical, outdoor activity at a distance from the home – with potential consequences for health and wellbeing. However, a second observation is that most categories of free-time activities seem unaffected in terms of between-group differences. This concerns time spent on entertainment and culture, media use (e.g., TV, video, and radio), and reading newspapers and books. These types of activities are sometimes argued to be susceptible to time reductions due to their functional equivalency to similar ICT-based options, although previous research has yet to establish any firm evidence of this.

The vital sphere of social life and involvement is also sometimes seen as vulnerable to increased ICT use, for example, as regards work and engagement in voluntary associations, informal social meetings, and contact with family and friends. However, no effect was found at either an aggregate level or concerning specific activities such as visiting friends and family. Still, there is a slight tendency for heavy users to spend slightly less time talking (face-to-face) than do the other groups, indicating displacement. On the other hand, heavy users generally spend slightly more time using the phone than do non-users, indicating reinforcement.

The pattern of differences in time use appearing in Table 3 contains one important overall observation. With few exceptions, no significant differences are found between

light and medium ICT users. Displacement and other implications therefore mainly seem to be associated with heavy users, indicating some kind of threshold effect, in this case, when private ICT use amounts to one hour or more.

Socio-spatial implications

Time use can also be aggregated by attributes other than type of activity, in this case, where and with whom an activity is carried out. In Table 3, we further analyze time spent travelling for all purposes, time spent performing activities at home, and time spent performing activities alone. The background is recurrent hypotheses in scholarly literature and debate concerning the potential capacity of ICTs to replace physical transport, to reinforce the individual's home-centeredness, and to reinforce loneliness and social isolation.

Regarding the overall time spent on trips and travel during the day, no between-group differences were found with one important exception: heavy ICT users spend significantly less time travelling than do the others. This could indicate a threshold effect, that potential relationships and rearrangements, i.e., in terms of new priorities and increased efficiency often called substitution in the transportation literature, become evident only at a certain level. The same pattern was also found concerning home-based and solitary activities. Heavy users spend significantly more time at home and also perform more activities alone – including ICT use – than do the others. No such differences were found between the other three groups, whose members spend less than one hour per day using ICTs, indicating no effects of ICT use.

/ TABLE 3 HERE/

5. Discussion

This study explored from a time-use perspective how the private use of computers and the Internet actually transforms daily activity patterns. Starting from a standard displacement discourse, we assumed that everyday ICT time use has the power to

transform priorities and choices regarding offline activities (or the effectiveness of performing them) and consequently to reduce or increase the actual time spent on them. We further noted the risk of attributing low levels of time allocated to certain activities directly to ICT use, taking the existing negative relationship between paid work and ICT use as an obvious example. Paid work, representing a contracted and fixed use of time, puts exogenous constraints on the amount of free time available, and as such influences the time available for private ICT use rather than vice versa. We further intended to highlight implications not only for specific types of activities, but also for time spent at home, travelling, and alone, dimensions that might have wider socio-spatial and environmental implications.

A first conclusion of our study relates to the notion of ICT use as an elastic activity that simply 'fills up' available time in daily life and quite easily adapts – increasing or decreasing – depending on current needs and constraints. A main finding is that the total time spent using ICTs is largely associated with free-time availability, even when controlling for background factors, including whether individuals are working, studying, or retired. From a theoretical perspective, the notion of time-use elasticity emphasizes the importance of adopting a broader, bidirectional, and interactive understanding of the relationships between ICT use and alternative time uses. Indeed, this calls for more dynamic, preferably longitudinal, examinations and data, options not available in this study, which relied on cross-sectional data and between-group comparisons.

Second, from a detailed activity perspective, our findings support those of earlier studies suggesting that the temporal implications of Internet use are quite marginal (Robinson & Lee, 2014; Wang & Wellman, 2010). Between the groups of light and medium ICT users, involving nearly half of the Swedish population, we find few and very small significant differences in offline time use. However, in contrast to previous studies, we find one overarching divergence concerning the group defined here as heavy ICT users. These heavy users differ significantly from the other groups in terms of leisure time priorities and certain socio-spatial aspects of time use, indicating a *threshold effect*: the observed implications for offline activities become significant only at a specific level, in this study, for people who spend one hour or more (two hours on

average) using ICT daily. This finding supports the usefulness of going beyond a simple user/non-user binary and recognizing the heterogeneity of Internet use when seeking and exploring its implications for daily life. Closely associated is the need for future time-use research and data collection *not* to treat ICT use as a homogeneous activity. Rather, ICT use must be clearly linked to the detailed goals and content of use, for example, online social communication, information seeking, shopping, reading, and entertainment.

A third conclusion relates to what we consider the socio-spatial implications of ICT use. Previous research suggests that ICT, on one hand, could encourage spatially and socially introverted, isolated, and home-centred lifestyles and, on the other, could reinforce extroverted, hyper-social, and hyper-mobile ways of living (see, e.g., Thulin & Vilhelmson, 2012; Hampton, 2007; Shen & Williams, 2011; Shklovski et al., 2006; Wang & Wellman, 2010;). Our findings suggest that a high level of ICT use among the Swedish population relates more to the former, introverted lifestyles than to the latter. In general, we find indications of the displacement rather than reinforcement of out-of-home activities, travel activities, and time spent socializing face to face, specifically in the case of heavy ICT users. Heavy users to a greater degree than medium, light, or non-users prefer to spend time engaging in solitary activities. They are more home centred, spending significantly more time at home, and more stationary, being less often on the move. Whether this is due to self-selection mechanisms – heavy users might have stayed home even if the Internet or computers were not available – is difficult to assess due to the cross-sectional nature of our data, which limits the ability to address change and causation. Again, this calls for more process-oriented data and analyses of change. Nevertheless, our results find support in previous findings based on dynamic approaches, for example, regarding early adopters and substantial increasers of ICTs (among young people) made in the first years of the 2000s (Vilhelmson & Thulin, 2008).

Our fourth conclusion concerns observed differences in time used for specific activities in the spheres of daily living from which ICT-use time is taken. Apart from the structuring role of free time, there is a tendency towards slightly less *committed time*, for example, for maintenance work and childcare. As regards *personal time*, there is

also an indication of a slight influence, as time for meals is negatively related to ICT use, while there is no relationship in the case of night-time sleep (see, e.g., Robinson, 2010; Wallsten, 2011), as might have been expected. Concerning *free-time* activities other than ICT use, we find that time spent using ICTs to some extent is taken from time spent on *sports and outdoor recreation*. In addition, free-time travel decreases with increased ICT use, indicating that heavy users' recreational activities are largely performed locally or at home. As regards off-line *media use, entertainment and cultural activities*, and *reading* (e.g., books and newspapers), activities often perceived as having functionally equivalent Internet substitutes and therefore susceptible to influence from the Internet, we find no evidence of reduced time among heavy ICT compared with other ICT users or non-users. In addition, there were no signs of a positive relationship that would substantiate the long-established 'the more, the more' hypothesis. As regards *social life*, there are generally no indications of influence, evident in terms of changed time use, on informal social interactions with family and friends or on time spent on voluntary associations and activities. There are, however, indications that heavy users spend less time conversing face to face.

Conclusively, we find that the specific *time regime*, that is, the distribution of time between work and leisure, largely defines the level of actual ICT time use in the population. Within that frame or constraint, certain processes of activity redistribution gradually become evident in terms of differences in time use. Those differences become significant at a certain thresholds of ICT-related time use, here often involving heavy users who spend one hour or more (two hours on average) being virtually mobile.

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TABLES

Table 1 Classification of ICT users and non-users

Group	Time use interval, minutes	Observed number of people, *n*	Share	Mean minutes per average day	Median	St. dev.
Non-users	0	1150	38.4%	0	0	0
Light users	1–20	604	20.1%	13	15	5.469
Medium users	20–60	658	21.9%	38	35	10.113
Heavy users	60–620	586	19.5%	121	95	74.025
Total		2998	100.0%	35	15	55.925

Table 2 Characteristics of the comparison groups; percentage distribution *within* each group

		Non-users, *n* = 1150	Light users, *n* = 604	Medium users, *n* = 658	Heavy users, *n* = 586	Total, *n* = 2998	Sig.
Gender							0.000
	Women	55.4	62.6	58.1	42.0	54.8	
	Men	44.6	37.4	41.9	58.0	45.2	
Age							0.000
	<20 years	1.4	1.0	4.1	10.8	3.7	
	20–34 years	12.9	21.5	22.0	29.2	19.8	
	35–49 years	27.2	37.7	35.3	26.6	31.0	
	50–64 years	30.8	28.0	23.9	19.3	26.5	
	65–84 years	27.7	11.8	14.7	14.2	19.0	
Mean age (years)		53.4	46.5	45.7	41.5	48.0	0.000
Has a child							0.000
	No child <17 years at home	72.1	59.1	67.2	77.5	69.4	
	Has a child <17 years at home	27.9	40.9	32.8	22.5	30.6	
Has a partner							0.000
	Living alone	30.6	27.8	34.5	48.1	34.3	
	Cohabiting	69.4	72.2	65.5	51.9	65.7	
Occupation							0.000
	Employed	63.7	74.8	68.2	52.0	64.6	
	Student	2.6	6.1	9.3	20.0	8.2	
	Other (incl. retired)	33.7	19.0	22.5	28.0	27.2	
Annual income (mean, thousand SEK)		294	324	288	247	289	0.000
Living region							0.026
	Stockholm region	18.2	20.9	20.5	20.6	19.7	
	Göteborg and Malmö regions	15.9	16.7	14.7	14.7	15.6	
	Medium-sized city regions	35.0	34.6	37.8	42.5	37.0	
	Small city regions	17.3	15.4	16.7	13.1	16.0	
	Small towns/rural regions	6.0	6.6	4.9	5.1	5.7	
	Remote rural regions	7.7	5.8	5.3	3.9	6.0	
Internet connection at home	yes	79.7	98.0	97.7	99.1	91.1	0.000
Computer access at home	yes	82.4	99.0	98.9	99.2	92.7	0.000

Table 3 Estimated time use within the comparison groups, in minutes; covariate analysis based on estimated marginal means; controlling for region, gender, age, family status, children, socio-economic status, Internet access, and type of day.

	Non-users, *n* =1127	Light users, *n* = 596	Medium users, *n* = 651	Heavy users, *n* = 582	Differences between groups
	(1)	(2)	(3)	(4)	*F*-test, * $p < 0.05$
Activities					
Contracted time, total	311	311	299	254	1 > 4*, 2 > 4*, 3 > 4*
Paid work, excl. commuting	*280*	*281*	*269*	*227*	*1 > 4*, 2 > 4*, 3 > 4**
Commuting	31	30	30	27	-
Committed time, total	208	216	199	191	2 > 4*
Housework, total	*86*	*88*	*80*	*80*	-
Cooking	32	32	30	33	-
Cleaning	25	27	23	22	-
Maintenance work, total	*32*	*28*	*24*	*23*	*1 > 3**
Childcare, total	*25*	*26*	*22*	*17*	*1 > 4*, 2 > 4**
Care of others, total	*9*	*9*	*7*	*8*	-
Shopping (all sorts), total	*23*	*26*	*25*	*25*	-
Shopping, groceries	8	10	8	9	
Shopping, other	*5*	*7*	*8*	*7*	-
Travel, shopping	*16*	*17*	*22*	*18*	1 < 3*
Other housework	*7*	*11*	*9*	*10*	*1 < 2**
Personal time, total	609	594	597	589	1 > 4*
Night-time sleep	461	454	459	459	-
Grooming	52	54	52	50	-
Meals	*86*	*81*	*78*	*76*	*1 > 3,4**
Studies	24	29	25	38	-
Studies excl. travel	*20*	*24*	*21*	*33*	*1 < 3, 4*, 3 < 4**
Free time, total	280	283	314	363	1 < 3, 4*, 2 < 3, 4*, 3 < 4*
Free time, excl. ICT use	279	269	279	259	-
Free-time travel	*25*	*23*	*23*	*14*	*1 > 4*, 2 > 4*, 3 > 4**
Sports and outdoor recreation	*34*	*34*	*35*	*26*	*3 > 4**
Volunteer work	*3*	*4*	*7*	*5*	-
Entertainment and culture	*3*	*3*	*3*	*3*	-
Social activities	*44*	*46*	*47*	*39*	-
Visiting friends	5	4	5	4	-
Conversations	17	17	17	10	1 > 4*, 2 > 4*, 3 > 4*
Phone calls	7	10	10	12	1 < 2, 3, 4*
TV, video, and radio, total	*112*	*105*	*108*	*112*	-
Reading, total	*26*	*26*	*27*	*31*	-
Newspaper	10	9	10	10	-
Books	11	11	11	15	-
Hobbies (excl. private ICT use)	10	10	11	12	-
Other free time	*22*	*17*	*17*	*17*	-
ICT use, private, total	2	14	35	104	1 < 2, 3, 4*, 2 < 3, 4*, 3 < 4*
Time at home, on travel and alone					
Time at home, total	848	864	887	965	1 < 4*, 2 < 4*, 3 < 4*
Travel time, total	87	87	90	74	1 > 4*, 2 > 4*, 3 > 4*
Time alone, total	390	393	398	454	1 < 4*, 2 < 4*, 3 < 4*