Have mobile devices changed working patterns in the 21st century?

A time-diary analysis of work extension in the UK

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Abstract

It is commonly claimed that ubiquitous connectivity erodes the boundaries that once separated work from other aspects of life. Mobile devices in particular enable people to perform work-related activities anytime anywhere. Surprisingly, however, we know little about how people nationwide organise their daily working time over a period that has witnessed rapid technological change. Using the United Kingdom Time-Use Surveys 2000 and 2015, covering this period of technological change, we studied work extension practices, and the links between work extension, total work hours, and subjective time pressure. We found a significant, though small, increase in work extension, and evidence that it was significantly associated with time pressure in 2015, but not in 2000. Additionally, work extension increased total work time, which was concentrated entirely in time working with a mobile device. We discuss our results in light of some taken-for-granted narratives about mobile devices allowing work to colonise life.

Keywords: Mobile devices, work extension, time pressure, work patterns, time use data

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Introduction: work without boundaries

The idea that digital technologies blur the boundaries between work and private life by extending work's reach has become commonplace. Beginning in the 1990s, the introduction of personal computers and mobile phones led to much speculation about telework and the general possibilities of taking work home (Felstead et al., 2005). Much has changed since then, particularly the rapid diffusion of mobile devices such as laptops, tablets, and smartphones, especially with the launch of the iPhone in the UK from 2007 onwards. Moreover, the once clunky modem connections have been replaced by seamless, ubiquitous connectivity. At the time of writing, two-thirds of UK adults already own a smartphone (Ofcom, 2015). The capacity of laptops, tablets and smartphones to operate regardless of location means that work can literally be performed at any time.

Social theories of time elaborate how time is socially variable and how temporal regimes greatly matter to people's lived experience of time (Adam, 1995). No wonder then that digital devices feature so prominently in theories about acceleration, time-space compression, time pressure, and mobility more generally (Castells, 2010; Hassan, 2009; Rosa, 2013; Urry, 2000). The widespread assumption is that digital devices are speeding up the pace of everyday life (Wajcman, 2015). This is said to be the result of constant connectivity, that a person with the device is always available, eroding the physical and temporal boundaries that once separated work from home and leisure.

We can distil from these debates two broad propositions linking information and

communication technologies (ICTs) to individuals' organisation of working time and experiences of subjective time pressure. The first is that ICTs have facilitated an increase in work extension practices. The second is that ICTs have strengthened links between work extension practices and subjective time pressure, directly by enhancing the capacity for workers to be always available, and perhaps indirectly by increasing overall working time. Yet although there is much speculation about both of these propositions, there is remarkably little empirical research on the way in which individuals organise their daily working time, and feelings of subjective time pressure, in recent decades of rapid technological change. This article investigates both these propositions using time use data collected in 2000 and 2015, thus spanning the period during which mobile devices became ubiquitous.

Work extension, subjective time pressure, and ICTs

In both academic and popular literature, controversies about the impact of ICTs on work practices centre on work extension. That our private time is being encroached upon by ubiquitous connectivity is widely regarded as driving the frantic pace of modern life. While the idea that the preoccupations of work can spill over into non-work life is familiar, the ease with which digital devices teleport work into spaces and times once reserved for personal life represent a qualitative shift in the dynamic. Many critics stress that, by allowing employers to contact their employees at all hours, mobile technologies encourage work problems to colonise the times and spaces once reserved for family life (Duxbury et al., 2014). Others, however, argue that by making place irrelevant, these devices also afford novel opportunities for flexible

working hours and for reconciling the increasingly complex temporal regimes of dual-earner families (Chesley, 2005; Rose, 2013; Wajcman et al., 2008).

Yet we know surprisingly little about how ICTs might be affecting the way in which individuals organise their daily work in the early twenty-first century. Most of the extant studies focus on managers and professionals (Mazmanian, 2013; Mazmanian et al., 2013; Moen et al., 2013; Perlow, 2012; Sturges, 2013). For example, Moen et al. (2013) studied a group of senior executives in two US firms. Their qualitative study articulates workers' narratives of working long hours, and where work bled into non-work times and places, which they refer to as 'work extensification'. They emphasise the stress caused by escalating work-time demands of high-status professional work and the 'erosion of boundaries confining work in space and time' (p. 84). The long-hours culture among managerial/professional employees is well established and reinforces the view that if people are working outside of normal working hours, they are not simply time shifting but rather adding to their work hours.

Moreover, and of direct relevance here, they assume, rather than examine, the link between work extension and the increasing use of ICTs. An early study finds that frequent cell phone use increased negative work-to-family spillover (Chesley, 2005). However, this study did not actually measure the temporal aspects of work extension that Moen et al. (2013: 106) above identify as key to the 'new normal of work in the 21st century', and the measure of cell phone use was limited to 'frequent' use. Building on this study, Bittman et al. (2009) used data from mobile phone logs together with time-diary data to test whether mobile phones are work extension technologies. In contrast to Chesley, their study found that mobile phone use outside

of working hours was not predominantly linked to work, and that work-related calls were largely restricted to normal working hours. Furthermore, the authors found only a single instance in their sample (of approximately 500 cases) where a mobile phone call in the evening interrupted a non-work activity and then precipitated an episode of work. In addition to questioning the link between mobile devices and work extension, Bittman et al. (2009) found no link between mobile devices and subjective time pressure.

To summarise, a rich body of qualitative research provides key insights into processes linking ICTs and work patterns, including work extension. However, this research focuses on tiny segments of the working population where these processes are arguably most pronounced. Quantitative survey-based studies are an improvement in this regard, but previous quantitative research analysed only limited, and inconsistent, measures of both work extension and ICT use. For example, Bittman et al. (2009) did not construct a measure of work extension, nor conduct any statistical analysis (bivariate or multivariate) of the link between mobile phone use and work extension. Moreover, research has not kept pace with technological developments in the decade up to 2015. The diffusion of smart phones and other mobile devices has been so dramatic in this period that it is imperative to update previous research to inform current debates.

Research focus

The rapid rate of the diffusion of mobile devices such as smartphones and tablets over the past decade is unprecedented. Prior to 2007 smartphones did not exist, whereas

today it would be difficult to find someone who did not own one. When assessing the impact of technology on any aspect of our daily lives, this unique circumstance raises an opportunity but also a challenge. The opportunity lies in the fact that we do not have to go very far back in time to when mobile devices did not exist. Therefore, we can examine change over time in some aspect of daily life, here work extension practices, before and after the widespread diffusion of mobile devices across society. Provided other factors that may be linked to processes underpinning work extension practices are controlled for, observed change in these practices, and change in links between these practices and subjective time pressure, may well be attributed to changes in access to and use of mobile devices as strongly suggested in previous research, and widely held in popular discourse.

The challenge lies in the fact that today the use of mobile devices has more or less reached saturation point. This means that it is futile, impossible in actuality, to compare workers who use mobile devices daily with those who are comparable in all salient respects, except with respect to their use of mobile devices. Therefore, it would be difficult for any analysis based on observational data relating to the contemporaneous use of mobile devices to identify a causal effect of this on some aspect of daily life. Besides, theoretical insights from science and technology studies (STS) caution against attributing a direct causal effect running from the adoption of a technology to changes in some specific aspect of daily life, according to its explicit design. Indeed, with respect to work extension practices in particular, STS would emphasise that digital technologies have become completely embedded in these practices and changed the very nature and content of what work is (Bailey and Leonardi, 2015; Orlikowski, 2007). The often contradictory effects of technology

shown in such previous research also augurs against any notion of a simple relationship between technology use and time pressure. At a minimum, however, it is important to attempt to gauge the extent to which mobile devices have become embedded in work extension practices today, and whether this is tied to feelings of subjective time pressure.

Acknowledging both this opportunity and challenge, this paper studies the relationship between mobile devices, work extension practices, and subjective time pressure from two distinct vantage points. First, we examine change over time in work extension practices, and change in the impact of work extension on working time and subjective time pressure. Specifically we ask, over a period that witnessed rapid technological change:

1. Have work extension practices (work beyond both the workplace and outside standard business hours) increased?
2. What is the association between work extension, working time, and subjective time pressure, and has this strengthened?

To address these questions, we use data from the UK Time Use Surveys (UKTUS) data collected in 2000-01 and 2014-15. These data are ideally suited to measuring work extension as they contain a detailed report of an individual's daily activities throughout an entire day, and both studies collect data on subjective time pressure. With respect to studying change over time, taken together these surveys bookend a period of massive changes in the integration of mobile technology into various aspects of our daily lives. The data therefore provide a unique opportunity to study changes in

work extension practices, and changes in the impact of these on working time and subjective time pressure over a period of rapid technological change.

Our second vantage point encompasses a contemporaneous study of the use of computers and mobile devices (smartphones and tablets) while working. The UKTUS 2014-15 collected data on the use of these devices throughout the day. These data are thus a valuable source of new information on how individuals are incorporating the latest technology into different aspects of their daily lives, including while working. Using these data, we address our third research question:

3. To what extent now, are mobile devices embedded in work extension practices and associated with feelings of subjective time pressure?

Methodology

Data and sample

The United Kingdom Time Use Surveys (UKTUS) 2000 and 2015 obtained nationally representative samples of households and individuals in the United Kingdom using a clustered, stratified sample design. Both surveys collected information about individuals' time use, along with a range of social, economic, and demographic variables. The 2000 survey obtained a 61.1% household response rate, with 72.7% of all eligible persons within responding household providing time diaries. The corresponding figures for UKTUS 2015 are 40.4% and 81.1% respectively. Though the household response rate is lower, the latest survey still obtained a sizeable national

sample of around 4,700 households providing around 16,500 diary days. Crucially, there is no evidence that non-response to time use surveys is systematically related to feelings of subjective time pressure (Gershuny, 2000).

Respondents to both surveys complete two time diaries (a weekday and a weekend day) reporting their activities and their location throughout the day. In the latest survey, respondents provided information about their use of devices (computers, smart-phones, and tablets) throughout the day. Our analysis is based on a sample of employed adults aged 16-64 years who are not students, and we exclude individuals who work solely at home. We use only those diaries that were completed on days respondents self-reported as 'work days'. Table 1 reports the number of respondents fitting our selection criteria in both surveys who completed a time diary for either one or two work days.

TABLE 1 here

Measures

Work extension can be thought of as entailing work that occurs beyond a fixed workplace (typically at home) at times outside of normal working hours (typically in the mornings before and/or evenings after the main period of work). To understand how we capture these features of work extension in our measure, consider Figure 1 which shows periods of time working for three hypothetical cases on a typical work day. All three cases report a long, principal episode of time at work during normal work hours (represented by the light-shaded bar). The first and third cases each report

an episode of work extension (dark-shaded bar), following and prior to their main episode of work respectively. We use data on the location and timing of work throughout the day to identify episodes of work extension as depicted in Figure 1.

FIGURE 1 here

The UKTUS 2000 survey did not collect location information when respondents reported time at work. Therefore, to ensure that the measures we construct are comparable across surveys, we impose this restriction on the latter UKTUS 2015 survey. That is, we proceed as if location information were not collected in UKTUS 2015. We then apply the following three rules in both surveys to define and measure work extension on a working day:

1) An episode of work occurring before 9am or after 6pm where the location prior to and after the episode was ‘at home’.
2) The first episode of work if it was preceded by an activity at home and followed by travel; or if the first work episode of the day was the second reported activity and preceded by sleep (i.e. a work episode immediately upon waking).
3) The last episode of work of the day if it was preceded by travel and followed by an activity at home; or if the last work episode was the second from last reported activity and was followed by sleep (i.e. a work episode just prior to going to bed).

Furthermore, the respondent must have reported more than one period of time working throughout the day, and episodes of work captured by the foregoing rules could not be the major work episode that day in terms of episode duration. It is important to note that work extension can be conceptualised, and thus measured, in different ways. For example, work extension may occur when work pressures inhibit individuals from fully enjoying or concentrating on other activities and commitments outside of work. While not diminishing the importance of the subjective sense of work spilling over into non-work time, our measure foregrounds the arguably less-well studied instances where people report working beyond its usual spatial and temporal confines.

Total working hours are measured as time when the respondent reported time in paid work (either their main or second job), including work breaks. Measures of time working while using a device, and not using a device, are restricted to the UKTUS 2015 survey. Computers and mobile devices are now deeply embedded in our daily lives. This is reflected in the way in which device use has been incorporated into the design of the time-diary instrument as part of the context of daily activities. Much like reporting where they are and who they are with, respondents were asked to report whether or not they are using a computer, smartphone or tablet while doing an activity regardless of what that activity was. Using this information, we decompose total work hours into measures of the time doing paid work with, and without, using mobile devices. Note that the data do not indicate whether someone is using a device as part of their work, or whether it is being used for some other purpose while working. Also note that it is not possible to distinguish between different types of devices.

We measure subjective time pressure in two ways. The first measure indicates respondents who report always or often feeling rushed or pressed for time (hereafter *rushed*). This measure is available in both the 2000 and 2015 data. The second measure indicates respondents who report some level of dissatisfaction with work-life or work-family balance (hereafter *dissatisfaction with WLB*), but this is available for 2015 only. The first measure captures a general sense of time pressure unrelated to any specific activity, while the second relates specifically to work. This allows us to explore, for 2015 only, whether work extension is tied to general feelings of time pressure or specifically tied to work.

Analysis plan

Our analysis is set out in three parts corresponding to each of our three research questions. Part one tests whether the incidence of work extension, as measured here, have changed over the past fifteen years, a period of rapid technological change with the widespread diffusion of mobile devices. The dependent variable is dichotomous, indicating whether the respondent reported one or more episodes of work defined as work extension by our criteria on either of the two diary days. We use multivariate logit regression to analyse change over time in work extension. The control variables we include in this and subsequent models are set out below.

The second part of our analysis considers whether the relationships highlighted in previous research between work extension, working time and subjective time pressure are found in the UK both in 2000 and 2015. Specifically, we estimate the model depicted in Figure 2, connecting work extension to work time (pathway a) and

subjective time pressure (pathway b), and work time to subjective time pressure (pathway c).

FIGURE 2 here

Though it could be argued that any effect of work extension on working time is somewhat tautological, we estimate this effect for two reasons. First, it is important to test whether the relationship between work extension and working time is positive, as suggested by previous qualitative research, and to evaluate the size of this effect. That is, to know how much extra work is associated with work extension. Second, previous research strongly suggests that we should expect to find that work extension has a significant positive effect on subjective time pressure. Of further interest, however, is to test whether this holds after controlling for total working time, and, moreover, to test whether working time has an independent effect on subjective time pressure.

We estimate this model for 2000 and 2015. Estimating the model using data from 2000 provides insights into the relationships depicted in Figure 2 prior to the widespread proliferation of powerful mobile devices. We can then compare the results in 2000 with those in 2015, when mobile devices were in widespread use. Doing so allows us to consider whether there has been any change in the connections between work extension, working time, and subjective time pressure over this period. In particular, whether they strengthened over this period where mobile devices have become ubiquitous, which is a widespread contention.

The third part of our analysis examines the extent to which the use of mobile devices are embedded in work extension practices, and tests links between work extension, the use of mobile devices, and time pressure. To do this we decompose the measure of total work into work with a device and work without a device and estimate the model depicted in Figure 3.

FIGURE 3 here

This model differs from the model depicted in Figure 2 in one key respect, which is that instead of including a single measure of total work time, we decompose this measure into: i) time working while using a device; and ii) time working while not using a device. Consequently, in this model, there are two pathways linking work extension to working time using a device (a^1) and not using a device (a^2), and two pathways linking working time using a device (c^1) and not using a device (c^2) to subjective time pressure. This model, for 2015 only, lets us examine whether the connections between work extension, working time and subjective time pressure, estimated in the previous model, are embedded in time working with a device. It also allows for correlation in the errors of the two measures of working time (shown in Figure 3 by the curved line).

The models in parts two and three of our analysis were estimated using the generalised structural equation modelling (gsem) command in Stata 13.1. This command facilitates simultaneous modelling of multiple dependent variables that are measured in different ways. For our application, work hours is a continuous dependent variable and estimated using OLS. Our two measures of subjective time

pressure (*rushed, dissatisfied with WLB*) are binary and estimated with logit regression.

All models control for a number of variables that likely have a bearing on work extension practices and technology use. As noted above, work extension practices, especially those tied to the use of mobile devices, are thought to be concentrated among managers and professionals, and so we control for national statistics socio-economic class (NS-SEC). We control for self-employment status, flexible work status, and overtime status, all of which may be tied to the scheduling and timing of paid work. To control for factors tied to the balancing of work and family commitments we include variables indicating part-time status, gender, and parenthood status (child 0-14 years). We control for home-PC ownership to account for change in access to technology in the home, and for age as we might expect younger workers to use technology more than older workers. Lastly, to account for differences in exposure, we control for the number of work days for which the respondent completed a time diary. Robust standard errors are computed for all multivariate models.

Results

I. Work extension: 2000-2015

Table 2 shows that 5.3% of employed individuals 16-64 years reported work extension on a workday in 2000, which increased to 7.9% in 2015. Reports of work extension are higher among professionals and managers than other occupation groups,

though there appears to be an increase in work extension across all major NS-SEC occupation groups.

TABLE 2 here

Turning to our multivariate results, Figure 4 displays estimates of odds ratios and 95% confidence intervals from a multivariate logistic regression of work extension. An odds ratio greater/less than '1' corresponds to a positive/negative association, and is statistically significant when its confidence interval does not contain 1. The results show a significant increase in the incidence of work extension in 2015 compared with 2000.

FIGURE 4 here

Looking at other results in the model, those in intermediate and routine/manual occupations were significantly less likely to report work extension, while the self-employed were significantly more likely to report work extension. Having flexible working arrangements was not significantly associated with reporting work extension, but those who report ever doing paid overtime were less likely to report work extension. Part-time employment status, gender and parenthood status were not associated with reporting work extension. These results together suggest that work extension, as measured here, is not linked to balancing the demands of work and family. Younger/older workers were less/more likely to report work extension than workers 25-54 years. Finally, individuals with no PC at home were less likely to

report work extension, and the incidence of work extension was higher among those who provided diaries on two working days.

II. Work extension, total work hours, and subjective time pressure

We now present the results from the model depicted in Figure 2 above for 2000 and 2015 examining the relationships between work extension, total work hours, and subjective time pressure. Table 3 reports the coefficients, p-values, and standardised coefficients for the each of the three key pathways from this model. The standardised coefficients facilitate substantive comparisons across survey years.[1]

TABLE 3 here

Work extension had a positive and significant effect on total work hours in both 2000 and 2015 (pathway a). In 2000, work extension was associated with 1.3 hours (79 minutes) extra work, and in 2015 it was associated with 1.08 extra hours work per working day (65 minutes). Work extension was also positively associated with reporting always or often feeling rushed. This effect was not statistically significant in 2000 ($p=.103$), whereas it was in 2015 ($p < .05$). The size of the effect, as represented by the standardised coefficient, though small, increased between 2000 and 2015 (.030 vs .052). Note, however, that the effect of work extension on subjective time pressure was significant in 2000 when total work was excluded from the model, suggesting that the effect of work extension on time pressure was partly mediated through total working time in 2000, which was not the case in 2015. Lastly, total work was positively and significantly associated with feeling rushed in both 2000 and 2015.

The results from the model using dissatisfaction with WLB as the measure of subjective time pressure, for 2015 only, are substantively identical to those for rushed (full results not reported). Both work extension and total work hours were positively associated with reporting dissatisfaction with WLB. The standardised effect for the latter was 0.154 ($p < .001$), which was notably larger than the corresponding effect in the 2015 model with rushed as the measure of subjective time pressure (0.089; $p < .01$). This shows that although work extension is positively associated with a general sense of time pressure, arguably it has a stronger influence on dissatisfaction with WLB. Unfortunately as we do not have this measure in the earlier data we cannot evaluate whether this has changed over time.

III. Work extension, working with and without devices, and subjective time pressure

Here we present the results of our analysis of work extension, device use, and subjective time pressure. Recall that in place of total work in our model, we now include measures of working time with a device and without a device. Working time when no device use was reported was not included in our measures, and cases with excessive amounts of missing device use (greater than four hours) were dropped to minimise the discrepancy between measures of work time in this and the previous section. Table 4 reports the coefficients, p-values, and standardised coefficients for the each of the five key pathways in the model depicted in Figure 4 above.

TABLE 4 here

The first and second rows of Table 4 provide a decomposition of the effect of work extension on total work (pathway a in Table 3) into work while using a device (a^1) and work while not using a device (a^2). The results show that the effect of work extension on total work was overwhelmingly composed of work time while using a device. The direct effect of work extension on subjective time pressure was very similar to the model in the previous section. The fourth and fifth rows of Table 4 provide a decomposition of the effect of total work on subjective time pressure (pathway c in Table 3) into the effect for working with a device (c^1) and working without a device (c^2). The overall significant positive effect of working time on subjective time pressure was found for both working with and without a device. That is, no evidence was found that working with a device was uniquely tied to feelings of subjective time pressure.

Nationally representative data on working time when using a device and not using a device has not been available before, so it is worth examining the results for the control variables in this model, which are reported in Table 5. It is striking that, on average, close to 50% of reported work time was carried out while also using a device, underscoring the how much technology is now integral to daily working life for managers and professionals. However, intermediate and routine/manual workers spent significantly less time using a device while working, as did self-employed workers. Workers with flexible work arrangements spent more time working with a device, while less time working without a device. Ever working paid overtime was not associated with working with a device. Part-time workers averaged less time working, both with and without a device. Age was not significantly associated with

work either with or without using a device. Lastly, workers who do not have a PC at home spent less time working with a device and more time working without a device.

TABLE 5 here

Discussion

The division between the public world of work and the private domestic sphere has often been claimed as a distinctive feature of modern societies (Davies and Frink, 2014; Giddens, 1991; Lasch, 1977). Although the historical account of 'separate spheres' has been thoroughly revised, by feminist scholars among others, the notion remains the bedrock for the social organization of time (Glucksmann, 1995; Rubery et al., 2005). Against this background, any threat to the inviolability of this personal realm is perceived as a risk to family balance, intimate relations, and personal identity.

It is hardly surprising that the potential of mobile devices to erode the traditional temporal and spatial constraints of work is the subject of much debate. The clichéd image is that of the frenetic, technologically-tethered iPhone-addicted citizen, inhabiting a digital ecology of constant connectivity. Such a picture appears to be a fact of contemporary 21st century work life. The topical focus on the long-hours culture of professionals fosters this view: that the boundaries between work and personal, family, and leisure time are blurring, bleeding, spilling over, or dissolving. And a key part of this received wisdom is that the pervasiveness of ICTs is inexorably extending work's reach.

Yet, neither UK employment surveys nor surveys of new media (such as Ofcom and OxIS) contain measures of when work is done on a daily basis together with how much people nationwide use digital devices while working. This study therefore makes three key contributions. Firstly, it provides unique data on the daily temporal organisation of work and whether it has changed over the last decade and a half. Secondly, it examines links between work extension and the total number of hours worked and aspects of subjective time pressure, and changes in these over a period covering the rapid diffusion of mobile devices in society. Thirdly, it considers how the use of mobile devices have become embedded in contemporary work practices.

So, have mobile technologies increased work extension? This study did indeed find a significant though small increase in work extension between the years 2000 and 2015. Crudely, this tallies with the argument that digital technologies are indeed blurring the boundaries between work and non-work time. However, the increase we report is substantively small and thus does not support the extreme narrative depicting the obsolescence of the temporal divide between work and other aspects of life. Moreover, our models reiterate previous research showing that these work patterns are overwhelmingly concentrated among managers and professionals. Given the massive expansion in the use of smart mobile devices, it is striking that patterns of work extension have changed so little and remain fixed within a particular segment of the workforce. This is not to deny that mobile devices have been thoroughly incorporated into the ‘doing’ of work by managers and professionals (Wajcman and Rose, 2011). Our results show clearly that these workers spend about half of their work time using

a device. But evidence that mobile technology has radically altered the nature of work, at least with respect to work extension, is scant.

If we had discovered a widespread and substantial increase in work extension practices over a period of rapid technological change, this would have provided a neat explanation for popular sentiments about time pressure. Is it the case, rather, that over this period links between work extension, working time, and time pressure have strengthened? Our analysis revealed that work extension was significantly associated with longer total working hours, and the effect was similar in magnitude and significant in both 2000 and 2015. On the other hand, we found that work extension was only significantly associated with feeling rushed in 2015. This latter finding could be connected to the significant increase in reports of work extension over this period. It could also point to the enhanced salience of aspects of work extension not related directly to additional working time, which might be tied to the increased use of digital devices over this period. For example, mobile devices can facilitate immediate notification, or checking, of work-related communications. This might not lead to a sustained period of extra work time, hence no change in the effect of work extension on working time, but it could be tied to work-related stresses spilling over into non-work time and contributing to an increased general sense of time pressure.

Our decomposition of working time into time working with and without devices, provided further insights into the way in which technology might be implicated in the relationship between work extension and subjective time pressure. We found little evidence for a direct relationship between technology and time pressure. Increasing work hours were associated with increased subjective time pressure, this held both for

work time when using a device and work time when not using a device. In other words, the overall positive association between working time and subjective time pressure is not concentrated during time when working with a device, suggesting that working time with a device is no different to working time without a device, with respect to time pressure. However, the additional work time associated with work extension was concentrated entirely in time working while also using a device. This could provide some of the explanation as to why mobile devices are routinely tied to feelings of time pressure, even though time both working with and without devices is equivalently associated with time pressure.

Our results suggests that the relationship between technology and time pressure, to the extent that there is a relationship, is indirect. In other words, to the extent that there is a link between time pressure and technology, it is mediated by work arrangements. Our finding, that working time both with and without devices is equally associated with time pressure, is interesting. Our results counter the widespread belief that a primary cause of time pressure is extensive use of ICTs per se, rather than it being a symptom of structural changes in the conditions of work (Barley et al., 2011; Bittman et al., 2009; Rubery et al., 2005). In other words, we need to be wary of making superficial assumptions about the relationship between time pressure and ICTs.

Our measure of device use is limited in that we do not know what particular device is being used, nor if the respondent is using the device for a work activity. Our analysis therefore cannot, and does not, provide insights into the impact of particular devices, nor distinguish between impacts of using devices for work from other uses of these devices while working. Measures of the use of specific devices, for specific purposes,

would facilitate a more pointed study of the impact of technology on work practices than is carried out here. This does not detract from the insights garnered from our research, though it points to directions for further research. In addition to this, an important aspect of constant connectivity that we do not capture is instances where individuals quickly check their mobile device, either in response to a notification or to check if they have been contacted. These may or may not result in further action, and may not consume a notable quantity of time (thereby not captured in time diaries), but they are a vital part of what people mean by no longer being able to mentally separate work from other aspects of life. Though not registered in a time diary, these micro-episodes are likely to have a substantial effect on the experience of time and time pressure. Debates in this area need to be mindful of these distinctions.

Our study suggests that measuring different aspects of subjective time pressure could yield further insights into the relationship between time pressure, technology, and work. Therefore, future work should continue to explore different aspects of subjective time pressure in connection with these issues. Finally, it is worth bearing in mind that our measure of work extension focuses entirely on time working outside of normal work hours and place. As we noted above, the sense of work spilling over into non-work time as a consequence of work-related stress or the pressures of the job could well be tied to technology in ways that we do not examine in this paper. In particular, connections between the rapid, repeated checking of mobile devices mentioned just previously, and subjective aspects of work extension merit close examination in future research.

Conclusion and future directions

How then might our results be interpreted in the light of debates about the impact of mobile devices on the character of time and the common perception of harriedness? We referred at the outset to a lively discussion within social theory and public rhetoric about how digital devices are speeding up life, forging a new instantaneous temporality. For example, Castells (2010: xIi) opines that life is a frantic race as people multi-task and multi-live by means of technology to reach 'timeless time: the social practice that aims at negating sequence to install ourselves in perennial simultaneity and simultaneous ubiquity'. While we reject such exaggerated claims about the annihilation of time, the general argument - that we are increasingly moving away from the clock time of the industrial age in which time was a method of demarcating and ordering sequences of events - is interesting. We agree that mobile devices provide the means for reconfiguring the temporal regime of work and that this greatly matters to people's lived experience of time.

We have emphasised here that while the total amount of time worked is key to time pressure, when and where you work is also important. A strong trend towards people using technology to *extend* work beyond the traditional working day would certainly help explain common perceptions about increasing time pressure. Yet we did not find this. While digital devices are now completely integrated with work extension practices, we found that increasing time pressure was tied equally to working time both while using and not using devices.

Perhaps the problem stems from the fact that most discussions about the relationship between technology and time are limited by a linear conception of time. In other

words, the notion that time spent using devices displaces or substitutes for other ways of spending time; thus intensifying the pace of life. Yet there is little evidence for this. After all, if British adults now spend more time watching TV, using their mobile and on the computer than they do sleeping (Ofcom 2015), where does this time come from? There are not enough hours in the day for all these practices, as they are not discrete, dedicated activities that one can measure sequentially. If we move away from the binary opposition of mediated/non-mediated, then we can see that time consumption may involve device usage without being dominated by it. The new devices have capacities that do not require full attention and therefore time consumption is less singular. As Kenyon (2008: 286) suggests, multitasking via a device may lead to the *broadening* of time, such that more activities are added to daily life (see also Gershuny and Sullivan, 1998; Robinson and Godbey, 1997). The question, then, is not so much whether mobile devices allow work to colonise life. Rather, we need to explore the degree to which the uneven diffusion of ICT usage throughout the different activities of daily life affects the multiple and complex aspects of our sense of time (Adam, 1995).

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End notes

[1] Standardised coefficients are computed as follows: $\beta_x^S = (\sigma_x \beta_x)/\sigma_y$, where σ_x is the standard deviation for covariate x, β_x is the unstandardised coefficient for covariate x, and σ_y is the standard deviation for the dependent variable y. The logit part of the model uses the standard deviation of the latent variable y^* (σ_{y*}), where, by assumption, Var(ϵ) = $\pi^2/3$ (see Long and Freese, 2006: 97).

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Table 1: Number of respondents completing time diaries on one or two work days: UK Time Use Surveys 2000 and 2015

	UKTUS 2000		UKTUS 2015	
Number of work days	N	%	N	%
One work day	3,076	79.8	2,418	82.6
Two work days	777	20.2	508	17.4
Total	3,853	100.0	2,593	100.0

Table 2. Proportion of employed individuals in major socio-economic occupation groupings reporting work extension on a work day

Survey		**Professional**	**Intermediate**	**Routine**	**All**
2000	% Work extension	8.7	4.9	1.9	5.3
	Base	1,439	1,055	1,311	3,805
2015	% Work extension	12.1	7.4	3.1	7.9
	Base	1,227	742	941	2,910

Notes: 64 cases have missing NS-SEC

Table 3. Model results for pathways linking work extension, working time, and subjective time pressure

	2000			**2015**		
	Coef.	*p*	*Std. Coef.*	*Coef.*	*p*	*Std. Coef.*
a: work extension –> total work hrs	1.316	.000	.106	1.075	.000	.107
b: work extension –> rushed	0.277	.103	.030	0.393	.025	.052
c: total work hrs –> rushed	0.044	.005	.060	0.067	.002	.089

Notes: Model 2000: N=4,095; Model 2015: N=2,680; Models control for occupation, self-employed status, flexible working arrangements, paid overtime status, part-time work status, gender, parenthood status (child 0-14 years), age, no home PC, and number of work days.

Table 4. Model results for pathways linking work extension, working time (hours) with and without devices, and subjective time pressure

	Rushed			**Dissatisfied with WLB**		
	Coef.	*p*	*Std. Coef.*	*Coef.*	*p*	*Std. Coef.*
a[1]: work extension –> work hours using device	1.096	0.000	0.083	1.096	0.000	0.083
a[2]: work extension –> work hours not using device	0.033	0.907	0.002	0.033	0.907	0.002
b: work extension –> subjective time pressure	0.533	0.003	0.071	0.555	0.001	0.073
c[1]: work hours using device –> subjective time pressure	0.067	0.008	0.117	0.143	0.000	0.250
c[2]: work hours not using device –> subjective time pressure	0.059	0.007	0.112	0.130	0.000	0.247

Notes: N=2,514; Models control for occupation, self-employed status, flexible working arrangements, part-time work status, gender, parenthood status (child 0-14 years), age, no home PC, and number of work days.

Table 5. Coefficients for control variables from models of working time (hours) with and without devices, and total working time

	Work hours with device[1]	**Work hours without device[1]**	**Total work hours[1]**	**Total work hours[2]**
Intermediate	-0.68***	0.63**	-0.05	-0.03
Routine/Manual	-2.36***	2.05***	-0.31*	-0.29*
Self-employed	-1.46***	0.76**	-0.69***	-0.69***
Flexible work	0.36*	-0.50**	-0.14	-0.12
Paid overtime	-0.26	0.62***	-1.94***	-1.92***
Part time	-0.85***	-1.09***	0.35**	0.38***
Woman	-0.17	-0.35*	-0.52***	-0.51***
Parent	-0.35**	0.11	-0.24*	-0.21*
16-24 years	-0.40	0.20	-0.2	-0.24
55-64 years	-0.02	-0.17	-0.19	-0.23
No home PC	-0.77***	0.87*	0.1	-0.01
Two working days	-0.40**	0.63***	0.23*	0.24*
Intercept	4.33***	4.43***	8.76***	8.78***
Number of observations	2,514	2,514	2,514	2,680

Notes: 1. Excludes working time when no device use was reported, and cases with more than four hours of missing device use time; 2. Includes all work time regardless of missing device use time. Reference categories: professional/manager, employee, no flexible work arrangements, no paid

overtime, full-time, male, not a parent of child 0-14 years, age 25-54 years, has home PC, and completed time diary for one work day. *** p < .001; ** p < .01; * p < .05

Figure 1: Stylised depiction of three hypothetical work days showing normal episodes of time at work, and episodes of work extension

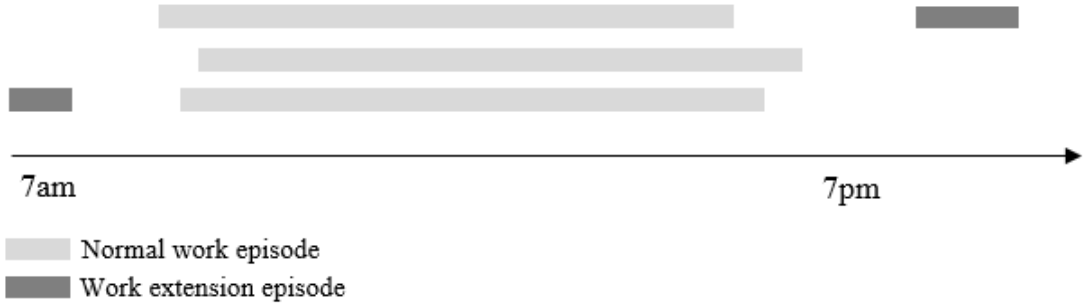


Figure 2. Model diagram depicting relationships between work extension, work time, and subjective time pressure

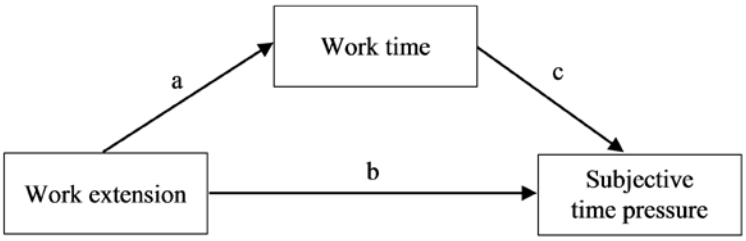


Figure 3. Model diagram depicting relationships between work extension, work time with and without a device, and subjective time pressure

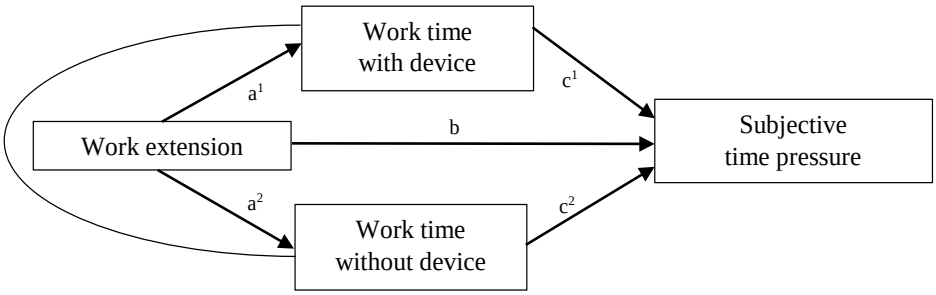
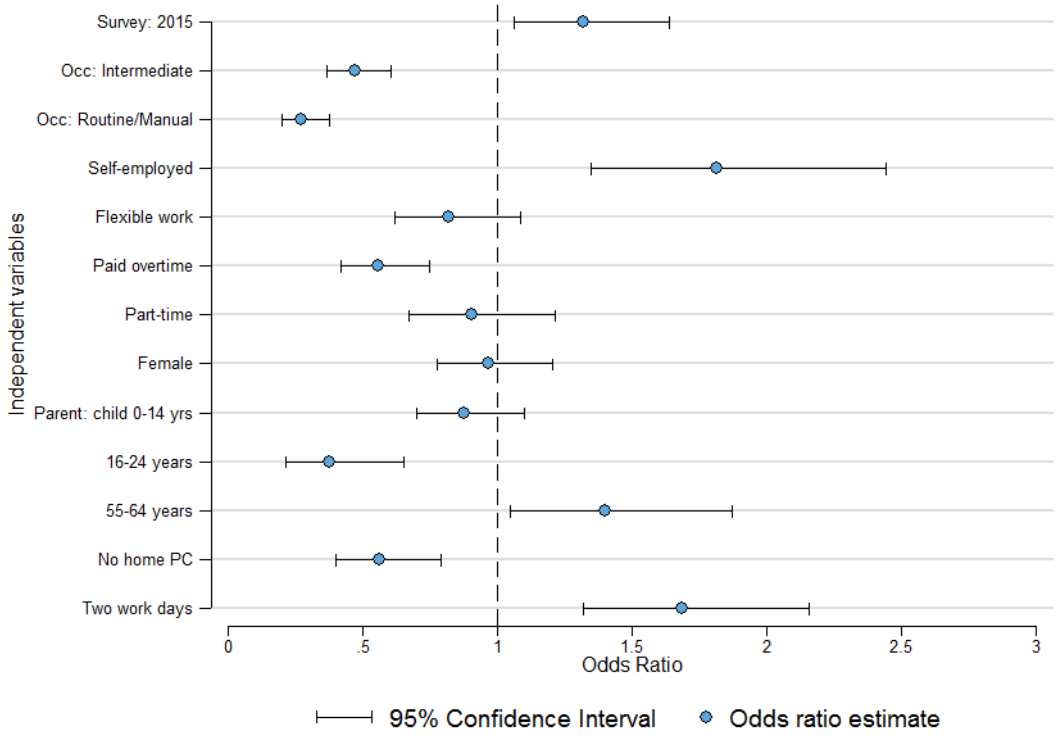


Figure 4. Odds ratios and confidence intervals from logistic regression of work extension



Notes: N=6,698; Pseudo R2=.08; Reference categories (top-bottom): Survey 2000-01, professional/manager, employee, no flexible work arrangements, no paid overtime, full-time, male, not parent of child 0-14 years, age 25-54 years, has home PC, and completed time diary for one work day.