Article

new media & society
1–18

DOI: 10.1177/1461444818820073
journals.sagepub.com/home/nms
SAGE

How Silicon Valley sets time

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Abstract
Digital calendars are logistical media, part of the infrastructure that configures arrangements among people and things. Calendars increasingly play a fundamental role in establishing our everyday rhythms, shaping our consciousness of temporality. Drawing on interviews with Silicon Valley calendar designers, this article explores how the conceptualization and production of scheduling applications codify contemporary ideals about efficient time management. I argue that these ideals reflect the driving cultural imperative for accelerated time handling in order to optimize productivity and minimize time wasting. Such mechanistic approaches treat time as a quantitative, individualistic resource, obscuring the politics of time embedded in what can and cannot be graphically represented on the grid interface. I conclude that electronic calendars are emblematic of a long-standing but mistaken belief, hegemonic in Silicon Valley, that automation will deliver us more time.

Keywords
Calendars, culture, scheduling, Silicon Valley, time management

> *The 1990s technology-industry boom introduced us to the concept of 'Internet time'. The phrase meant different things to different people, but mostly it meant fast. Under the digital age's new temporal dispensation, everything would happen – technologies would emerge, companies would rise, fortunes would be made – at gasp-inducing speed.* (Rosenberg, 2007: 4)

So begins *Dreaming in Code*, one of the many popular accounts of the working practices of a group of Silicon Valley's computer programmers. In this place where much of our digital technology is born, where the highest concentration of techies – both as makers and as users – exist in the United States, the overriding belief and commitment to the idea that time moves faster still holds despite several cycles of bust and boom since the 1990s.

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Facebook's slogan *The Quick Shall Inherit the Earth* ('The Little Red Book' 2012) has not lost it potency.

The role of technologies in radically speeding up the social world's tempo around the turn of the twentieth century has been the subject of a vast literature. Social theorists and historians, ranging from Adam (2004) and Nowotny (2005) to EP Thompson (1967) and Schivelbusch (1987) have shown how the clock, the railway, the telegraph and the telephone were the metronomes of a major historical shift in modern time consciousness. Time became clock time, engendering the pursuit of a frugal use of time in the quest for efficiency by constituting people as temporal subjects, 'as both having an orientation *to* time, and being disciplined *by* time' (Lash and Urry, 1994: 226). No wonder Mumford (1934: 14) saw the clock as the key invention of industrial society.

At the beginning of the new millennium, there is once again intense interest in how technologies, principally new media, are transforming the human perception of time. The idea that digitalization has wrought a new temporality of acceleration, immediacy and instantaneity, is widespread. Indeed 'speed theory', as Sharma's (2014: 15) astute critique shows, has become a genre in itself, a circulating discourse that masks the 'chronographies of power'. That is, it both obscures the socially differentiated lived experience of time and legitimates the cultural fixation on the control of time. While such theories are ostensibly concerned with how new technologies are reshaping time, too often they take the form of grand, totalizing narratives, 'techno-epics heralding techno-epochs', with little substantive interest in the specific, located settings in which temporality is made together with devices and instruments (Thrift, 1996: 1467).

A similar comment can be levelled at the burgeoning literature on the temporal dynamics of social media platforms, the third wave of mediatization (Couldry and Hepp, 2017; Fornas, 2016; Fuchs, 2014; Kaun and Stiernstedt, 2014; Keightley 2012; Weltevrede et al., 2014). It also features relatively little research on the apparently mundane yet essential tools that we rely on to organize the quotidian routines of everyday life. As Pentzold (2018) notes, the customary practices through which time is produced in the interplay of communicative texts, media technologies and social relations, the 'temporal scaffoldings' of daily life, are mostly ignored. Yet, as media scholars (in common with the rubric of science and technology studies) increasingly emphasize, material objects and technical assemblages are 'active participants and intermediaries' in the production of time (Leong et al., 2009: 1281; Wajcman 2015). This article explores how one such 'logistical' medium, the electronic calendar, mediates timekeeping (Peters, 2016).

From scheduling to managing and beyond

The calendar is one of the most basic of all human time-making devices, responsible for the creation of the temporally regular patterns through which all societies maintain order. However, it was only with the invention of the schedule that time could be calibrated at the microscopic level of the hour and the minute. So argues Zerubavel (1985), in his classic work on schedules and calendars in social life. Here, he traces the development of what he refers to as the *quantitative* philosophy of time that has come to characterize Western civilization, in which time is an entity that is: 'segmentable into various quantities of duration and, therefore, is countable and measurable' (59–60). Schedules

epitomize this quantitative view of time, as they require rigid durations or *time slots* into which we fit fixed activities and events. This temporal exactitude is a unique feature of modern life: the schedule made the modern art of time management possible. This art in turn relies on us having internalized a socially sanctioned norm of time discipline in which, to paraphrase Weber, wasting time is the deadliest of sins. Calendars as schedules thus materialize the highly rationalized temporal order in which time is viewed as a scare resource that must be optimally utilized.

The legacy of twentieth century scientific management, and the way in which it permeates the subjectivity of today's salaried knowledge worker, is the theme of Gregg's (2018: 8–9) *Counterproductive*. She eloquently charts how time mastery became a defining quality of professionals as the productivity imperative became associated with moral perfection, accruing virtue as 'a framework for living ethically through work'. Whereas the Protestant ethic relied on religious devotion, productivity as a self-affirming logic of action 'fills the spiritual void of profit-driven corporate culture'. Time-management techniques in the form of self-help manuals and more recently mobile apps were crucial, she argues, in encouraging a personalized relationship to efficiency, providing the necessary cultural weight and authority to normalize such practices as management common sense.

My study of the digital calendar builds on these insights. Schedules presuppose and promote a historically and culturally distinctive orientation to lived time. They therefore constitute an ideal site for exploring the dominant *temporal logic* or 'socially legitimated, shared assumptions about time that are embedded in institutional and societal norms, discourses, material and technological processes, and shared ideologies' (Mazmanian et al., 2015: 1455). The research presented here adds a further analytical dimension to Gregg's textual analysis of productivity apps. It is based on interviews I conducted with calendar designers, whose own understandings and beliefs about how to operate in and through time inevitably inform their design practice.

From the earliest patent record for an electronic calendar, dated 1975, the invention promised to provide 'a convenient means for the management, programming and monitoring of various day-to-day activities and performances'.[1] That the digital calendar was, from the outset, envisaged as an automated productivity tool for seamlessly programming the time-consuming vicissitudes of everyday living is clear from accounts of early systems, such as The Coordinator (Winograd and Flores, 1986), Lotus Notes, Lotus Agenda and Chandler. There were word processors, spreadsheets and databases, Kaplan (the co-inventor of Lotus Agenda) recalls, but another kind of information – personal information – was increasingly being seen as valuable to manage (personal interview 20 April 2018). The aim of Agenda, launched in 1988, was to develop a 'Personal Information Manager'.

The idea behind Agenda was as ambitious as computer-based artificial intelligence and as mundane as the pile of small papers – business cards, post-it notes, notebook pages, reminders – that accumulated in Mitch Kapor's (the co-inventor with Kaplan) pocket every day. You could use it to manage your day, organize your research and any other bits of information, and you could tell it to book a lunch next Friday and it could automatically schedule it for the proper date and time. It was a new generation of software, developed in line with the dream, as old as computing itself, that computers could be used to master tides of information. Indeed, it came to be described as a 'spreadsheet for words'.

Projects like Agenda, Markoff (2015) argues, were inspired by a vision of artificial intelligence as augmenting and empowering users, rather than replacing them. Originally set down in Engelbart's (inventor of the mouse) 'Framework for the Augmentation of Human Intellect', this vision of upgrading the brain is still at the heart of much computing innovation. It directly inspired Kapor's subsequent, failed attempt to build Chandler. This even more ambitious project aimed to build a comprehensive 'interpersonal information manager' that would end the silos between emails/tasks/appointments/notes/addresses, but also between music/photos/blogs … and make this all secure and shared. The scale of the development process is recounted in *Dreaming in Code: Two Dozen Programmers, Three Years, 4,732 Bugs, and One Quest of Transcendent Software* (Rosenberg, 2007). The subtitle bears witness to the difficulties of building such software, as does its lack of realization today. Perhaps it also bears witness to the limits of categorizing and rationalizing human behaviour required for smooth engineering. As Kaplan remarked: 'what's missing is that there are many things that are important, but not time sensitive and there isn't a good way to represent that in modern calendars'. However, the idea that artificial intelligence will solve the messy and complex exigencies of everyday life, that 'time is subject to control by those who know the code' (Danahay, 2004: 806), still animates current attempts to automate calendars, as we shall see.

Calendars are now completely embedded in standard software packages. They can be accessed 24/7 on a variety of devices, anywhere there is Internet connectivity. Although still called calendars and marketed as personal productivity tools, they are first and foremost organizational tools to support social synchronization and distributed collaboration. They are designed and deployed as Groupware Calendar Systems to be shared, facilitating the booking of appointments, meetings and rooms within the organization. It is quite common in Silicon Valley high-tech firms that laud their radical openness for employees' daily schedules to be fully visible, allowing others to book appointments in empty slots. While I will be highlighting the opportunities that calendars provide for self-monitoring, open calendar systems create the opportunity for peer judgement about time allocation as well as for employer surveillance. Employees can make inferences about others' workload not only by the number of appointments, but also by the nature of appointments. This logic of openness to facilitate sharing within the organization also enables employers to readily monitor all employee activities. Yet the default setting of openness is rarely changed.

This ceding of control over timetabling, involving a profound lack of privacy, was largely sanctioned in terms of the positive gains in information sharing that characterize these purportedly non-hierarchical network firms: 'I can see what's happening and decide if I want to go to a meeting, see if it's relevant for me'. However, talk of gaming the system, faking an appointment to carve out time or to disguise events that the individual did not want publicly known, was common as I was repeatedly told: 'people are very very reticent in sharing anything outside of the work environment'.

One of the well-documented hurdles in the adoption of shared calendar systems is precisely the fundamental tension between their affordances for organizational effectiveness and the aims of the single, individual user.[2] As I have argued elsewhere, the merger of the personal diary and the business enterprise calendar has made the platform a core apparatus in the ongoing power dynamics over who controls, or 'owns', whose time (Wajcman, 2018). This then is the organizational context in which the coercive potential

of recording devices have their analogue as the prism through which individuals comprehend their own temporality. In what follows, I am primarily concerned with how calendars are evolving as sociotechnical or sociomaterial assemblages that mediate individual timekeeping practices.

So how, then, do the designers and software engineers envisage calendaring software being employed now and in the future? What kinds of conceptualization about time, of *what time is*, are being framed by and inscribed in these digital platforms? And do the material affordances of calendars, such as the grid interface, represent certain activities more easily than others?

To try to answer these questions, this article draws on a series of interviews with designers of calendars at several large technology companies located in Silicon Valley.[3] This iconic region has come to represent all that is new now and also what is imagined in the future – including how we should relate to time. The Silicon Valley ethos in which these designers are situated combines engineering and entrepreneurial approaches, which shapes how people think of themselves and interpret their social relationships. Here, the passion for technology is valorized above all else, which has come to normalize moral scripts and a mechanistic philosophy in which all social problems are seen as amenable to technical fixes. Time, too, can be treated as a problem and readily solved by enough technical acumen. Treated as an individualistic resource that must be harnessed appropriately, time has been diagnosed by Silicon Valley as prone to inefficient or misallocated use. Making the most of time then becomes an engineered solution for efficient task flow. Happily, 'there's an app for that' – in this case, a host of new, increasingly automated calendar applications.

Yet not everyone can equally avail themselves of the temporal offerings of digital technologies. As noted above, while the rhetoric of speed and busyness is pervasive, time pressure is in reality experienced very differently by diverse social groups, depending on their resources and capacities. However, what is shared, as Sharma (2017: 133) demonstrates, 'is the looming expectation that everyone must become an entrepreneur of time-control'. Probing the ambitions to organize temporalities draws our attention to the regimes of valorising distinct qualities of time. Calendaring software conceals such embedded politics by normalizing certain types of time calibration while obscuring others. In the end, I argue, electronic calendars are emblematic of a long-standing but mistaken belief, hegemonic in Silicon Valley, that automation will not only ensure better time management but deliver us more time.

The tempo of the technological place

Like all artefacts, electronic calendars reflect the culture of their makers. They are the result of a series of specific decisions made by particular groups of people at particular times and in particular places. As such, technologies are crystallizations of society: they bear the imprint of the people and social context in which they develop. So it is worth trying to capture the ambiance of Silicon Valley, which infuses the very air that the people who design calendars breathe.

Although several cultures coexist here, high-tech professionals (who make up 30% of the workforce) generally live in affluent areas like Mountain View, Palo Alto and San

Francisco, where they often socialize and mix with those in similar occupations (Muro et al., 2015). The sheer density of this tech network is hard to convey if you have not lived here. When I got stranded one evening in a Palo Alto supermarket with grocery shopping and dead Wi-Fi (no access to Lyft), I was randomly offered a lift home by a couple: turned out he worked on AI for Google Brain and she was a scientist at NASA.

In local restaurants, coffee shops and bars, one often overhears young men in conversation about the tech industry, and Stanford students, and the Uber driver tells you about the app they are developing. Stanford University might be considered as a training ground for these ubiquitous computer scientists and engineers who are encouraged to engage in commercial partnerships. Indeed, there is frequent movement between university positions, jobs in large tech firms and work on new start-ups. There are literally thousands of start-ups initiated in Silicon Valley annually and vast amounts of venture capital are poised on Sand Hill road to 'accelerate the seeds' (Kenney, 2017). The start-up scene epitomizes and feeds into the fast-moving pace of the Valley – as when you are in start-up mode, you have to innovate very very quickly: 'time is everything' (Saxenian, 1994: X1) It is a culture in which you have rapid decisions, rapid movement and rapid changes.

And its workforce is even younger, more masculine and more fully committed to working all hours. While this geek identity can be traced back to the computational culture so well-captured in Turkle's (1984) writings in the mid-1980s, a new variant has emerged in recent years: the 'brogrammer' (a portmanteau of the terms 'bro' and 'programmer') to describe the rise of the testosterone-fuelled, young male programmer associated with 'frat-house' culture (Chang, 2018). Asked about the lack of women in tech start-ups, Paul Graham (one of the founders of the legendary *Y Combinator*) remarked that it simply reflected the pool of programmers, 'a bunch of white and Asian dudes' (Stross, 2012: 55).

Pick up any popular book on the recipe for success that characterizes the 'big 5' tech giants (Amazon, Apple, Google, Facebook, Microsoft) and you will read about hard work as fun and organizations as informal, fluid, networked and meritocratic. It is a story about knowledge workers who trade in information and whose jobs are characterized by a high degree of individual autonomy, flexible hours, seamless connectivity, mobile work and a strong identification with their profession. Schmidt and Rosenberg's (2014) book *How Google Works*, for example, literally has a section called 'Overworked in a good way', where they say that work-life balance policies are insulting to smart, dedicated employees. They advocate a work culture in which you always have too many interesting things to do. Hyper-productivity, living in the fast lane, is valorized as success. Rest is merely a means to excel at the office.

The region's highly competitive culture and dynamic economy has been the subject of excellent analyses by several scholars, such as Saxenian (1994) and Turner (2006).

English-Lueck's (2017) ethnography, however, provides the richest account of the distinctive lifestyle associated with this high-tech work. She defines its features as a value for efficiency, a driving passion for technology and working for the future – at the centre of each sits the omnipresence of work:

> *Use of technology is linked to work, the lodestone of Silicon Valley life. In our fieldwork, if we asked about technologies, we would end up hearing about work. If we asked about family, we*

> *heard about work. Work is a center of discourse. Work matters and workplaces matter.* (English-Lueck, 2017: 25)

High-tech workers devote extremely long hours to achieve peak performance, but also make a great show of working long hours to demonstrate dedication to work. In this culture, work defines worth and is based on producing technology and embracing a fast pace and open attitude. Daily life is colonized by work concerns and is saturated with technology. The sheer quantity of communications like email means that devices need frequent attention. Determining the timing of access becomes a major part of the working day.

English-Lueck's (2017: 78) informants universally regard technology as the primary cause of all social changes, for good or ill. In this environment, technology provides the language, lens and reasoning through which the world is seen and defined. 'In Silicon Valley, people view the daily conflicts of life as "social engineering problems" that can be "solved" if given a thoughtful and systematic appraisal'. Planning and self-direction are highly valued and identified with, as an efficient life is morally equated to a good life. According to this engineering mindset, economic rationality and efficiency become virtues in and of themselves. While these values are not unique to Silicon Valley, she argues, they embody part of an intangible emotional sensibility associated with this area's technological saturation.

How does this technical, instrumental ethos and the time-related social norms associated with it, express itself in the products of Silicon Valley, particularly scheduling software? Can we see an association between the two? Calendars are being designed by and for knowledge workers who inhabit this heady mix of workaholism, velocity and technology. Silicon Valley's hyper-driven work culture resonates strongly, in my view, with the quantitative temporal orientation referred to above. Fostering precise planning and prioritizing in the name of efficiency involves, simultaneously, the systematic elimination of all that is considered to be dispensable, unnecessary, time wasting activities.

In this context, 'calendar work' becomes a new task in itself, a form of skilled labour or competency that must be cultivated. As such, it has much in common with self-tracking practices which also encourage self-discipline (Lupton, 2016; Neff and Nafus, 2016). As one of the designers I interviewed, who writes a blog advising people on how to hone their calendaring practice, told me (without irony), he actually spends quite a lot of time doing this work. Within a framework that stresses individual responsibility for self-improvement, calendars perpetuate a promise that an autonomous individual can control the unpredictability of real life that inevitably involves other people and plans (Gregg, 2018). And in doing so, they also perform an affective role, as the title of Leshed and Sengers's (2011) study of productivity tools indicates, 'I Lie to Myself that I Have Freedom in My Own Schedule'. The ethic of busyness, doing more in less time, is so ingrained, they argue, that productivity tools play an essential role in helping people constitute themselves as valuable and accomplished busy individuals. As Vostal (2016) reminds us, fast subjectivity is not only a negative experience, it may also be enjoyable and enabling for many individuals. Calendar practices are emotional as well as functional, creating positive feelings of control, order and predictability. Indeed, recording a task or an event, *or not*, can be seen as a way one defines what is important, one's goals and priorities. I will return to this issue below.

Research

I undertook empirical research to explore the questions posed above during the 2017–2018 academic year I spent as a visiting fellow at Stanford University. My aim was to interview designers, software engineers, and product managers working on several scheduling programmes as a means to probe deeper into the digital architecture of calendars and the affordances they provide for managing temporal relations. I wanted to focus on how designers conceive of calendars from the point of view of the individual user, including themselves. In all, I interviewed 20 people (18 men and 2 women) directly involved in calendar design by way of snowball sampling. The interviewees all live and work in Silicon Valley (apart from two who work in European branches) and, apart from one 'older' (sic) manager, they were all aged between 25 and 40.

The semi-structured interviews each lasted approximately an hour and were audio-recorded and transcribed. Sixteen were conducted face-to-face and four occurred via Skype. Co-located meeting venues varied, some held at their workplace, others in my office and a couple at cafes in Palo Alto. Topics discussed include: working practices; time management; reasons for developing the software; attraction to and experience of particular platforms; the development process; and the rise of scheduling algorithms. The interviews were all scheduled via calendar apps, many features of which were designed by these same engineers. The fact that the people I interviewed are, at once, designers, producers and consumers of digital apps meant that I was able to study the dynamic interrelated processes of innovation and usage.

The research was augmented by many informal conversations with a wide range of people working in the tech industry during my residency in Silicon Valley. Throughout, I immersed myself as much as possible in the local culture, treating calendars as an entry point to capture the much wider range of people and processes involved in producing the sociomaterial entanglements we refer to as computer programmes or digital media. Many actors shape the scheduling systems that companies build and I have tried to locate my study in the broad ecology and cultural life in which these platforms are being inculcated.

Software applications (apps) pose new methodological challenges for sociocultural media research. For example, Rogers (2013; see also Marres, 2017) advocates the 'methods of the medium': studying society and culture through the functions and everyday practices of digital media technologies that remediate and shape sociocultural phenomena. Similarly, Light et al. (2018) outline a 'walkthrough method' for the critical analysis of a given app. Their method involves establishing an app's environment of expected use by identifying and describing its vision, operating model and modes of governance. It examines the apps' embedded sociocultural representations as much as its technological features, which also have social and cultural influences. This mutual shaping approach, combining science and technology studies with cultural studies, attends to how technologies shape culture while simultaneously being a product of it. My own approach is in tune with these broad recommendations, as is the emphasis in 'software studies' on exploring how software actively assembles and produces social realities (Fuller, 2008; Kitchin and Dodge, 2011; Manovich, 2013; MacKenzie and Wajcman, 1985).

Moreover, while apps resemble platforms as closed and controlled systems, they are also a kind of infrastructure. Over the past two decades, infrastructure studies have become a prominent topic in both STS and media studies (Gillespie, 2010; Parks and

Starosielski, 2015; Plantin et al., 2018; Star and Strauss, 1999). Indeed, Peters (2016: 37) suggests adopting 'infrastructuralism' as a way of understanding the work of media as fundamentally logistical. Logistical media, he argues, have the job of ordering fundamental terms and units, arranging relationships among people and things, fitting bodies to artificial time grids. Clocks and calendars are logistical media par excellence as they 'design both ultimate things and the texture of everyday life'. This study of calendars then attempts to reveal 'the basic, the boring, the mundane, and all the mischievous work done behind the scenes' (Peters 2016: 33).

Getting things done

So how do designers think about the properties and affordances of calendars, and is this thinking framed by a particular conception of time? As outlined above, Silicon Valley engineers inhabit a work-driven, technophilic milieu in which efficient time use or hyper productivity, which mean the same thing in this context, take precedence.

Mark Zuckerberg's attitude to clothes exemplifies this philosophy. When in 2014, during a Facebook Town Hall, he was asked about the grey tees, he responded:

> *I really want to clear my life to make it so that I have to make as few decisions as possible about anything except how to best serve this community. And there's actually a bunch of psychology theory that even making small decisions around what you wear, or what you eat for breakfast, or things like that, they kind of make you tired and consume your energy.* (Friedman, 2018: A17)

While I doubt Sheryl Sandberg (or any professional woman) could get away with wearing the same clothes every day, this comment reflects the extreme end of an ideal model of scientific time management applied to every aspect of life. Reading, listening, eating, dating and even getting dressed, there is apparently no activity that cannot be made better by being made faster via automation. Why spend time composing a reply to an email when the Gmail mobile app has a 'Smart Reply' feature that suggests email replies for you to select with a tap?

During my interviews, time management emerged as a central preoccupation, with participants frequently talking about setting goals that must be achieved in the most time effective way. The expression 'optimizing one's time' was repeatedly used, the lynchpin of what one might think of as a shared cultural repertoire of time-related beliefs and practices. Rather than citing Benjamin Franklin's aphorism that 'time is money', the ethic of saving is directed towards the scarcity of time itself as, in the new spirit of capitalism, 'to be doing something, to move, to change – that is what enjoys prestige' (Boltanski and Chiapello, 2007: 155). The 'promise of a good life' puts a premium on *activity*, and this was narrated by the interviewees in terms of an individual's responsibility or moral obligation to be industrious.

Scheduling apps are heavily enrolled in this project, regarded and promoted as the key tool for the skilled mastery of time and optimal accomplishment of tasks. If only individuals would use them methodically and intentionally, they would be able to control the precious resource of time and apportion it maximally.

As one software engineer explained when reflecting on his experience with designing calendars:

> *One of the things that we learned as we were exploring this space is that people have their own workflow, their own processes, or their own philosophy on how to handle time. If you look at things like Getting Things Done, it is like a whole religion almost. They come with a set of values on how you should live your life and people who buy into them, there's a whole set of tools and a whole set of looking at life to that and so we felt that either we build a tool that matches one of those religions or build a new religion in some ways. A new religion of how to manage time.*

He went on to say that while calendars feel very neutral and objective, 'people don't think of time necessarily like that', so using the calendar becomes 'the eyes of a particular way of looking at time'.

The shared narrative of my interviewees revolved around the urgent need to utilize time because they were so busy. However, they were also heavily invested in identifying themselves *as* constantly busy, this being a signifier of high status. Calendars were perceived as an external mechanism that could be used to facilitate, or even coach, individuals to achieve a better use of time. After all, given that we define ourselves in large part by how we spend our time, calendars afford the possibility of constantly inspecting our time use to see how we measure up (Rose, 1998). In this Foucauldian sense, one might think of calendars as literally 'technologies' of the self.

Broadly speaking, time was conceptualized as a quantitative resource that individuals *should* spend wisely, but often fail at doing. One product designer describes this temporal conundrum as follows:

> *time has a base layer, that I like to think of as constraints, things that are non-negotiable, the most obvious one being 24 hours a day. We'd like to negotiate that, that's not at all possible ... there's sleep, there's work time and then there's non-work time ... you can think of each of those chunks as budgets that you draw down from in order to do these specific things. ... So there's an intrinsic finite source, zero sum game here that we have to play with and people are also behaviourally not very good at making good trade-offs when they're trying to decide about how to spend their time in the most impactful way.*

Calendar designers, not surprisingly, often expressed the sentiment that the art of time management is one of the fundamentally unsolved and untapped areas for people, 'it is notoriously hard' and, left to ourselves, 'we do it really poorly'. Notifications or prompts were seen as particularly useful because, in the words of one designer:

> *people don't know themselves as well as they think they do ... It's like, yeah, I'll totally get this done by Thursday, but if you totally manage yourself you are going to procrastinate ... a powerful system can help by reminding you on Wednesday.*

Strikingly, in response to my query about why they were working on calendar products, many of my interviewees immediately told me about their own, personal quest for efficient time management. They expressed pride in the way they optimize time, which was

a crucial part of their self-presentation and linked to an optimal self. Indeed, their commitment to improving the functionality of calendars seemed, at least in part, driven by their own need for a better calendar. For example, a manager described himself to me in the following terms:

> *I've always been personally a time management geek. I love planning, I love logistics, I love organising things ... I'm very deliberate about the time management system I set up for myself.*

Several other participants spoke about their reliance on self-tracking productivity systems, such as *GTD* (Getting Things Done), *Zen Habits, Rescue Time* and *Beeminder*. All of these systems encourage you to specify a goal and help you 'change things that need to be done some time into things that need to be done right now'. Popular apps for time management typically intone about how poor people are at achieving their aspirations and negotiating with themselves into the future. As Beeminder states: 'your goals can be anything quantifiable – weight, pushups, minutes spent on Facebook, points on Duolingo … we'll show your progress and a Yellow Brick Road to follow to stay on track'. Beeminder has a unique feature in that it charges you if you go off track, thereby directly monetizing failure. All these apps in one way or another promise to unlock your full potential and master the art of stress-free productivity. They reflect a wider underlying cultural expectation of continuous improvement, as if increased awareness (or the colonization of everyday life) of one's behavioural data will necessarily result in a more rational apportioning of one's time.

Notably, the only senior woman engineer I interviewed shared the view that capturing and displaying all her daily actions on a virtual calendar would be hugely valuable feedback on her time use:

> *if I had such a mapping of my time, like, if I had a visual representation that told me how much time I spend with my kids, right? Basically, how much time do I spend on the things that I care about, right? If I had a tool that, if I could see it, and have the tool hold me accountable. It's like 'Oh, I'm the greatest mother on Earth', and then the tool would show me I only spent five minutes a day with my kids. Right? Like, imagine some kind of scenario like that. Having that kind of accountability to myself is something that compels me, personally to action.*

She quickly went on to say, however, that while she would act on this information, others might need more help from technology: 'I could tell the tool "Look, these blocks of time, whatever, spending time with my kids. I wanna do more of that. Help me, prompt me". Either with notes, or track it over time, like any of these other fitness goals that we have'.

A spreadsheet for time calibration

How then might this 'spreadsheet for words', as the early prototypes of personal information managers were known, shape our perceptions of time? As this analogy indicates, the only dimension of time that the graphical practices of calendar systems can represent is as abstract units of duration. The grid interface is divided into equal, interchangeable blocks of 30 or 60 minutes, as if shifting an activity from one slot to another is as easy as 'dragging' the activity across the calendar. The architecture of rows and columns

promotes a quantitative, fungible view of time. As Palen (1999: 20) argues, calendrical systems are artefacts that make time tangible, they:

> *... allow for the manipulation of time: exchanging one meeting hour for another, allotting time for a task, splicing events in between others. It is time-as-artifact that, in part, makes calendars useful.*

This is precisely what makes for scheduling flexibility, but at the cost of flattening time. Calendars cannot capture our lived experience of time as modulated, differentiated and qualitative in character. The inscribed user is the knowledge worker who rationally calculates the duration of events and can plan the day with extraordinary precision in advance, erasing unexpected occurrences and delays. The fallacy in this computational approach, as Suchman's (1987) *Plans and Situated Actions* made clear, is that it does not distinguish between formal representations of courses of actions and situated, real-life experiences.

Indeed, several designers expressed frustration at the grid format's inability to denote a more nuanced sense of intentions, context and tasks. The use of colour on the calendar to signify activities of varying importance, for example, was seen as crude. One software engineer emphasized that colour coding was used extensively to keep a visual separation precisely because 'it's very hard to wedge any semantics into an event'. He went on to explain:

> *what you have right now is effectively a grid representing your grid in a two dimensional view. Your mode of interaction is that you have something in mind, and you highlight an area of that calendar and it represents what you have in mind ... we still use a calendar pretty much the way we use a paper version. We've not yet created a new metaphor for interacting with it.*

Others stressed that the digital calendar was far more restrictive than the paper version because, to quote one designer:

> *It forces us to think about different types of time increments. My digital calendar is a grid, every square represents one hour. The things that are represented on that grid most effectively are our meetings ... All I think about is how can I construct every day in half an hour and two-hour increments. It's actually very hard in an hour-based grid system to plan a weekend trip, or a week-long vacation, whereas in an old school paper calendar you put a line across. ... I think one of the effects on time management is now we think about much smaller blocks of time and scheduling smaller blocks of time.*

Several interviewees remarked that a typical calendar interface fragments time and makes it hard to make time for longer term thinking:

> *I'm too polluted in my mind by the calendaring system, so its hard for me to imagine a different unit of measurement that is not half hour or 15 minutes ... we definitely think in terms of the tools we use.*

Such sentiments echo the dominant temporal orientation that Mazmanian et al. (2015: 1453) found among professional users of calendars, in which time is considered *chunkable, single purpose, linear* and *ownable*. An extreme version of this logic, I would argue,

underpins designers' accounts of how digital calendars modulate time. The notion that time is a resource that is owned by an individual, that it is a territory that can be conquered, is an integral part of the injunction to manage one's own time efficiently.[4]

Visibility on the grid

I noted above that the recording of a task or event, *or not*, is a way in which significance is defined. In this final section, I want to reflect upon the way that the grid architecture of calendars affects the kind of activities that can be straightforwardly represented, while others are neglected or rendered insignificant.

By far, the most common personal activity recorded on the calendar was 'gym'. As one person remarked, I need to put gym in but not buying groceries as 'that can be done anytime' (perhaps a signifier of the time priorities of a young single male). When I asked him why going to the gym was so important, he told me about the Californian necessity to have a body in good shape, 'it has a lot to do with the importance of perception and how physically attractive one is'.

I had noticed that in the three short blocks of mainly restaurants in my local area's South California Avenue, there were 10 gyms/yoga/pilates/massage centres – surprisingly many given that both Stanford University and the high-tech companies provide multiple facilities of their own. (Attending a talk at the Computer History Museum in Mountain View, I was intrigued to hear the billionaire founder of WhatsApp, Jan Koum, say that he was motivated to design his first app by the need to notify people that he was missing their call because he was at the gym!) The extent to which this activity can be considered as leisure, as opposed to necessary bodywork, is an open question. As Boltanski and Chiapello (2007) among others have shown, the distinction between the time of private life and the time of professional life becomes increasingly difficult to draw.

However, the question of what is considered to be legitimate work or not is of considerable significance to designers of systems. As Star and Strauss (1999: 25) point out, as applications affect relations of power and the nature of work, designers need to be acutely aware of the assumptions they make about work processes. Otherwise, they risk systematically excluding certain forms of work: 'if the system does not account for the matrix of visible and invisible work and its questions of equity, those at the bottom will suffer'. The authors contrast the primary focus of CSCW on professional work processes with the concomitant neglect of caring work and housework. This is clearly tied to different regimes of evaluation, as affective work, the most difficult and deepest of all labours, requires 'quality time' that cannot be calibrated according to the temporal accountancy of rational scheduling (Wajcman, 2015: 170). The dominant temporal logic thereby renders it invisible.

Certainly, such intimate aspects of life were rarely mentioned in my interviews about the function of calendars. Perhaps this reflects the fact that private time is hard to categorize in the quantitative matrix of the grid. (Interestingly, meditation apps retain circular clock time even with their Buddhist overtones). This, in turn, may be related to the preponderance of young, unencumbered men in engineering, while the responsibilities of care have generally fallen on women. Moreover, most of the interviewees spend long hours at the workplace. While their work calendar is generally open inside organizations, it is literally closed to all outside. Yet the quest for the hyper productive lifestyle of these

Silicon Valley techies – for making the best possible use of one's time – depends directly on a myriad of 'invisible' services provided by those who are less privileged. (I vividly recall that Stanford's clean streets and pristine lawns were soundtracked by the constant whirring of leaf-blowers.) Time is portrayed as an individual resource to be husbanded, rather than as relational, a collective accomplishment.

Digital scheduling systems can only garner time because of the starkly polarized social arrangements or 'chronographies of power' (Sharma, 2014) in which they are embedded. The time of the lean fit bodies of these workers, honed to perfection to be productive for capital, is exceptionally valuable. (Stanford computer science graduates garner starting salaries of over US$100,000 – bolstering the belief that this type of work is the most creative, cutting-edge, brainwork to do – Google's AI group is after all called 'Brain'). The lack of recognition of the bodies of service workers, who are required to synchronize their diurnal rhythms with those that they service, is reflected in their low pay. The proliferation of apps, whereby you can simply click and anything under the sun is provided in record time, adds to the illusion that technology puts time fully at one's command.

Conclusion

Logistical media are ordering devices; part of the infrastructure or scaffolding that configures arrangements among people and things. Digital calendars increasingly play such a role, setting the rhythm of everyday timekeeping practices that inform our consciousness of temporality. So, their design and their material affordances matter.

This article has explored the ways in which distinctive, time-related social norms and moral judgements are manifest and materialized in the process of calendarmaking. I have shown that Silicon Valley engineers conceive of calendars primarily as tools for efficiency, and this is framed within a particular mental model of knowledge work. The driving cultural imperative is a desire for accelerated time handling in order to optimize productivity and ensure the minimum of time wasting. Time is viewed as an individualistic resource, a commodity, a sequence of events that can be mastered by means of computational expertise. In effect, contemporary ideals about time management are being instantiated in scheduling software.

Calendars take on a contradictory character in this context. On one hand, they can provide a source of positive identity and a sense of accomplishment. On the other hand, this same recording function routinely sets up personal failure, as lived time rarely matches ideals or intentions. As we know from research on other self-tracking devices, new forms of self-knowledge can normalize and legitimate the need to recalibrate our activities in order to stay in tune with quantified data.

Moreover, decisions about what should and should not be entered on the grid interface become a kind of temporal accountancy, a medium for both self-monitoring and public performance. The current trend to use algorithms to combine calendars, emails, contacts and other data between multiple platforms, and increase notifications, will further reinforce the notion that what is documented in these various media can be equated with what is important. The qualitative, multi-layeredness of the temporal texture of everyday life, involving things that are important but not time sensitive, will remain diminished.

I began this essay by noting how the linear, clock time of industrial capitalism engendered the pursuit of a disciplined and frugal use of time in the quest for

efficiency. Modern time management was built on precision scheduling. In this sense, the widespread adoption of digital calendars echoes Frederick Taylor's use of the stopwatch to regulate work over 100 years ago. However, the bodies that were synchronized to the speed of machines then could clearly distinguish between their own time and the employers' time. 24/7 mobile connectivity has made these boundaries increasingly porous as work concerns and obligations are always present, close at hand. Calendars accompany us everywhere, mediating our sense of time and representing our actions, movements and priorities in minute detail. As such, they serve both as a powerful metaphor for visualizing temporality and a tool for enacting it. The unacknowledged assumption is that all time should be colonized, compressed, harnessed and controlled. Moreover, as apps know no boundaries, and our bodies are rendered evermore translucent and subject to datafication, they potentially extend the dominant temporal logic into the very interstices of life. Even leisure time is subject to the principles of optimization.

Whether this marks a profound reconfiguration of social time, a new techno-epoch, remains an open question. Certainly, what is does signify is a more personalized relationship to acceleration as a moral enterprise. Digital calendars are thus intimately entangled in the ongoing material remaking of time mastery as an individual responsibility, a quest ripe for technical fixes.

What of the near future that is being made here in this iconic place? From the outset, as I noted above, electronic calendars were envisaged as a part of the broader attempt to build a comprehensive 'interpersonal information manager'. By codifying and rationalizing human activities, augmenting the brain with artificial intelligence, the calendar would enable the seamless organization of information, coordination and tasks. The current vogue for algorithms, machine learning and datafication projects an updated image of this quest – turning calendars into virtual personal assistants or your concierge (as Samsung's vice president described the smartphone). Many interviewees spoke about a future in which we would develop a personal relationship with the calendaring device, rather like a coach who would 'nudge' us to make more rational decisions about the allocation of time. The desire for a butler, to whom we can delegate routine labour and thus not waste our own precious time, continues to animate such visions.

Such a sociotechnical imaginary involves applying AI to further quantify more and more aspects of our behaviour, encouraging the automation of judgements, evaluation and decision-making. It is as if the messy, unpredictable business of everyday life is an engineering problem to be solved by algorithmic improvement. The real problem, however, is that the only basis on which even intelligent machines can make what amounts to value judgements about our time use is according to an instrumental philosophy in which an efficient life is morally equated to a good life. Calendars will never ask us what we want to save time for. Nor will Siri or Alexa ever answer that question.

Acknowledgement

The author would like to thank the Center for Advanced Study in the Behavioral Sciences at Stanford University for awarding her a Mellon Foundation Fellowship (2017–2018) to support this research.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. https://patents.google.com/patent/US3999050?oq=3%2c999%2c050+1975.
2. See the CSCW (*Computer Supported Cooperative Work*)/HCI (*Human-Computer Interaction*) literature on the challenges of implementing groupware, for example, Grudin (1994), Orlikowski (1992) and Palen (1999).
3. While some prototypes were developed in Cambridge Mass., Silicon Valley (which arguably encompasses Seattle where Microsoft is based) is the current setting for digital calendar design.
4. It also, as Gregg (2018) argues, reinforces patriarchal and colonial regimes of thought.

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