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The temporal organisation and practices of planning work: The temporalities of digital infrastructure, the digital infrastructuring of temporality

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Abstract
Digitalisation is having a profound impact on the relationship between time and planning. The temporalities of planning's bureaucratic infrastructure is being transformed through its digitalisation, introducing machine and network time and reshaping the relations between past, present and future. In turn, the temporalities of digital infrastructure has led to re-infrastructuring of planning's temporalities, introducing a new timescape wherein the pace, tempo, timings, time patterns and temporal modalities of planning practice have been reconfigured. Yet, despite the profound effect of digitalisation on temporal relations, clock time remains important in the organisation and work of planning given the centrality of time rules and timetables, and this will continue to be the case. Using a case study of the development and control function of planning in Ireland, this paper examines temporalities of planning's digital infrastructures and the digital infrastructuring of planning's temporalities, illustrating the ways in which the temporal organisation and practices of planning work are being re-cast.

Key words: planning, temporality, infrastructure, digitalisation, digital technologies, artificial intelligence

Introduction

Planning is an institutionalized activity that creates proposals and makes decisions about the design and development of land and the built environment. It determines how landscapes and places should be managed, assesses what new forms of development might be desirable and permitted, designs action plans to realise planned ambitions, and monitors and disciplines change of use and new construction (Hall, 2002). Such work can span scales from the local (e.g., seeking permission to build a new house) through to the supra-national (e.g., a shared piece of infrastructure linking nation-states) and can involve many stakeholders (e.g., planners, developers and builders, politicians, and local communities) who have quite different interests and aims. To give planning sufficient governmental authority, it is underpinned by a set of legal statutes, regulations, directives and policies that stipulate how planning should be practiced, proposals assessed, and decisions made and appealed; and it is practiced by a suite of public bodies that have responsibility for undertaking or overseeing planning work (e.g., local and regional government, planning appeals boards, national government departments, and special purpose vehicles such as strategic development zone authorities). To structure planning work, across jurisdictions, it is generally divided into three main blocks of tasks: strategic (or master) planning to determine what type of development will occur over multiple years at local and regional scales; development and control to assess planning applications and associated appeals and track building control requirements; and enforcement and compliance to check adherence to the conditions of a planning permission and take any necessary legal action.

Planning is often cast as a spatial discipline (Davoudi and Pendelbury, 2010), but at its heart it is a thoroughly tempo-spatial enterprise. Indeed, the planning timescape is relatively complex and planning practice unfolds within, and produces, multiple temporalities (Abram and Weszkalnys, 2011; Laurian and Adams, 2019). Adam (1998, 2004) describes a timescape as a cluster of associated temporal relations that collectively work to (re)produce a temporal regime. Such temporal relations include timeframes (temporal scale), temporalities (forms), tempo (at what speed), timings (how synchronized/coordinated), time point (when), time patterns (how organized), time sequence (in what order), time extensions (length and horizon), and modality (past, present, future) (Adam, 2004; Kitchin, 2023). Planning is largely a time-ordered and time-pressured activity grounded in clock time and its timeframes are a measured quantity (days, years). Its timings are rationalized and coordinated, and its time sequence ordered, with processes running in relation to established timetables with legally defined deadlines (e.g., a planning application in Ireland must receive a decision within 12 weeks of submission) or working to defined timescales (e.g., a five or ten year plan). Its temporalities are regulated, controlled and defined in legislation. The tempo of planning work is generally steady and rhythmic, striving towards efficiency and optimisation, while being cognizant of the need for reflection and reaction. Its time extension is generally years, with resulting development likely to be in place for a century or more. Its temporal modality stretches across the past, present and future, seeking to chart the future of places from the standpoint of the present and informed by the past

(Ekman, 2024; Laurian and Inch, 2018). Planning is thus promissory in nature, plotting a path towards a desired landscape and society (Durrant et al., 2024). Yet, there are often temporal slippages, with delays and pauses common. Between calls for further information, revisions to plans, and the appeals process, decision-making can stretch for years. Planning bureaucracy is then frequently 'punctuated rather than enduring', 'full of discontinuities rather than linearity and clarity' and 'pivot[s] around compliance and delay, synchrony, and avoidance, and the multiple possibilities for forward looking and backdating' (Guyer, 2007: 416, cited in Raco et al., 2018). Tensions and conflicts can frequently arise between the demands of 'economic (market) time, political (ideological) time, democratic (deliberative) time and procedural (bureaucratic) time' that are prioritised by different stakeholders (Dobson and Parker, 2024: 8).

This tension is evident in Italy (and elsewhere) through the temporal interventions of the CittaSlow movement, established in 1999 to promote an alternative pace of life that ameliorates the time pressures and stresses produced by the processes of globalisation and neoliberalisation (Mayer and Knox, 2006). The CittaSlow movement encourages city administrations to adopt a set of principles and pledges to produce slower, healthier, more sustainable social and economic practices, and development authentic to the region (Pink, 2008). Similarly, several policies and laws were introduced in Italy in the early 1990s to regulate the timings and scheduling of urban services and workplaces, with Italian municipalities having to create a territorial time plan that harmonized the timetables of public and transport services with the needs of citizens, rather than allowing businesses and government bodies to solely determine operational scheduling (Bonfiglioli, 1997; Radoccia, 2013). In particular, time plans had to take account of gender and adopt policies that facilitated the childcare needs of working parents (such as schools, businesses and government services not sharing the same operating hours, but rather be overlapping).

At present, the temporalities of planning in the Global North are being reconfigured by two major drivers of reform, both of which have implications for the organisation and practices of planning work. The first is political economy-driven demands for planning to become more efficient and quicker, evident in neoliberal reforms designed to streamline and speed-up planning to better serve the interests of capital and a political agenda (Abram and Weszkalnys, 2011; Raco et al., 2018). This includes demands for productivity gains and time squeezes through institutional reform and increases in staff performance through work intensification and the cutting of 'red tape' and deregulation to simplify processes and remove procedures that consume time and create delay (Dobson and Parker, 2024). Here, time to assess plans against a complex set of criteria, to seek input from all designated constituents, and for deliberation, is cast as a burden, unnecessarily delaying development and growth and restricting market flexibility. Due to its supposed inefficient temporalities, neoliberal actors thus seek to assert control over the planning process and to impose a revised timescape (Raco et al., 2018; Durrant et al., 2024).

The second driver of changes to the temporal regime of planning is the digitalisation of planning praxis as analogue systems and processes are replaced by digital equivalents, accompanied by new digital systems performing new tasks (Boland et al., 2022; Potts, 2020). Digital technologies have been seeping into the operations of planning in the Global North since the late 1950s and their initial use in land and transportation modelling in the United States (Batty, 1994). In the 1980s, geographic information systems (GIS) and computer aided design (CAD) were adopted by local government across Europe and North America for mediating planning work, followed by planning application management systems (PAMS), expert systems and spatial decision support systems in the 1990s, consultative online platforms and 3D spatial media (virtual/augmented reality, building information modelling, and digital twins) in the 2000s and 2010s (Potts, 2020; Batty, 2021; Kitchin et al., 2021). At times, rather than simply being employed as tools, there have been attempts to shift the logics of planning theory and praxis so that it follows computational logics. For example, in the late 1960s and early 1970s, a cybernetics approach to urban and regional planning was proposed in the United States in which computational models would determine optimal planning outcomes and guide decision-making (Forrester, 1969; Flood, 2011). This initial algorithmic approach was largely rejected by the planning community in favour of a more consultative framework (Lee, 1973; Light, 2003), though the call for planning to be more scientific, computational and technocratic in nature has persisted (Batty, 1994), with a cybernetic approach resurfacing in the 2010s with the rise of smart city logics and technologies (Krivý, 2018). Regardless of the underlying logics of planning, it is now an enterprise that, in the Global North, is extensively digitally mediated.

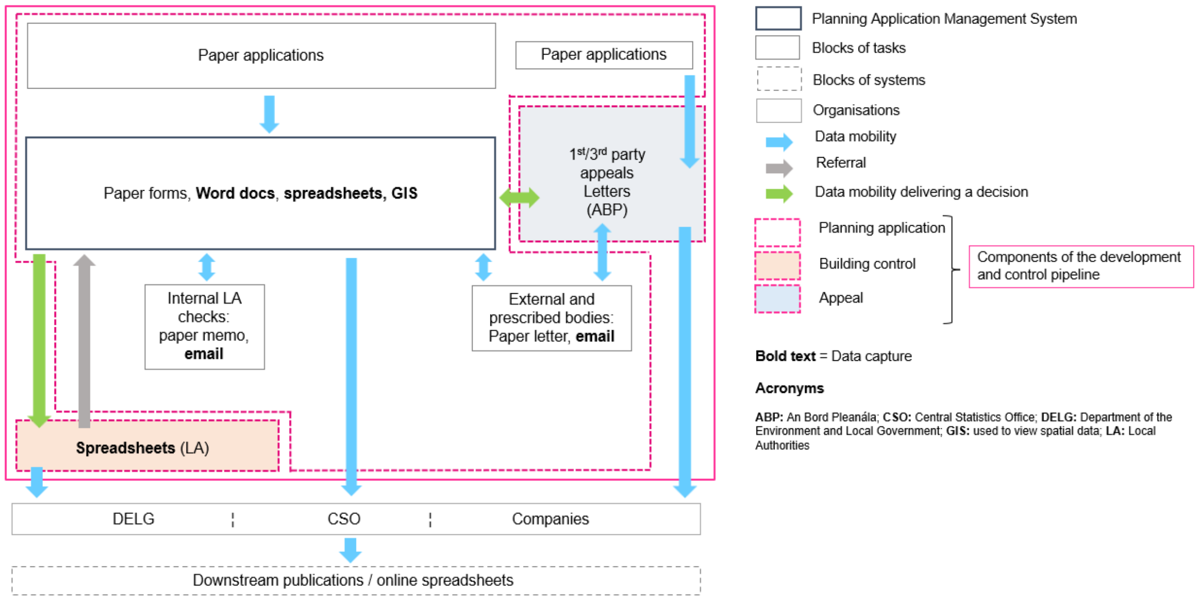
This paper focuses on the second driver, and how the digitalisation of planning has altered, and will continue to amend, the organization, nature and temporalities of planning work. Following Stine and Vollmar (2021), the analysis is divided into two main sections. The first considers the *temporalities of planning's digital infrastructures*; that is, how the digital technologies used in planning, which are bounded together into a functioning digital infrastructure and data ecosystem, are subject to their own temporalities, such as their lifecycles and unfolding process of digitalisation over time, and their day-to-day operation and maintenance (Coutard, 2024). The second examines the *digital infrastructuring of planning's temporalities*; that is, how planning's evolving digital infrastructure reshapes its timescape by remediating the timings of planning, such as the progression along the development pipeline and the everyday practices of planners (Raco et al., 2018). It is important to examine both aspects as there is a recursive relationship between the two: the temporalities of infrastructure shapes the infrastructuring of temporalities, and vice versa (Engels, 2020).

The analysis draws on a case study of the development and control function of the Irish planning system. This case study consisted of identifying all the IT systems used within development and control across the 31 local authorities (LAs) and state agencies that are designated planning authorities in Ireland: (1) documenting the tasks they were used to perform; (2) charting how the IT systems were interlinked to form a digital infrastructure that supported a data ecosystem and performed complementary tasks (van Schalkwyk et al., 2016); and (3) how this had developed over time between 2000 and 2025. The work was informed by interviews conducted with 29 public sector officials (14 women and 15 men) within the planning system at local, regional and national levels between June and August 2023, including walk-through interviews, wherein the interviewee undertook their usual data work, demonstrating and explaining how they used a data system and its various functionalities. Interviewees were generally mid-career and held middle management positions, though some were in more senior positions. At the request of the project funder, interviews were either not recorded or their quoting was prohibited. In addition, a full data audit of five systems was undertaken to reconstruct their data dictionaries and a close reading was performed on user manuals.

The temporalities of planning's digital infrastructure

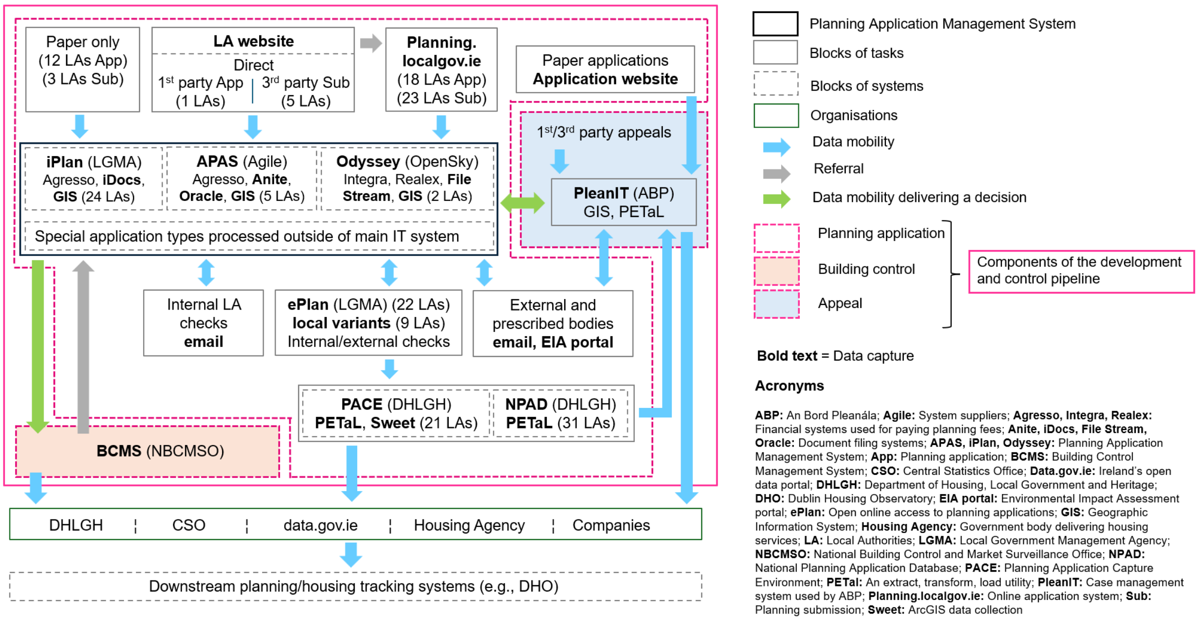
The digital technologies used within planning are subject to their own temporalities, such as long-term change over time, and short-term day-to-day rote operations, which in turn make a difference to the constitution and operation of a planning system. As noted, the digitalisation of planning has been a gradual process. Digital systems were initially used to undertake specialist tasks, such as to run simulation models or to map property assets. With the introduction of e-government in the Global North in the 1990s, there was a move towards the digitalisation of everyday planning work, such as the processing of planning applications. Paper-based bureaucracy started to be supplemented with, and replaced by, an emerging digital infrastructure. This process of digitalisation is selective and piecemeal in nature and takes place over a number of years, rather than there being a critical juncture and a rapid shift to an entirely new set of procedures and modes of assessment. For example, in the Irish case, prior to 2000, the management of the development and control pipeline was almost entirely a paper-based enterprise (see Figure 1), consisting of a set of interlinked processes that spanned LAs, An Bord Pleanála (ABP; the national planning appeals body), and prescribed bodies (organisations whose opinion on planned development had to be consulted). Planning applications were submitted using paper forms, communications with applicants and stakeholders were via paper letters, and all information was managed and tracked using a paper-based filing system. By the mid-1990s, there was some use of email for communications and the use of word-processing and spreadsheets for recording and tracking information. From 2000 onwards, the development and control bureaucracy started to become more digitally mediated.

Figure 1: Development and Control in the late 1990s



In 2000, Dublin City Council became the first LA in Ireland to implement a planning application management system (APAS) for processing and tracking planning applications. Despite this, applications continued to be submitted as paper documents for another twenty years, with a national online portal (planning.localgov.ie) for submitting digital applications only launched in 2022. Until then, planners were required to scan the paper documents and manually enter the data into APAS. As of August 2023, 12 LAs were still accepting paper-based applications only (see Figure 2); this number decreased to 4 by August 2024. Furthermore, not all types of planning application could be processed through APAS, with a number of specific forms of application being handled using different procedures. In the years following Dublin's adoption of APAS, additional LAs began implementing digital systems, using either locally adapted versions of APAS or iPlan, a system developed by the Local Government Computer Services Board (LGCSB), a state body. In 2015, a third system, Odyssey, was adopted by two LAs. In 2003, a national shared eplanning system was introduced that shared key documents in a planning application via the internet so members of the public could view them without having to visit the planning office. However, written submissions objecting or supporting an application needed to be posted as a paper letter. Building control continued to be monitored using spreadsheets and document management systems until 2016 when a national shared service, the Building Control Management System (BCMS), was introduced. Similarly, ABP only introduced its management system (PleanIT) in 2017. The National Planning Application Database (NPAD), a new digital system that does not have a paper-based equivalent was first introduced in 2016. A second such system, Planning Application Capture Environment (PACE) was introduced in 2021.

Figure 2: Development and Control in August 2023



The rationale underpinning the digitalisation of planning has largely been to replicate the analogue infrastructure already in place (see Figure 1) with digital equivalents (see Figure 2). In this sense, the analogue infrastructure – through its embedded systems of management and governance and legal/regulatory framing – provides a degree of path dependency that produces a self-reinforcing direction of travel (Rast, 2012). In addition, embedded work practices and resistance to change by workers, along with the embeddedness of legacy technologies, can also slow, disrupt, and prevent transition and system change. However, as we have argued elsewhere (Kitchin et al., 2025b), the process of digitalisation was not pre-determined or linear, but emerged from a complex interplay between various stakeholders (Dublin City Council was an early adopter, others were slower to adopt). Indeed, aspects of development within the same infrastructure can be divergent, with several related components unfolding over time in variable ways. In the Irish case, different LAs adopted and configured the same data system in varying ways, or employed different data systems to perform the same tasks.

The production of digital infrastructures rarely passes through an anticipated, sequential phasing of planning, procurement, construction, growth, maturity (followed by decline and demise) (Carse and Kneas, 2019; Coutard, 2024). Instead, their unfolding is shaped by blockages, delays, realignments and obsolescence that add dead-ends, retreats and knots to the path experienced (Carse and Kneas, 2019; Moss, 2021). As Addie et al. (2024) note:

> 'Infrastructure systems are … inherently spatio*temporal* products, constructed through intersecting times: of planning, of capital flows, of political cycles, of embodied practice, and

> of the material properties of their organic and inorganic assemblages. … [I]nfrastructure is always in a state of becoming, 'designed to do something, but … never "finished" ' (Smith, 2016: 173).'

Infrastructure development involves many stakeholders who have vested interests and its evolving design, governance and operational arrangements are negotiated compromises (Kitchin et al., 2025c). Undoubtedly, choices and decisions are shaped by existing relations – in this sense, the system architects are heirs rather than pure innovators (Rose, 1990) – but a direction of travel is not assured. At any one point of development, there are always alternative paths that can be taken. Engels (2020) thus argues that infrastructure histories should be understood not as sequences, but as palimpsests, with new socio-technical elements layered and fused onto ones produced in different periods, so that 'multiple historical times present at the same moment, layer upon layer pressed together, some still volatile, others already hardened' (Koselleck, 2018: viii). As Monstadt (2022) notes, multiple components, each with their own time frames, timings, time patterns, extensions and modality, are added together to become reciprocally linked, though they are not necessarily mutually dependent. These fused pasts and presents project into and enable the future. As we detail in the next section, this slow and partial digital transition has had consequences with respect to the temporalities of planning. It is now the case, however, that everyday planning work is increasingly being performed using networked digital systems that operate in machine time and network time.

Machine time refers to the micro-temporalities of digital system performance and is composed of a number of forms including 'seek time, run time, read time, access time, available time, real time, polynomial time, time division, time slicing, time sharing, time complexity, write time, processor time, hold time, execution time, compilation time, and cycle time' (Mackenzie, 2007: 89-90). In complex systems composed of many devices and networks (e.g., sensors, computers, routers, servers, etc.) there are multiple machine times at play. Automated processes operate in machine time, performed at significantly faster pace than human calculation and labour, meaning that far more work can be undertaken very efficiently, such as transferring and processing of very large numbers of records that would be incredibly time-consuming to undertake by hand.

Network time refers more broadly to time that is digitally mediated. Two predominant forms of network time are in operation in the Irish planning system. Asynchronous connection and response in which communications (e.g., email) and data transfers happen at the speed of light, but the receiver chooses when to reply or process (ranging from a few moments after delivery to never). In contrast, synchronous connection involves a real-time exchange or processing, for example in automated transfers of data through ETL (extract, transform, load) processes. Both asynchronous and synchronous connection produce radical time-space compression, including both time-space convergence (the reduction in time taken to travel or communicate between locations) and time-space distanciation (increasing synchronicity between places so that they become interdependent) (Leyshon, 1995; Kitchin, 2023). In other words, systems located in different places can work in harmony with each other through a real-time connection, and the control of systems can be performed in real or near-real time from a distance. Data mobilities are thus transformed, with the pace and tempo of the infrastructure heightened compared to when it was paper-based. That said, in the case of the planning system, while digital systems operate in machine time, most planning processes are performed asynchronously as they are directed and controlled by people rather than being fully automated. That is, people enter and upload data, they send requests and answer queries, they check, process and transfer data, make decisions and communicate them, with these tasks being digitally mediated, performed using (cloud) databases, management systems, office and communications software (e.g., word processing, spreadsheets, email clients). Consequently, interruptions and delays often stem not only from individual time management challenges or excessive workloads, but also from broader intersections of work and non-work responsibilities, as well as organisational processes that limit the capacity for timely action.

Other interruptions and delays are caused by faults, security threats, and the everyday reordering of procedures and processes as systems evolve creating disjunctures, all of which require temporal care practices. Schabacher (2021) identifies four such care practices that correspond to different temporal patterns:

> 'First, the retrospective response to unforeseen interruptions (repair); second, the prospective routine procedure to prevent all forms of disorder (maintenance); third, a neglect of care that leads to devaluating infrastructure (abandonment) as well as—fourth—forms of revaluation in changing contexts (repurposing).'

These forms of care have different temporal rhythms. While repair happens occasionally in response to a breakage, an interruption in a usual operating rhythm, maintenance mostly consists of repetitive, routinised, slow, mundane work that ebbs and flows, whereas abandonment is a flatline of decay and deterioration or a usual rhythm punctuated by a rapid decline and stop. All of these temporal care practices and temporal rhythms were evident in our case study, with workers undertaking them to ensure that individual systems, and the infrastructure as a whole, continued to function (repair, maintenance), old systems were replaced (abandoned) with newer ones, and additional value was produced (repurposing data). For example, the ETL process for extracting data from ePlan systems and transforming and loading it into NPAD regularly fails due to LA firewalls and alterations to server settings (sometimes caused through maintenance patching updates), resulting in the data for some local authorities being unavailable until fixed (which might take a couple of months). The two Cork local authorities abandoned the Odyssey system in 2024 replacing it with APAS, a process that led to a temporal squeeze as planners undertook their usual work, while also setting up and populating the new system.

In addition, digital technologies such as management systems and GIS enable the weaving together of different modalities: the past, the present, and the future (Adam 2004; Degen, 2018). Databases hold archives of past planning applications and landscapes, as well as the existing state-of-play, and the processing and evaluation of new applications project future potential development. These technologies thus aid planners to consider the three modalities in relation to each other and to assess the merits of different planned scenarios. In the paper-era, such work would have been difficult and time-consuming as these complex tasks would need to be undertaken by hand. However, the machine time of digital technologies enables the rapid prototyping of design and to run multiple iterations of scenario modelling (Batty, 2021). Here, the past can be mobilised as a resource from which insights and value can be extracted using digital tools to efficiently project and assess possible, plausible and preferred futures (Poli, 2015). Such tools include the use of ePlan (and related) systems, which makes an archive of past and present planning applications available to the public, enabling them to easily search, browse and access key application documents in order to consider how a place has developed over time and to project potential future changes to the existing landscape. Likewise, the use of 3D spatial media such as virtual reality (VR), augmented reality (AR), Building Information Models (BIM), and City Information Models (CIM) enable users to place proposed new developments into an existing 3D landscape to view what it would look like if built and to run various scenario models of the effects of construction (such as sunlight/shadows, viewsheds, flooding and traffic) (Kitchin et al., 2021).

What this discussion highlights is that the temporalities of digital infrastructure are multiple and qualitatively different in nature to those produced under clock time. Rather than following a linear or uniform progression, digitalisation in planning unfolds unevenly through a complex interplay of legacy systems, institutional path dependencies, stakeholder negotiations, and evolving technologies. These infrastructures operate though hybrid temporalities, combining machine time, network time, and asynchronous human activity, which reshape how planning is conducted. As such, the digitalisation of planning introduces new temporal logics that transform the sequencing, pace, and coordination of planning tasks, producing a more fragmented and dynamic temporal landscape. In turn, the temporalities of digital infrastructure alter the temporalities of planning.

The digital infrastructuring of planning's temporalities

The temporalities of planning, as noted, are rooted in the timetables and deadlines of clock time, defined in statutes (each process – pre-planning consultation, planning application assessment, appeals, building control – has a defined timeline for completion). The performance of planning practice, however, is increasingly mediated through machine and network time due to the use of digital systems. As planning workloads increase and the external pressures for a speedier planning system grows, there is pressure to do more with less given resources remain static or are shrinking. Digital systems are promoted as the means to achieve necessary efficiencies and increase productivity to enable timelines to be met. For example, in the Celtic Tiger period (a phase of rapid economic growth in Ireland from the mid-1990s to the late 2000s) PAMS (APAS and iPlan) were adopted to modernise planning services and to improve the efficiency and timeliness of planning decisions at a time when planning applications were surging (annual housing completions were 19,652 in 1991, rising to 49,812 in 2000, and reaching a peak of 93,419 in 2006; Kitchin et al., 2016). In the wake of the 2008 global financial crash, and the collapse in Irish government finances and the IMF-EU-ECB bailout of 2010, LA staffing fell from 35,007 in 2008 to 26,630 in 2015, a reduction of 8,377 (23.9%) (DPER, 2024). Digital planning tools were a means of replacing shrinking human labour and this continues to be the case. Austerity measures still affect the local authority sector, and planning departments in particular. LA staffing in Q4 2023 was 31,792, still 9.2% below 2008 numbers. In 2022, the Local Government Management Agency (LGMA) and Department of Housing, Local Government and Heritage (DHLGH) identified a need for 541 new posts in local authority planning departments, a 35% uplift on staffing numbers at the time, plus for the 10% of already established but vacant posts to be filled (DHLHG 2024). In 2024, the DHLGH concluded that 'there are strong signals that the pool of professional planners in Ireland is undersized by a factor of 25-30%' (p. 11-12).

Switching from postal mail to email for sourcing internal and external evaluation of planning applications enabled much quicker delivery of requests, and, although both are asynchronous in nature, response times using email are typically much faster. Email can also take advantage of pre-formatted templates where key fields can be auto-populated and the sending of requests can be automated. In other words, digital systems enable a more refined coordination and synchronisation of planning tasks that are stretched out over time-space (at local, regional and national scales and across many stakeholders). The switch also saves paper, printing and postage costs. Digital data mobilities, in general, enable a much more efficient transfer of data between digital systems, as well as significantly more data to be shared and processed (Kitchin et al., 2025a). The use of PETaL to automate the transfer of data from ePlan systems to NPAD occurs in real-time and enables the time-shifting of the labour time saved to other tasks. Similarly, for companies such as Construction Information Services (CIS) Ireland, who used to visit every planning office once a month to manually document all planning applications made to LAs, web-scraping of ePlan sites speeds up and enhances their work. Not only can they compile data daily, but they can capture far more information than they had been recording by hand. Moreover, they can scrape other related data about proposed developments, such as from e-tender websites, and combine them to produce new insights and products. The use of digital calendars, with auto-prompt reminders to chase-up responses and to fulfil tasks prior to deadlines, enable workers to manage their time and work, and to reschedule their diaries when needed. During Covid-19, remote access to the digital systems detailed in Figure 2 enabled planners to perform most of their work from home, experiencing radical time-space compression. However, any paper applications still needed to be scanned before their details could be ingested into

PAMS and file management systems. For those LAs which had adopted planning.localgov.ie, the public could submit their applications online. When a LA switches from paper application to digital submission a significant amount of time is saved as scanning, uploading and cataloguing the documents is a time intensive activity.

Given the continued importance of clock time and timelines, planning tends to be quite repetitive, rhythmic and patterned activity. The adoption of digital technologies to mediate planning work should further harmonise and synchronize its rhythmic nature. Indeed, digitalisation has enabled a change in pace and greater synchronization across digital systems and stakeholders. However, such effects have been partial since technical and social data frictions disrupt the usual tempo and rhythms of planning processes and data practices (the embodied means of performing data work), producing temporal effects. Data frictions are impediments or blockages that hinder the performance of data practices and prevent, slow, or make difficult the sharing of data between data systems within and between organisations and hinder the production of eurhythmic (harmonious and stable) rhythms (Edwards, 2010; Bates, 2018). Instead, data frictions produce arrhythmic patterns of work that are out-of-sync and punctuated. Data frictions can be caused by a number of issues, such as technical frictions, like incompatible data formats, glitches, non-aligned workflows, and socio-cultural fictions, such as weak institutional capacities (e.g., skills, resources), refusal of actors to cooperate and share data, and regulatory and legal limitations (Pink et al., 2018). Both kinds of data frictions were present in our case study.

With respect to technical data frictions, the data dictionaries for PAMS vary quite substantially in terms of what data are captured, with marked differences in the number of required fields (e.g., iPlan has 65 compulsory fields, Odyssey 40, and APAS 21) and optional fields (iPlan, 265; Odyssey, 409; and APAS. 194). iPlan makes extensive use of open text fields, whereas APAS and Odyssey make greater use of check boxes and dropdown menus. Open text fields enables bespoke information to be recorded, but also means that the data recorded lack standardisation. PAMS systems are designed to process and assess planning applications, but are not to produce official statistics or to run bespoke data reporting (e.g., requests from DHLGH or to answer freedom of information requests). Consequently, a planner in a LA might spend a week or more each month manually extracting planning application data from PAMS for reporting to the Central Statistics Office (CSO). Workers in the CSO then spends a month or more cleaning, wrangling and standardizing the data from across LAs to produce national level official planning statistics. Likewise, the lack of standardized reference IDs for planning applications across PAMS, Plean-IT and BCMS means that it is difficult to track each proposed development as it moves along the planning and construction pipeline, and doing so is a time-intensive task that is performed through extensive search. The PETaL process for transferring data into NPAD from ePlan systems can be glitchy and often needs repair, and this can take some time as many LA planning departments do not have the time and/or expertise to resolve such issues and it is left to the DHLGH to repair outages, which may involve site visits. In each of these cases, delays are being introduced and the timings of workloads are reconfigured to try to maintain timelines and efficiency gains. Technical data frictions are lessened through maintenance and repair, the adoption of shared standards, protocols and detailed metadata that enable interoperability, and clear documentation and communication that creates a shared understanding between actors. Undertaking these tasks requires time, which is in short supply, thus perpetuating data frictions.

Socio-cultural frictions relate to the wider-context in which planning work is undertaken. Planners experience a form of temporal arbitrage (Sharma, 2014), with their work having to follow the defined timelines set for processing each application (Laurian and Inch, 2018). This arbitrage becomes more of a burden as its effects are deepened. Understaffing due to austerity measures has led to some fatigue, frustration and demoralisation in LA planning departments as the workload increases but resources remain the same and the timelines to process each application remain static. Dissatisfaction with temporal pressures is translated into practices of refusal or prioritisation, such as ignoring non-urgent maintenance work or optional work and focusing on absolutely necessary operational functions. One expression of such tactics is different staff members inputting varying amounts of data for each application, with some recording all relevant data and some recording the minimal viable amount (e.g., required fields), leading to patchiness and inconsistency of data capture across applications. Another is staff members delaying communication with an applicant for further information until near to the decision deadline; once such a request is issued, the timeline is reset back to the start of the process. As Arican (2020) notes, delays are a means of claiming temporal power and asserting some degree of control over the timing of planning work. Social data frictions are eased by additional resources, alterations to workflow, and changes to workplace governance.

As noted, public sector planners are not the only actors seeking to control and manage the temporalities of development and control. Private sector interests actively lobby for reforms of the planning system in order to speed up the turnaround time for processing applications and making decisions by making the system simpler and reducing delays caused by planners or third parties objecting to plans. Yet, Marshall et al. (2015) note that planning delays are most often caused by applicants submitting proposals that do not comply with planning regulations, are experiencing financing issues, or are being opposed politically and communally. Indeed, developers often seek to control the pacing and timing of the planning process, slowing and speeding up the bureaucratic procedures where necessary in order to negotiate more favourable outcomes over the longer term and to value-engineer plans, allowing assets to appreciate in value, bring a development to market at the optimal time to maximize profit (Raco et al., 2018; Moore-Cherry and Bonnin, 2020). Planning authorities, in contrast, might be seeking a more orderly, timely development process, and local communities might be seeking a defined timetable of development, or to implement forms of fast activism (Lauermann and Vogelpohl, 2019), or to be given sufficient time to examine a proposal. . As Laurian and Inch (2019: 276) highlight, multiple temporalities operate with respect to proposed developments, 'including bureaucratic and legal processes, electoral terms, political machinations to secure public support, macro- and microeconomic, investment, and redevelopment cycles. … Disjunctions between activities can, and do, generate conflict and delay' as different stakeholders seek to dictate whose time frames dominate (Raco et al., 2018).

In some contexts, developer and state interests can align around a development agenda, where the private and public sector actively work together to fast-track planning and construction. In the Irish case, such alignment has occurred with respect to special development zones, which are designated areas prioritized for regeneration or new development (Byrne, 2016; Kayanan et al, 2018; Lawton, 2017). In other parts of the world, such pro-development arrangements might relate to whole cities, producing what has been termed 'fast urbanization', designed to produce housing and infrastructure for rapidly growing populations (Datta, 2017). Such development is often speculative in nature. Here, speed is not simply a means to deliver property quickly, but also to reduce the turnover time of profit (Goldman, 2011). This is being facilitated by the digitalisation of finance and property services that enable capital to switch rapidly between investments across the globe, buying up land and property assets in anticipation of value creation, producing development, then selling on and offloading liabilities and risks, and investing elsewhere (Goldman and Narayan, 2021). In the Irish case, the investment strategies of what have been termed 'vulture funds' (usually held by equity firms) have sought to capitalise on rapid increases in rent by funding the widescale construction of built-to-rent developments (including student accommodation) and wholesale purchasing new stock (Hearne, 2020). In order to facilitate such development, in 2017, the government sought to prioritise their passage through the planning system by creating a special category of application (Strategic Housing Developments (SHDs)) that bypassed local authority planning departments and were submitted instead to ABP (Yang et al., 2024).

The temporalities of how the public participate in the planning process is also being re-mediated by digital technologies. With respect to planning development and control, eplanning has enabled the public to access planning application documents 24/7 and at a distance, meaning they do not have to visit LA offices, saving them time. A range of digital dashboards and online mapping applications provide an interactive overview of planning activity.[1] With the publication of open planning data, the public can also download and undertake their own analysis. In relation to strategic planning, a number of new digital platforms (e.g., Decidim, PlaceSpeak, CitizenLab, Nextdoor) allow the public to give their views about potential future development in an area (Ertiö, 2015; Robinson and Johnson, 2023). They no longer need to attend a singular event (a townhall meeting), but can contribute in their own time. They can also use social media to create advocacy groups and organise lobbying and protest designed to sway public opinion on proposed plans and produce alternative ones (Mandarano et al., 2010). As Trapenberg Frick (2016) details, speed can be used as a tactic, such as live streaming and disrupting public and political consultations as they take place, the use of 'one-click actions' that simultaneously send a template protest email and sign a petition, and performing 'repertoire switches' in which participants rapidly move from one approach to another to place professional staff on the back foot. For planners, all of the publics' submissions and comments are centrally stored and digital tools can be used to search, sort and code the material, and more recently Generative Artificial Intelligence (GenAI) tools can be used to perform the same tasks (Du et al., 2024).

Conclusion

This paper has examined the inter-relationship between digital infrastructures, temporality and planning administration, with a particular focus on the development and control functions of the planning system. It has been argued that digitalisation has transformed the temporalities of planning's bureaucratic infrastructure through the introduction of machine and network time. In turn, the temporalities of planning have been reconfigured through digital infrastructuring that is reshaping the organisation and work of planning. In short, a new timescape has been introduced, wherein the pace, tempo, timings, time patterns and temporal modalities of planning have been reconfigured. Planning work can be practised more efficiently and its practices have experienced significant time-space compression with an ability to conduct planning work at a distance and in real-time. However, while the digitalisation of planning is pursued precisely because of its promise of coordination, efficiency, and production of eurythmic patterns of work, the conditions under which digitalisation happens and the legacies of clock time continue to frustrate the establishment of a new temporal order. Planners are caught in that tension, having to negotiate the intersection of clock and network time and this is unlikely to change, even in a fully digitalised planning system, due to the persistence of time rules and timetables for planning activities. This emerging, new timescape is largely matched across state and business organisations globally, particularly those that are under time pressures due to fixed timetables and limited resources, or which has a remit to consult with the public.

While the temporal shifts in the digital era have already been profound, planning organisation and practice (and those of other organisations and businesses) will continue to transform as new digital technologies are introduced. The next set of temporal shifts induced by digital innovation is most likely to be through the development and adoption of AI tools. Planning is potentially ripe for the introduction of AI given it is a highly rule-based and regulated activity and its discursive aspects are open to the use of GenAI tools (Sanchez et al. 2023; Du et al., 2024). Several potential applications are already being actively considered and tested, including the use of AI tools for analysing local knowledge and viewpoints, extracting insights from other relevant datasets (such as movement data, social media, street view imagery, sensor records, building information), formulating possible strategic plans, evaluating the compliance and efficacy of submitted plans, and running modelling scenarios (Du et al., 2024). As yet, however, AI has made little in-roads into planning practice due to the role of the planner as the arbiter of rule, a need for transparency and accountability in the evaluation process, and variances in planning regulations and law across scales hindering the rollout of one-size fits all solutions. In addition, given that the planning process requires a high degree of integrity to engender trust across stakeholders, AI processes need to be rooted in high quality training data that represents all views and has had extensive testing, ground-truthing, debugging and refinement to avoid in-built biases. As yet, planners are sceptical of the introduction of AI tools for a number of reasons, including a lack of knowledge and skills regarding AI, being unable to know how black-boxed systems derive their outputs and therefore unable to fully explain decision-making to stakeholders, and uncertainty as to whether AI tools can adequately address the 'wicked' urban problems that planning often tackles (Sanchez et al., 2023). Nonetheless, experimentation with AI will continue apace, and it will be introduced to planning practice in a number of ways that will further increase the pace and tempo, and time-space compression of planning work.

Notes

1. Dashboards and interactive mapping systems related to planning in Ireland.
   a) Department of Housing, Local Government and Heritage Housing Delivery Tracker (https://storymaps.arcgis.com/stories/ab12ed6d50a540e2891170c24955ff49)
   b) Housing for All dashboard (https://public.tableau.com/app/profile/statistics.unit.housing/viz/HousingforAll/0_Overview)
   c) Office of the Planning Regulator Digital Planning Hub (https://opr-hub-oprgis.hub.arcgis.com/)
   d) Dublin Housing Observatory (https://airomaps.geohive.ie/dho/)
   e) Regional Development Monitor (https://rdm.geohive.ie/)
   f) Dublin Housing Task Force mapper (https://housinggovie.maps.arcgis.com/apps/View/index.html?appid=3fa56a71ee774f9487d14a9e5336b00c)

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