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# The digital turn in planning and the production of 'good enough' planning systems

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**Abstract**

The digitialization of planning has taken place in a context where planning work is on-going and cannot be halted, and in which there are embedded institutional and technical systems and practices, as well as a number of technical, regulatory and socio-cultural data frictions. This context has led to a sub-optimizing approach to digitialization. In this paper, we examine the digital mediation of planning through an in-depth case study of a multi-scale planning development and control data ecosystem in Ireland. We detail the incrementalist nature of the digital turn in planning and how this institutionalizes a 'good enough' digitialized planning system; that is, a system that is functional and performs essential tasks, but not necessarily in an optimal manner and which is always open to potential improvements. We develop a conceptual basis for assessing 'good enough' and through its application contend that 'good enough' planning is a sufficient and reasonable state of affairs given the substantive challenges of creating and maintaining a complex data ecosystem and that there are incremental limits to achieving 'better planning'. As such, any technological solutionist claims promising to radically reconfigure and fix planning's operation shortcomings, such as the introduction of artificial intelligence tools, require careful assessment.

**Key words:** planning, digital turn, digitialization, data ecosystem, data frictions, Ireland

## Introduction

Charles Lindblom's (1959) identification of 'muddling through' or 'incrementalism' within policy and decision-making struck a chord within planning programmes, theory and practice. Contrasting the processes of muddling through against the rational comprehensive method of policy development, Lindblom argued that the near-constant evolution of technologies complicated the application of a fixed methodology to address complex situations. For Lindblom, the test of a 'good policy' was one that various analysts could settle on, even if it was not the most appropriate to achieve the agreed objective (p. 81). The increased dependence on digital systems in planning work and the continual advances in technologies that necessitate new learning curves and new ways of working make Lindblom's argument ever-more pertinent. The digital turn in the Global North has introduced data systems that are now entrenched in planning operations. Given that planning's work is on-going and time-sensitive and cannot be suspended in order to radically reconfigure operations, it is neither possible nor advisable to abandon sub-optimal systems and design new systems from scratch. Instead, an incremental approach to systems change that seeks to maintain 'good enough' performance must suffice (Collins et al., 1994; Gabrys et al. 2016; Bialski 2024).

We argue that the 'art of sub-optimizing', to use Lindblom's framing, is evident when inspecting the various ways digital systems have been developed, linked together, and reconfigured over time to form a functioning data ecosystem. With respect to managing the development and control pipeline that tracks a planning application from submission to completed property, a data ecosystem typically conjoins several IT systems including: an online submission portal, a planning application management system, a document management system, a payment system, GIS (Geographic Information System), an online system for sharing application details to the public and receiving third-party submissions, a building control system, and a system for managing appeals. Data ecosystems develop and mutate over time as the digitialization and datafication of planning deepens and new technologies, standards and work flows are developed and adopted (Kitchin et al., 2025a). This data ecosystem might not be optimal in its configuration or operations, and can possess significant limitations and shortcomings, but it is typically 'good enough' to perform the tasks required to an acceptable standard to deliver 'good enough' outcomes, such as informed decisions on planning applications and monitoring the building control aspects of the construction process.

We are aware that while the notion of 'good enough' is used in a number of papers and books to refer to systems that perform necessary tasks in a suboptimal way (Collins et al., 1994; Gabrys et al., 2016; Gieseking, 2018; Bialski 2024), the actual component characteristics that compose 'good enough' are not formally articulated. In these contexts, 'good enough' is assumed to have a commonsensical meaning that needs little further elaboration. In our formulation, 'good enough' is not used pejoratively (Bialski, 2024). 'Good enough' can be a laudable outcome when dealing with complex challenges. Drawing on Pääkkönen's (2020) assessment of how ideas and methods gain traction and are deemed worthy of adoption, we posit that there are a number of inter-related criteria to assess whether a state of 'good enough' is present. These include: 'credibility' (the outputs produced appear credible and expected); 'integrity' (the outputs meet expected standards thresholds, which might be defined as sufficient, reasonable, reliable, and trustworthy, rather than flawless); 'legitimacy' (the processes used follow expected procedures and practices); 'relevance' (the outputs fulfil the task requirements); and 'authority' (those producing the outputs use their reputation and power to assert their veracity). 'Good enough' then involves exceeding a threshold of all or some of these criteria, but not necessarily functioning optimally or exceptionally well.

Given the complexity of the planning system, with its myriad laws, regulations, time rules, workflows and data systems that span multiple stakeholders, and in a context of limited funding and understaffing, achieving a functioning system that delivers expected planning outcomes is a challenge. Here, being 'good enough' is largely about producing credible, legitimate systems that produce sufficient and reasonable performance with respect to expected tasks that can sustain the authority of planning bodies regarding the decisions they make. That is, the systems produce outcomes that satisfy expectation and which stakeholders (planners, developers, politicians, the public) believe to have integrity and are fair, transparent, and proportionate. In this sense, good enough systems prioritize satisficing over optimal performance (Simon 1957). This is particularly pertinent in planning where a large component of the profession's complexity stems from its intertwined relationship to politics (Albrechts, 2003; Forester, 1984). However, this does not mean that systems are devoid of critique as, while they aim to be satisfying, they nonetheless might be inefficient or glitchy.

Our contention is that satisficing systems is a reasonable expectation of digitally mediated planning, with the possibility of a perfect integrated system a mirage. This is not to deny that there are no desires for improvements that will create a 'better' data ecosystem. Indeed, data ecosystems are constantly evolving with the on-going digitialization of paper-based processes, updates to software, revised workflows, and the introduction of new systems and data standards designed to improve functionality and processes, enhance capacities, increase productivity and efficiency, and create new spillover effects (e.g., data repurposing). In other words, a data ecosystem is constantly in a tension between stasis (being 'good enough') and innovation (desiring 'better'), though improvements lead to a new condition of 'good enough'. As such, any technological solutionist proposals to radically reconfigure the operations of planning, with the aim of addressing existing shortcomings and producing significant gains in efficiency – such as recent discussions regarding the potential of artificial intelligence (AI) tools (Sanchez et al, 2022; Li and Dang, 2025) – will also introduce a new state of 'good enough', but if undertaken without due care could reduce 'good enough' to 'unacceptable' (by basing decisions on black-boxed processes that might be biased or on hallucinations which undermine a system's credibility, integrity, legitimacy, and authority).

In this paper, we examine a planning development and control data ecosystem and the on-going work by administrators to practice the art of sub-optimizing in order to maintain its status as 'good enough' given a number of system shortcomings (e.g., data frictions) and contextual factors (e.g., under-resourcing), while simultaneously seeking to address these issues and incrementally improve the data ecosystem's design and performance. Our analysis is based on fieldwork conducted in Ireland in 2023, undertaken on behalf of the Local Government and Management Agency (LGMA), the representative body for Ireland's 31 local authorities (LAs). The research consisted of: identifying all the various data systems in operation across the planning sector in Ireland and their relationship to each other; identifying how the data systems are used in the various stages of the planning process (e.g., pre-planning, application, outline permission, full permission, change of use, retention, extension of duration, appeals, enforcement, commencements, completions) and for varying types of customers (e.g., residential, commercial, strategic infrastructure development, etc.); charting what data are generated and used within each stage and to plot the work/data flow and timescale for each stage; assessing the level of standardized processes and data fields across local authorities using the same and different data systems; and producing charts of the generation and flow of data within and across data systems (see Kitchin et al., 2025b).

Fieldwork consisted mostly online, non-audio recorded interviews with 29 public sector officials within the planning system at local, regional and national scales across 13 organizations (6 local authorities, 2 government departments, and 5 state agencies) to comprehend the planning data ecosystem in the first instance and to verify and adjust our mapping of the ecosystem in later instances. Extensive notes were taken, along with screenshots of computer system demonstrations. The funder was of the view that not audio recording the interviews would aid access to respondents and allow for more open and frank expression of views in a context where public planning is under pressure from external stakeholders for de-regulation and reform. Six of these interviews were of a walk-through nature, discussing the tasks a planner is conducting as they use a system to enter and process data. The 31 LAs use one of the three planning application management systems (PAMS): iPlan, APAS, and Odyssey. We reviewed five local versions of these systems plus the national planning appeals board (An Bord Pleanála; ABP)[1] case management and GIS system (PleanIT). For a comprehensive understanding of these systems, we completed close readings of the PAMS user manuals and performed full data audits to reconstruct their data dictionaries. We did the same for the Building Control Management System (BCMS) and planning.localgov.ie (an online application system). We then examined local authority planning websites and citizen application web forms, and documented the data variables available in a number of downstream open data sites and planning/housing data tracking tools (e.g., Dublin Housing Observatory, Housing Delivery Tracker, Housing for All dashboard). This set of methods enabled us to gain an understanding of the data architecture of each system, as well as how they were interconnected to form a wider data ecosystem.

## The digital turn and 'good enough' planning

The integration of digital technologies into planning has progressed in the Global North to the point where the digitialization (shifting from paper-based to digital systems and processes) and datafication (the capture of planning information and tasks as digital data) of all aspects of planning practice is extensive (Daniel and Pettit 2021; Boland et al., 2022; Potts and Webb 2023). Planning work is organized and ordered with respect to its digital mediation, with tasks now predominately undertaken using a range of digital technologies such as online portals, email, spreadsheets, word processing, databases, planning application management systems, spatial decision/planning support systems, GIS, CAD (Computer Aided Design), BIM (Building Information Modelling), CIM (City Information Modelling), and virtual augmented reality (Klosterman 2012; Falco and Kleinhans 2018; Batty 2021; Kitchin et al., 2021). To enable a related set of planning tasks, extensive data ecosystems have been produced, each consisting of a number of inter-related data systems that are functionally interlinked, sharing data to some degree and enabling collaboration between actors (Kitchin et al, 2025a). In addition, the quick adoption of remote working technologies has altered the labour conditions of planners and online platforms have widened public consultation (Milz et al., 2023; Mualam et al., 2022).

The aims associated with digitialization and datafication are multiple: to increase efficiencies and reduce costs, gain new tools and enhance the range and sophistication of services delivered, create spillover effects through new data resources (e.g., evidence-informed practice and policy), develop more transparent, accountable and participatory decision-making processes, enhance citizen experience of government (through on-demand, online services) and ultimately improve public services (Silva 2010; Daniel et al., 2023). In other words, it is to transition 'good enough' planning into 'better' planning, which if successfully implemented then becomes the new state of 'good enough'. This transition is not, however, an open endeavour free from constraints. Indeed, there are a number of contextual factors and path dependencies that limit transitions to incremental adjustments rather than radical change.

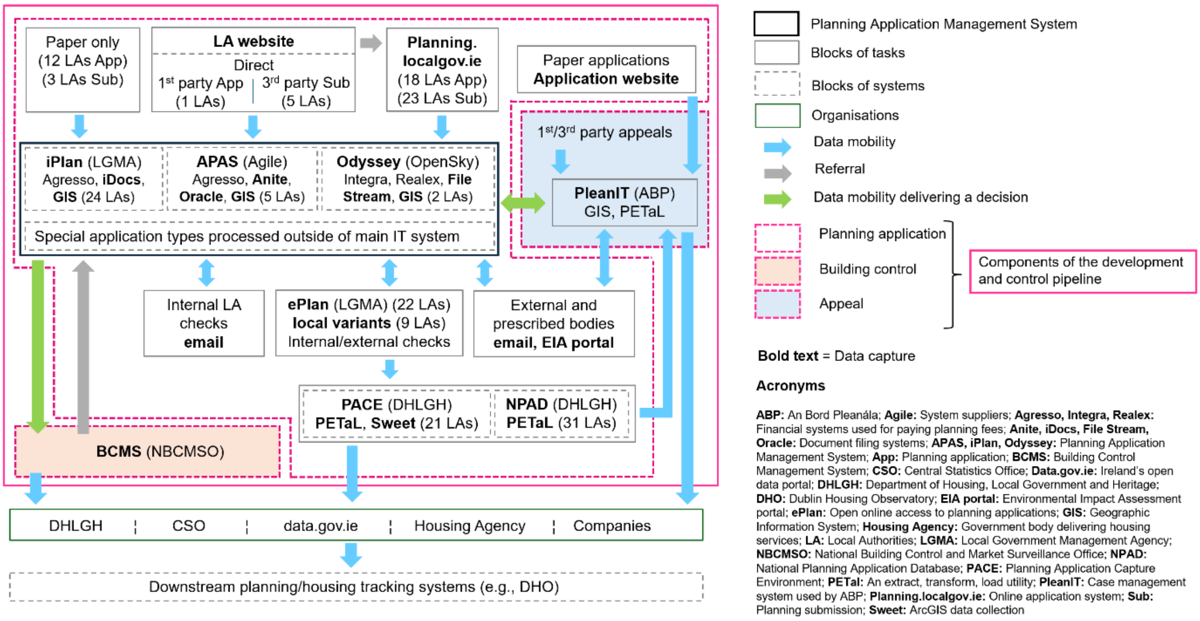
At a fundamental level, planning is a process and a service in constant operation (Brooks, 2019). Much like performing software updates or home decorating, any changes to the data ecosystem have to be performed on systems that are in use. While a new parallel system can be built, with the intention of switching over from the old to the new system with immediate effect, in reality the old and new systems are typically run in parallel for a period of time, with staff double-jobbing, running the old system while simultaneously transferring cases and data to the new system. Given this high labour overhead, such a transition is typically applied to single systems, rather than a radical change being applied to the whole ecosystem concurrently. Additional fundamental factors are the legislative and policy frameworks that set the parameters for what kinds of planning work are required, with an existing data ecosystem built to perform these tasks, which mitigates against attempting a radical technological overhaul designed to achieve the same ends. Likewise, once the digitialization of planning bureaucracy initiates, early choices and decisions regarding system design create path dependencies that limit later technological innovations (Grzymala-Busse, 2011; Kitchin 2023). Consequently, data ecosystems are composed of data systems which have extensive sunk costs in terms of investment into technologies, but also staff training and know-how, built up over many years. Indeed, there can be technological lock-ins in terms of on-going vendor contracts or the use of proprietary software and data formats that can hinder transferring data to a new system (Rast 2012). Moreover, staff retraining requires time and resources.

There are also potential risks and drawbacks in transitioning to a new arrangement, which introduces caution for fear of cost over-run or an expensive, failed process (Flyvbjerg, 2009). Moreover, the adoption of newer technologies can further complicate existing data practices and the policies that govern them. For example, adding more complex procedures into workflows, shortening timelines and increasing temporal pressures, expecting more to be done with less resourcing, and introducing unanticipated effects that can extend existing issues or produce new ones that need additional attention to resolve (Wajcman and Dodd, 2017; Bates, 2018). In addition, a prevalent neoliberal political economy can create austerity effects, reducing institutional capacities to seamlessly execute the transition and producing a splintering effect in roll-out and form (Graham and Marvin 2001; Kitchin et al., 2021). This can lead to staff resistance to change and practices such as working to rule or refusing to undertake some work. In other words, staff seek to maintain the existing 'good enough' status quo and resist change unless they can be reassured that it will improve their working conditions. Incremental shifts seem more likely to achieve change as they reconfigure what is already known, whereas radical transformation has a high degree of uncertainty. As we illustrate in our case study, a planning data ecosystem is constantly in the process of seeking to be 'good enough' despite constraints, while also aiming to introduce improvements, mostly through the 'art of sub-optimizing' (Lindblom, 1959).

## The Irish planning development and control data ecosystem

The Irish planning system is divided into three main blocks of work: strategic planning (focused on plan making at local and regional scales); development and control (assessing planning applications and appeals, monitoring building control compliance during construction); and enforcement and compliance (checking whether a development complies with the conditions of planning permission and taking any necessary legal action). In all three blocks of planning work, key participating stakeholders make extensive use of IT systems to undertake planning functions. In this paper, we focus on development and control given that it involves a number of interlinked data systems managed by a multi-tier set of public bodies that collectively form an extensive data ecosystem (see Figure 1).

**Figure 1: The development and control data ecosystem in August 2023**




This data ecosystem has been in place formally since the enactment of The Local Government (Planning and Development) Act (1963) that required LAs to assess and rule on planning applications. Prior to 2000, the planning application process was paper-based except for some use of email, word processing and spreadsheets (Kitchin et al., 2025a). From 2000 onwards, the various tasks of development and control have been subject to digitialization and datafication, with this unfolding in a relatively piecemeal manner, with paper-based systems and processes digitialized at different times and in different ways across actors.

The first element to be digitialized in the Irish development and control pipeline was the case management process, with the introduction of planning application management systems (PAMS) from 2000 onwards to capture, process and share application and assessment data. Significantly, up until 2022 planning applications could only be made using paper forms and documents posted in hardcopy, which were digitized and uploaded into a PAMS by planning staff. This remained the case for 12 LAs at the time of fieldwork, but subsequently has been reduced to zero (though paper applications can still be made for all LAs if desired). The introduction of ePlan systems in 2003 enabled citizens to access online selected components of planning applications to assess them, rather than having to visit planning offices to view paper copies. Over time, PAMS were interlinked with financial systems to check payment of fees (e.g., Agresso, Integra), file management systems (e.g., iDocs, Oracle), and analysis systems (e.g., GIS) as part of the assessment and decision-making process.

The next significant phase of digitialization took place after the global financial crash of 2007-08 and subsequent austerity measures. The crash was particularly severe in Ireland. The deep contraction of the economy led to a €85 billion IMF-EU bailout in November 2010 (Kitchin et al., 2012). Given the massive reduction in government revenue, LAs' net budgeted expenditure fell from 5.029 billion in 2008 to a low of 3.911 billion in 2015, a fall of 22.2 percent (DEHLG 2008, DECLG 2015). LA staffing fell from 35,007 in 2008 to a low of 26,630 in 2015, a reduction of 8,377 (23.9 percent) (DPER 2024). After an initial period of trying to manage the challenging situation of shrinking budgets and staff numbers on the delivery of services, attention was re-focused on the digitialization of the development and control data ecosystem from 2014 on.

In 2016, the BCMS was launched as a shared national service, administered by the new National Building Control and Market Surveillance Office (NBCMSO). The BCMS enabled all LAs to track compliance with the Building Control Act 1990 during the construction phase (e.g., monitoring commencement, notices, compliance and completion certificates, statutory documents). Also in 2016, the National Planning Application Database (NPAD) was introduced by the Department of Housing, Local Government and Heritage (DHLGH) to collate basic information on all planning applications nationwide from 2012 onwards into a single database viewable using an online interactive map. Unlike other systems, this was an entirely new element in the data ecosystem that did not previously exist in a paper-based form. In 2017, ABP launched PleanIT, a case management and GIS system, to aid the processing and assessment of planning appeals. Due to legal requirements, at the time of fieldwork, all digital material held by ABP is also held in paper form. This includes emails that are printed out and stored. The Planning Application Capture Environment (PACE) system, developed by Ordnance Survey Ireland (now Tailte Éireann) and DHLGH, was launched in 2021 and provides a standardized tool for digitally capturing the site boundaries of planning applications. In 2022, planning.localgov.ie, an online portal for the digital submission of planning applications and third-party public feedback about applications, was launched, developed by the LGMA.

Austerity measures have affected the local authority sector, and planning departments in particular. LA staffing in Q4 2023 was 31,792, still 9.2 percent below 2008 numbers. Since 2021, the DHLGH has agreed to an additional 117 posts in ABP to meet existing needs, increasing the workforce by 50 percent (DHLHG 2024). In 2022, the LGMA and DHLGH identified a need for 541 new posts in local authority planning departments, a 35 percent uplift on staffing numbers at the time, plus for the 10 percent 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%, before the needs for other professional and expert skills related to planning (environmental etc.) are factored in" (p. 11-12). The levels of understaffing undoubtedly play a role in the capacity of LAs to undergo the expected digital transformation, as well as some of the data frictions discussed below, particularly related to workflow, standardization, and the capacity to handle ever more schemes, programs, directives and requests from central government. Such conditions produce a range of impacts for the everyday work of the public bodies charged with providing services, particularly at the local scale.

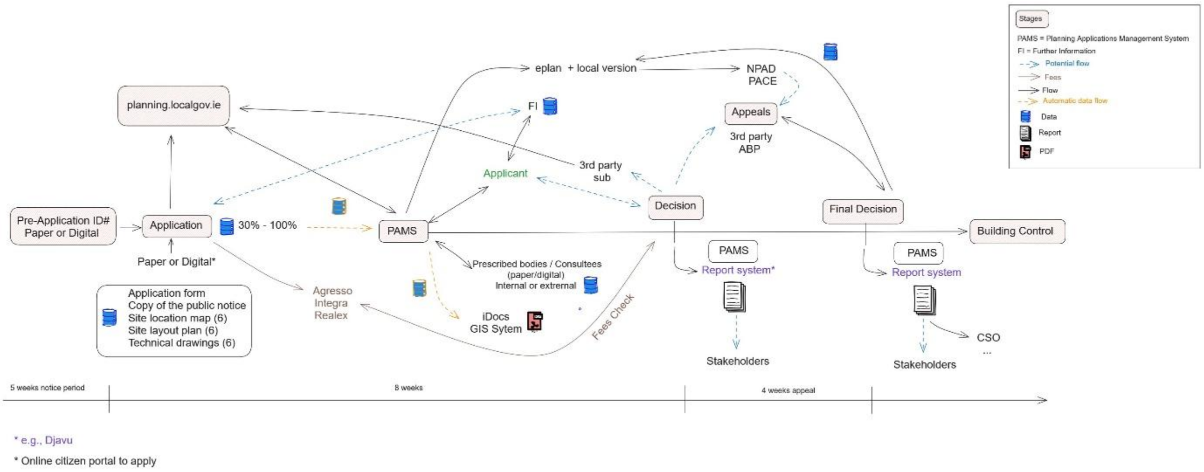
While the financial crash and austerity are important contextualising factors shaping the development and operation of the data ecosystem, a number of the data frictions in the ecosystem exist otherwise, largely arising due to its jerry-rigged evolution and the commissioning and adoption of data systems by numerous actors that have varying aims and agendas.

**Data frictions in the data ecosystem**

Being composed of a constellation of data systems, for a planning data ecosystem to function as necessary it is vital that the various systems can be interlinked and share data. In a seamless design, the seams (points of contact) between data systems enable the free movement of data, providing a clean, well-functioning data ecosystem (Vertesi 2014; Inman and Ribes 2018). Seamless design is aided by metadata, standards, protocols, documentation and communication that enable interoperability and shared understanding between actors. Data frictions, in contrast, are impediments or blockages that prevent, slow, or make difficult the sharing of data between data systems within and between organizations (Edwards, 2010; Bates 2018). Data frictions can produce inefficiencies in how processes work and place limits on the functionality and utility of data systems within a data ecosystem (e.g., a lack of shared indexical data [unique identifiers such as a file reference number] or data formats limiting the ability to link together data). In their strongest form, data frictions can stop individual processes or a whole system from working (e.g., changes to firewall or server settings preventing data from being transferred between systems). Data frictions are not always negative in effect; for example, some data frictions exist for a good reason, such as protecting privacy or ensuring data security (Bates 2018).

The planning development and control data ecosystem detailed in Figure 1 is highly dependent on the sharing of data and decisions between data systems that enable a planning application to pass from submission to turn-key property. The diversity and complexity of the interactions between data systems are made clear when one charts them for just one part of the data ecosystem. For example, Figure 2 documents the interactions between actors and data systems for the planning application stage that manages and tracks the progress of an assessment along a prescribed timeline, including sourcing additional information and feedback, monitoring fee payment, tracking all communications with the applicant and third parties, and noting observations and decisions (we have produced such data mobility diagrams for the pre-planning, appeals and building control functions; see Kitchin et al., 2025b). The diagram reveals a time period spanning approximately 12 weeks (plus 5 weeks' notice period in pre-application stage), wherein the PAMS functions as the central repository and coordination hub, mediating between multiple human and non-human actors, including applicants, prescribed bodies, consultees, and various digital infrastructures such as iDocs and GIS System in LAs, and NPAD or PACE at the national level. The data flows demonstrate a hybrid materiality where paper or digital planning applications are entered into the PAMS system (ranging from 30 to 100% of the application content, depending on the LA). This process coexists with digital processing workflows, creating multiple points of translation and transformation as information moves between systems. Notably, the architecture reveals how data mobility is not merely technical but deeply embedded in regulatory temporalities that shape the rhythm and flow of planning decisions. The figure demonstrates how digital transformation in public administration creates new forms of system integration and multi-scalar governance processes that extend from local planning authorities to appeal bodies and building control systems.

**Figure 2: The data mobilities of the planning application stage in 2023**




Data frictions are not always technical in form (e.g., incompatible data formats, glitches), but can also be socio-material in nature, influenced by factors such as institutional capacity (e.g., skills, time, resources), organizational structures and cultures, workflows, habits, routines and affects (e.g., trust, enthusiasm, frustration) (Pink et al., 2018). Bates (2018) thus identifies three broad sets of factors that influence the nature and form of data frictions: data sharing infrastructure and management, regulatory frameworks, and socio-cultural factors.

***Technical infrastructure and management***

The planning development and control data ecosystem is composed of a diverse set of data systems. In some parts of the ecosystem there is uniformity in system use. For example, ABP uses a single system, Plean-IT, for managing all appeal cases, regardless of origin LA. However, in other parts of the data ecosystem a variety of systems are used, creating a fragmented technical infrastructure at the ecosystem scale. For example, with respect to PAMS, 24 LAs use iPlan (produced by the LGMA), 5 LAs use APAS (produced by Agile), and 2 LAs use Odyssey. In the case of the 5 LAs using APAS, each LA has locally configured the system to its own design and needs so that these five instances are quite different to each other operationally. In effect, this means that there are 7 different PAMS being used across the 31 local authorities. The sharing of planning application information with the public also varies across LAs, with 22 LAs using ePlan (produced by the LGMA), the 4 Dublin LAs using planning.applications.ie, the 2 Galway LAs using geo.galwaycity.ie, and the remaining three using their own eplanning system.

The workflow for each PAMS is organized differently (see Table 1), though each is designed to achieve the same ends: a formal assessment of a planning application with respect to planning regulations and law undertaken within statutory deadlines. Even across LAs using the same data system (e.g., iPlan), different LAs might locally configure workflows, with modifications made to cater for localized ways of meeting local needs. Furthermore, while all PAMS can be used by LA staff to process and assess a standard planning application, such as permission to build a house or extension or a request for a material change of use (e.g., a shop to a home), not all types of planning applications can be managed in all PAMS. As detailed in Table 2, with respect to five LA's PAMS we took as a sample, there were a number of special application types that were handled using other software such as Excel and GIS systems. This table reveals the fragmented and heterogeneous nature of digital planning governance across different Irish LAs, demonstrating how various application types are differentially managed though distinct PAMS. Particularly noteworthy are the gaps in coverage for certain application types even when LAs use the same PAMS, such as Section 44 (revocation of planning permission) and enforcement notices under Part VIII. These  are inconsistently handled across LAs, highlighting how the digitialization of planning processes remains incomplete and uneven. The table also reveals the complexity of diverse regulatory mechanisms from pre-application consultations (Section 247) to protected structures declarations (Section 57), each requiring different data handling approaches and stakeholder engagement protocols. This technological heterogeneity reflects broader challenges in public sector digital transformation, where legacy systems and varying resource capacities create a patchwork of digital capabilities that may impact consistency and transparency in planning decision-making across different local authority areas.

**Table 1: The workflows for iPlan, Odyssey and APAS**

| iPlan | Odyssey | APAS |
|---|---|---|
| Validate | New Application | Pre-Reg |
| Request Consultants reports | Admin Validation | Registration |
| Location details | Technical Validation | Validation |
| New development unit | Awaiting Validation | Allocation |
| Further information | Awaiting Recommendation | Referral |
| Submissions | Awaiting Liaison Officer | 35 Days Assessment |
| Representation and Motions processing | Prepare MO | Additional Information Requested |
| Health & Safety Advice (HAS) Report | Prepare FI Request | Additional Information Received |
| Planning Decision | Awaiting Final Schedule | Clarification of AI Requested |
| Grant Application | Awaiting FI SignOff | Clarification of AI Received |
| Leave to appeal | Send FI Request | Significant AI Received |
| Appeals Processing | Awaiting Decision | Withdrawn Application |

| | | |
|---|---|---|
| Appeal Financial Processing | Awaiting Managers Report | 49 Day Planning Assessment |
| Extend application decision date | Send MO | Recommendation Review |
| Environmental Impact Assessment | Awaiting Decision Notification SignOff | Decision Review |
| Maintain Commencements | Send Notification of Decision | Issue Decision |
| Significant Case/Comments | Decision Made | Decision issued |
| | Awaiting Final Grant | Appeal lodged |
| | Awaiting FI Response | Planner RPT to ABP |
| | Awaiting Grant SignOff | Appeal decided |
| | Send Grant Documentation | Final Grant Review |
| | Application Invalid | Final Grant |
| | Application Closed | |
| | Application Withdrawn | |
| | Application Appealed | |
| | Prepare Invalid Letters | |
| | Awaiting Invalid Letter SignOff | |
| | Send Invalid Letters | |
| | SEP Assigned | |
| | SP Assigned | |
| | iPlan Pending | |

**Table 2: Special application types and whether handled by Planning Application Management Systems**

| Application Type | APAS (LA1) | APAS (LA2) | APAS (LA3) | Odyssey (LA4) | iPlan (LA5) |
|---|---|---|---|---|---|
| **Declarations/referrals under Section 5 of the Planning Act 2000** (as amended) | Yes | Yes | Yes | Excel | SharePoint GIS |
| **Section 35** (refusal of permission due to the track record of a developer) | Yes | Yes | Not stated | No | Yes |
| **Section 42** (extensions of the duration of a planning permission) | Yes | Yes | Yes | Yes | Yes |
| **Section 44** (revocation of pp) | Yes | Not stated | Not stated | No | Yes |
| **Section 57** (declarations regarding protected structures) | Yes | Yes | CE order produced, unlikely to enter APAS | No | SharePoint GIS |
| **Warning and enforcement notices, etc. under Part VIII** | Yes | Yes | Not stated | No | i-enforce GIS |
| **Development by state and local authorities (Part XI)** | Yes | Yes | Yes | No | Yes + GIS |
| **Section 247** (pre-application consultations) | Yes | Yes | Partially. Information is not made public | Yes | Yes + GIS (not public) |
| **Part V** | Yes | Yes | Divided | Housing Directorate | SharePoint Map |

Note. LA1 = Local Authority No. 1, etc.

At a local level, the variation in system design and operation has limited effects as the systems are directly interlinked and aligned to upstream data inputs (paper submissions or planning.localgov.ie) and downstream data output (eplanning system) and perform the tasks they are designed to achieve. However, the variation in data systems can cause data friction at the data ecosystem scale by creating interoperability issues and data standardization issues, particularly downstream from the PAMS. Glitches that can occur when feeding data into NPAD from eplanning systems are one such interoperability issue. NPAD is populated with data through an automated ETL (extract, transform, load) process using PETaL (Planning ETL produced and managed by the DHLGH) that harvests up to 25 variables from LA eplanning systems. PETaL has to access the six kinds of eplanning systems, which are different in form, to extract data. The process is not straightforward and many planning applications displayed in NPAD do not have the full suite of associated variables. It can also be quite glitchy due to issues such as changes to firewall permissions, server configuration and data formats, software patches and upgrades, loss of permissions, and network issues. It is not uncommon for the data of one or more LAs to be absent from NPAD while glitches are being addressed. 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.

***Standardization***

Accompanying variances in data systems is a lack of data standardization across them. At a base level, the data dictionaries for each PAMS vary quite substantially in terms of how and what data are captured. For example, there are marked differences in the number of required fields that planners must enter into each system (see Table 3). In the case of the three data systems for which we constructed data dictionaries, iPlan had 65 compulsory fields, Odyssey 40, and APAS 21. This variance is important as it is only possible to compare equivalent data for every planning application across the 21 required fields for APAS. In fact, this is not the case, as these 21 variables are not the same ones captured in iPlan and Odyssey. Similarly, the three PAMS had a variable number of optional fields: iPlan 265, Odyssey 409 and APAS 194. Not only do the required fields vary, but also how the data are captured. For example, iPlan uses few check boxes (9) compared to Odyssey (48) and APAS (55). Odyssey makes greater use of dropdown menus than iPlan or APAS. The use of open text fields, used quite extensively in iPlan and Odyssey, enables bespoke information to be recorded, but also means that the data recorded lack standardization. Again, this reduces the ability to directly compare data that have been captured in different PAMS without a substantive amount of data cleaning and wrangling, which might be possible for a handful of variables but is very challenging for full data dictionaries.

**Table 3: Required and optional fields and mode of data capture in PAMS**

| Number | Sub-criteria | iPlan | Odyssey | APAS |
|---|---|---|---|---|
| Required field | Total | 296 | 63 | 26 |

| | | | | |
|---|---|---|---|---|
| | without duplicate | 65 | 40 | 21 |
| Optional field | Total | 961 | 616 | 215 |
| | without duplicate | 265 | 409 | 194 |
| Type of field | Total **Free text** (number or text) | 585 | 304 | 76 |
| | without duplicate | 163 | 190 | 68 |
| | Total **Check box** | 9 | 48 | 55 |
| | without duplicate | 6 | 42 | 50 |
| | Total **Dropdown menu** | 135 | 206 | 38 |
| | without duplicate | 57 | 135 | 31 |

Two additional examples of standardization issues relate to the use of reference IDs across systems and the planning application form used when first seeking planning permission. As a proposed development moves along the planning and construction pipeline, it is managed by a different data system. To log and track progress each proposed development is assigned an ID number. In the Irish case, a unique ID is assigned for each stage and system: planning application (PAMS), appeals (Plean-IT) and construction (BCMS). The two IDs (or three if it passes through the appeals process) allocated to the same proposed development are not necessarily shared across data systems making it difficult to track a development along the planning and construction pipeline from start to finish. In 2013, in an effort to standardize the application process, a standard planning application form was adopted by all 31 LAs. Since 2013, there has been a drift in the composition of the form, with LAs altering, adding, and deleting fields to suit their own purpose and their PAMS requirements. This is illustrated through a snapshot of the data captured in the planning application forms of 12 LAs (see Table 4). While such variation does not affect the task of assessing planning applications, it would hinder any attempt to construct a nationwide comparable dataset.

**Table 4: Drift from a standardized planning application form**

| Step | Sub-variable | Carlow CC | Cavan CC | Clare CC | Cork City | Cork CC | Dublin City | Dún Laoghaire-Rathdown CC | Fingal CC | Galway CC | Limerick City & CC | South Dublin CC | Wexford CC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Name of relevant planning authority** | | x | | x | x | x | | | x | | x | x | x |
| **Location of Development / Proposed Development details** | Postal Address | x | x | x | x | x | x | x | x | x | x | x | x |
| | Townland | x | x | x | x | x | | x | x | x | x | x | x |
| | Location (as may best identify the land or structure in question) | x | | x | x | x | | x | x | x | x | x | x |
| | Eircode | | x | | | | | | | | | | |
| | Ordnance Survey Map Ref No (and the Grid Reference where available) | x | x | x | x | x | | x | x | x | x | x | x |
| | ITM co-ordinates | | x | | | | | | | | | | |
| **Type of planning permission / Type of permission sought** | Permission | x | x | x | x | x | x | x | x | x | x | x | x |
| | Permission for retention | x | x | x | x | x | x | x | x | x | x | x | x |
| | Outline Permission | x | x | x | x | x | x | x | x | x | x | x | x |
| | Permission consequent on Grant of Outline Permission | x | x | x | x | x | x | x | x | x | x | x | x |
| | Permission for Continuation of Use | | | | | | | | x | | | | |
| **Where planning permission is consequent on grant of outline permission** | Outline Permission Register Reference Number | x | x | x | x | x | | x | x | x | x | x | x |
| | Date of Grant of Outline Permission | x | x | x | x | x | | x | x | x | x | x | x |
| **Applicant** | Name(s) | x | x | x | x | x | x | x | x | x | x | x | x |
| | Address | | | | | | | | x | | | | |
| **Where Applicant is a Company (registered under the Companies Acts)** | Name(s) of company director(s) | x | | x | x | x | x | x | x | x | x | x | x |
| | Registered Address (of company) | x | | x | x | | x | x | x | x | x | x | x |
| | Company Registration No. | x | | x | x | x | x | | x | x | x | x | x |
| | Telephone No. | | | | x | | | | | x | | x | |
| | Email Address (if any) | | | | x | | | | | x | | x | |
| | Fax No. (if any) | | | | x | | | | | | | x | |
| **Person/Agent acting on behalf of the Applicant (if any):** | Name | x | | x | x | | x | x | x | x | x | x | x |
| | Address | | | | | x | x | | x | | | | |
| **Person responsible for preparation of Drawings and Plans** | Name | x | x | x | x | x | | x | x | x | x | x | x |
| | Firm/Company | x | | x | x | x | | x | x | | x | | x |
| **Description of Proposed Development** | Brief description of nature and extent of development | x | x | x | x | x | x | x | x | x | x | x | x |
| **Legal Interest of Applicant in the Land or Structure** | Owner | x | x | x | x | x | x | x | x | x | x | x | x |
| | Occupier | x | x | x | x | x | | x | x | x | x | x | x |
| | Other | x | x | x | x | x | | x | x | x | x | x | x |
| | Prospective Purchaser | | | | | | | | | | | | x |
| | Where legal interest is "other", please expand further on your interest in the land or structure | | | | x | x | | x | x | x | x | x | |
| | If you are not legal owner, please state the name and address of the owner | x | | x | x | x | x | x | x | x | | x | x |

CC = county council

This issue of comparability comes into sharp relief with respect to the compiling of official planning statistics by the Central Statistics Office (CSO), the release of open planning datasets by the DHLGH, and the handling of FOI (freedom of information requests) made by the media and public. The CSO produces official planning statistics using data drawn from LAs' PAMS and ABP's PleanIT system. They send an Excel template to each LA and ABP seeking information on 14 variables related to planning applications for the previous month. For each application, they request info such as reference number, permission type, address, decision, number of units, and floor area. The issue for LAs is that the PAMS system does not possess a reporting function that can automatically produce such data, and an administrator must manually open and extract the required information for each planning application and enter it into the spreadsheet. This issue arises also for special data requests from DHLGH and FOI requests. The data received by the CSO is variable across LAs in two respects. First, the data recorded might have different formats. Second, a number of LAs either ignore the CSO template and use their own, or they return the data in a different media (e.g., as a pdf, screenshots, or printed paper tables). The result is a team of six CSO staff members spending up to a month cleaning and wrangling the data to standardize them across LAs.

***Socio-cultural factors***

We have already discussed some socio-cultural factors that produce and shape data frictions by placing limits on resources and capacities. Austerity measures have led to understaffing and some fatigue, frustration and demoralisation in LA planning departments. Hastings and Gannon (2022) focus on the experiences of local government workers in the UK 'required to maintain services with reduced resources, that is, to "do more with less"'. Tracing austerity to pre-existing New Public Management (NPM) approaches, the paper understands these workers as 'shock absorbers'. As with the notion of weariness (see Wilkinson and Ortega-Alcáraz, 2019: 157), this is a complex position characterized by fatigue and frustration, but also potentially by the mobilization of a variety of strategies – including a stance of resistance, states of 'high alert' or fire-fighting, and defensive demarcation (Hastings and Gannon, 2022: 894, 898-899) – in order to cope with austere conditions. These austerity measures manifest as practices of refusal or prioritization, such as focusing on necessary operational functions.

Other socio-cultural factors might include a reluctance to share information due to concerns about confidentiality, security or data ownership, or to resist governance relations. In the Irish case, the latter is evident in an on-going tension between local and central government and the lack of devolved powers to local authorities who have reduced autonomy in planning work compared to other jurisdictions in Europe (Kayanan et al., 2025). As a result, LAs can express a 'defensive demarcation' of work and responsibilities (Hastings and Gannon, 2022), clinging to what autonomy they do possess to use the data systems of their choice, and to organize and undertake their workflows and data management as they see fit, so long as the planning service meets statutory requirements, and to resist change management and standardization initiatives. At a more individual level, socio-cultural factors include the data practices of planners, which are shaped by wider austerity and governance issues.

Data practices consist of the behaviour and actions of individuals in relation to the data lifecycle and the use of data (Ruppert and Scheel 2021). Data practices are embodied, performed through bodily action, but also affective, inflected by mood, feelings, and pre-cognitive thoughts (Pink et al., 2017). They are ways of doing that are framed within wider social norms, data regulations, and governance arrangements, and which can become routine and habitual. For example, data entry and processing are often scripted, following a set pattern that is dictated by task requirements. As a consequence, the execution of data practices is seen as mundane and often overlooked or forgotten. Yet, data practices can have substantial effects on the operation of a data system, also being the means to manage, resist, or simply 'get through' data work (Plantin, 2019; 2021). Indeed, in performing data work, planners may (whether more or less consciously) express different forms and degrees of subjection, adaption, resistance, or ambivalence to certain technologies or the particular structures or programmes into which those technologies are enrolled (Kuppler and Fricke 2024).

In our case, evident expressions of the above include staff varying in how much data they record for each application case, with a few entering all relevant data and some recording the minimal viable amount (e.g., required fields), leading to patchiness and inconsistency of data capture across applications. These pressures are also evident in the variable data practices with respect to preparing the submission of planning data to the CSO and rejection of the CSO templated form. Capacity and resource issues also mean it is more difficult to find the extra time to address system issues as staff are too busy working to meet existing workload and deadlines. Socio-cultural factors make it challenging to innovate and find alternative solutions, meaning that step-by-step and by small changes to existing approaches are preferable to starting over each time from scratch (Lindblom, 1959).

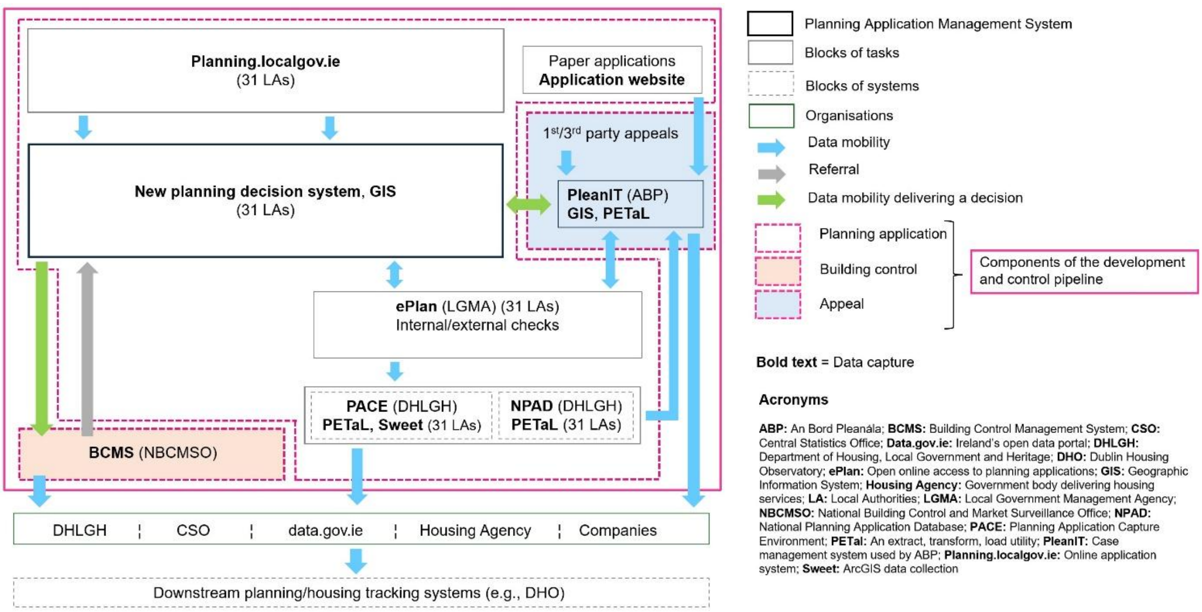
**Good enough systems, data and planning outcomes?**

While we have documented a number of technical, management, regulatory, and socio-cultural data frictions operating within the Irish planning development and control data ecosystem, the system is nonetheless functional and does enable actors to fulfil their statutory role and deliver services. Planning applications are being processed, assessed, and decisions made. Appeals are being lodged, investigated, and adjudicated. Construction and compliance with building control measures are being tracked. In this sense, at a base level, the data ecosystem does appear to be ‘good enough’ with respect to the technologies supporting planning work and outcomes. That is, it is largely seen to be meeting expectations, performing sufficient and reasonable work, and producing credible, legitimate decisions. However, that is not to say that it is beyond reproach, with some actors, notably from the development sector, challenging outcomes. Further, as Bialski (2024) contends, actors still recognize that the current arrangements might be improved. Notwithstanding, good enough acknowledges that the situation meets acceptable expectations given contextual factors. In relation to our case, those factors include a gradually evolving process of digitialization and datafication, involving multiple stakeholders with varying agendas, nearly all of which have taken place during austerity measures, with reduced resources, staffing, and capacities for care and innovation. Indeed, one of the characteristics of ‘good enough’ identified by Bialski (2024) is an-going tension between care and compromise; of wanting to improve but settling for patching and a workable solution. In other words, adopting a satisficing approach.

Yet, at higher levels, the data ecosystem is less than optimal for performing tasks that extend beyond assessing and making decisions on applications and tracking building control compliance, such as repurposing the data held within the data systems for the compilation of official statistics and open datasets that would aid policy making. This should be of no surprise. The original design specifications of the PAMS did not include the production of official statistics or functionality to easily answer FOI requests. The ability to extract data via an ETL process for inclusion in NPAD was not anticipated in the design of the ePlan system and other eplanning systems. The data ecosystem has never had a masterplan with a clearly defined set of technical specifications, roles and responsibilities, workflows, governance and management structure, and standards and protocols. Instead, the data ecosystem has been jerry-rigged together over a 25-year period, with different data systems commissioned and adopted at different points by numerous, independent actors that have varying aims, agendas and constraints, and who configured the systems to suit their specific needs. It is little wonder that multiple data frictions exist in the data ecosystem.

What is evident is a tension between data systems being ‘good enough’ to perform the original intent and providing ‘good enough’ outcomes, and the data ecosystem as a whole being sub-optimal to perform the new tasks demanded of it. This is a situation well recognized by managers and policy makers at the national level. There are three initiatives underway at the time of writing aimed at significantly reducing data frictions and expanding the expected functionality of systems. First, an inter-departmental group has been scoping out a major overhaul of the BCMS to address its two primary weaknesses: the lack of shared ID reference tying the BCMS to PAMS; and the lack of standardization and data quality due to open text fields and self-reporting. The proposed solution is a shared ID reference number, and replacing open text fields with drop-down menus with fixed categories for selection. Second, the LGMA and DHLGH have been producing a plan to create a new, standardized national development and control system. While the detail of this plan is not yet published, if it were to progress to implementation it would see all 31 LAs using the same set of IT systems, configured in the same way, with standardized data ontologies, workflows, and no option to individually tweak, and from which it will be much easier to run bespoke reports and extract data (see Figure 3). It is likely that if/when this comes to fruition, resistance to change and the labour it will entail will become an issue, particularly for front-line administrators. Third, there is a commitment to address the understaffing issue by filling vacant posts and increasing the number of planners by 350-400 in the next 3-5 years and increasing the number of planning graduates to a minimum of 120 per year (DHLHG 2024). These three initiatives aim to assist the data ecosystem in meeting present expectations, though new complications that require redress will inevitably emerge.

**Figure 3: The likely proposed development and control ecosystem for 2027 if approved and adopted**



**Conclusion**

In this paper, we have examined the digital mediation of planning through an in-depth case study of the development and control functions in Ireland, its associated data ecosystem, and data frictions. The principal contributions of our analysis are three-fold. First, the analysis of the digital mediation of planning has largely focused on the adoption and effects of specific technologies on planning practice (such as GIS, planning support systems, digital twins, AI), but has paid less attention to the ways in which *constellations* of digital technologies are assembled to undertake suites of related tasks. We have documented how planning work is rarely reliant on single technologies or systems, but rather employs a number of IT systems to perform the plethora of tasks required to fulfil planning functions. As such, our view is that focusing on specific technologies fails to recognise how much digitialized planning is actually occurring in practice. Yet, there is very little work that charts how IT systems are used in conjunction with each other and the effects of these constellations on the organization and operations of planning. We believe it would be instructive to examine other planning data ecosystems (e.g., relating to strategic planning, consultative/participatory planning, etc.) and identify their features and characteristics, particularly of those that are thought to work well that might inform the slow shift to better data ecosystems. Part of this examination needs to include additional research on the affective impacts of ongoing system upgrades and changes on planning practitioners.

Second, digital planning research has considered the efficacy of new digital systems. However, this evaluation typically focuses on the value of a specific IT system to planning practice in terms of new or enhanced functionality. Less attention has been paid to whether constellations of technologies provide 'good enough' solutions for expected planning practice. Similarly, relatively little attention has been paid to the technical, regulatory, and socio-cultural data frictions that limit and hinder how digital planning work takes place. We have made a case that it is useful to evaluate the extent to which data systems, and the wider data ecosystem, provide sufficient and reasonable execution, and to identify issues that hinder and disrupt optimal performance. Such an evaluation is necessary given the extent of interdependencies between planning IT systems that span organizations and scales (local to national), which are fractured in their makeup and possess extensive data frictions due to being introduced at different times, for varying purposes, with different standards and governance arrangements, and that are jerry-rigged into place with respect to each other. To aid the assessment of 'good enough', we have identified a set of inter-related components (credibility, integrity, legitimacy, relevance and authority), and three forms of data frictions (technical, regulatory and socio-cultural) that potentially undermine system performance. Furthermore, we have noted that while each data system employed within a data ecosystem might be 'good enough' in performing its original sets of tasks, the data ecosystem as a whole can be sub-optimal in its organization and operation and might struggle to effectively deliver with respect to new demands. In our case, the state has recognized that a review and reorganization is necessary in order to render the data ecosystem as a whole 'good enough' to meet current and future operational and policy expectations. In other words, ‘good enough’ is relational in nature, being acceptable for certain tasks at a particular scale, but not for other purposes or not at a different scale.

Finally, we have illustrated that there are incremental limits to achieving ‘better planning’ through technological and other interventions. Data frictions will always be present to some degree given the use of multiple data systems. Therefore, any technological solutionist claims to be able to radically reconfigure and fix planning’s operation shortcomings, such as the introduction of AI tools, should be treated with scepticism and cautious assessment. AI requires careful interleaving into existing systems to maintain a status of ‘good enough’, rather than radical reform that could regress to ‘unacceptable’.

**Note**

Ireland’s planning appeals board, An Bord Pleanála, underwent a name change to An Coimisiún Pleanála in June 2025 with the introduction of Ireland’s Planning and Development Act 2024. In this paper we use the acronym ABP to refer to the previous name of the planning appeals board as this was its name at the time of research and writing.

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**References**

Albrechts, L. (2003) “Reconstructing decision-making: Planning versus politics”, *Planning Theory*, 23, 249–268.

Batty, M. 2021. “The digital transformation of planning.” *Environment and Planning B: Urban Analytics and City Science* 48(4), 593–597.

Bates, J. 2018. “The politics of data friction”, *Journal of Documentation* 74: 412–429.

Bialski, P. 2024. *Middle Tech: Software Work and the Culture of Good Enough*. Princeton, NJ: Princeton University Press.

Boland, P., Durrant, A., McHenry, J., McKay, S., & Wilson, A. 2022. “A ‘planning revolution’ or an ‘attack on planning’ in England: Digitization, digitalization, and democratization.” *International Planning Studies*, 27(2): 155–172.

Brooks, M. 2019. *Planning Theory for Practitioners*. London: Routledge.

Collins, W.R., Miller, K.W., Spielman, B.J. and Wherry, P. 1994. “How good is good enough? An ethical analysis of software construction and use.” *Communications of the ACM* 37(1): 81–91.

Daniel, C. and Pettit, C. 2021. “Digital disruption and planning – use of data and digital technology by professional planners, and perceptions of change to planning work.” *Australian Planner* 57(1): 50-64.

Daniel, C., Wentz, E., Hurtado, P., Yang, W. and Pettit, C. 2023. “Digital technology use and future expectations: A multinational survey of professional planners. *Journal of the American Planning Association* 90(3): 1-16.

DECLG. 2015. *Local Authority Budgets 2015*. Dublin: Department of Environment, Community and Local Government. Gov.ie, https://assets.gov.ie/111386/41aa9b02-446d-4188-8e5e-d86ea87faca0.pdf

DEHLG. 2008. *Local Authority Budgets 2008*. Dublin: Department of Environment, Heritage and Local Government. Gov.ie, https://assets.gov.ie/111397/f4ede5e2-1f1c-4491-b3f6-300b49506d8c.pdf

DHLGH. 2024. *Ministerial Action Plan on Planning Resources, October 2024*. Dublin: Department of Housing, Local Government and Heritage. https://www.gov.ie/en/publication/51194-ministerial-action-plan-on-planning-resources-october-2024/

DPER. 2024. *Databank*. Department of Public Expenditure & Reform, https://databank.per.gov.ie/Public_Service_Numbers.aspx?rep=SectorTrend

Edwards, P. 2010. *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming*. Cambridge, MA MIT Press.

Falco, E. and Kleinhans, R. 2018. “Digital participatory platforms for co-production in urban development: a systematic review.” *International Journal of E-Planning Research* 7(3): 52-79. https://doi.org/10.4018/IJEPR.2018070105.

Flyvbjerg, B. 2009. “Survival of the unfittest: Why the worst infrastructure gets built—and what we can do about it.” *Oxford Review of Economic Policy*, 3(3): 344–367.

Forester, J. 1984. “Bounded Rationality and the Politics of Muddling Through.” *Public Administration Review*, 44(1): 23–31.

Gabrys, J., Pritchard, H., and Barratt, B. 2016. “Just good enough data: Figuring data citizenships through air pollution sensing and data stories.” *Big Data & Society* 3(2): 1–14.

Gieseking, J. J. 2018. Operating anew: Queering GIS with good enough software. *Canadian Geographies / Géographies Canadiennes*, *62*(1), 55–66. https://doi.org/10.1111/cag.12397

Graham, S. and Marvin, S. 2001. *Splintering Urbanism*. London: Routledge.

Grzymala-Busse, A. 2011. “Time will tell? Temporality and the analysis of causal mechanisms and processes.” *Comparative Political Studies*, 44(9): 1267–97.

Hastings, A. and Gannon, M. 2022. “Absorbing the shock of austerity: the experience of local government workers on the front line.” *Local Government Studies* 48(5): 887-906.

Inman, S. and Ribes, D. 2018. “Data streams, data seams: Toward a seamful representation of data interoperability.” Paper presented at Design Research Society, University of Limerick, 25–28 September, https://dl.designresearchsociety.org/drs-conference-papers/drs2018/researchpapers/16

Kayanan, C. M., Moore-Cherry, N. and Tomaney, J. (2025). Metropolitanization, civic capacity and metropolitan governance: Ireland in the metropolitan century. *Territory, Politics, Governance*, *13*(2), 204-220.

Kitchin, R. 2023. *Digital Timescapes: Technology, Temporality and Society.* Polity Books, Cambridge.

Kitchin, R., O’Callaghan, C., Boyle, M., Gleeson J. and Keaveney, K. 2012. “Placing neoliberalism: The rise and fall of Ireland’s Celtic Tiger.” *Environment and Planning A* 44(6): 1302-1326.

Kitchin, R., Young, G. and Dawkins, O. 2021. “Planning and 3D spatial media: progress, prospects, and the knowledge and experiences of local government planners in Ireland.” *Planning Theory and Practice* 22(3): 349-367.

Kitchin, R., Davret, J., Kayanan, C. and Mutter, S. (2025a) Genealogy of a data ecosystem: The digitialization of the Ireland’s planning development and control, 2000-2024. *Digital Geography & Society* 8: 100124. doi: 10.1016/j.diggeo.2025.100124

Kitchin, R., Davret, J., Kayanan, C. and Mutter, S. (2025b) Data mobilities: Rethinking the movement and circulation of data. *Mobilities* 20(5): 1002-1020. doi: 10.1080/17450101.2025.2481309

Klosterman, R.E. 2012. “E-Planning: Retrospect and prospect.” *International Journal of E-Planning Research*, 1(1), 1–4.

Kuppler, A. and Fricke, C. 2024, online first. “Between innovative ambitions and erratic everyday practices: urban planners’ ambivalences towards digital transformation.” *Town Planning Review* 96: 155-177. https://doi.org/10.3828/tpr.2024.41

Li, X. and Dang, A. 2025, online first. “The disruptive effect of AI on urban planning.” *Nature Cities* 2: 568-570. https://doi.org/10.1038/s44284-025-00256-4

Lindblom, C. E. 1959. “The Science of ‘Muddling Through.’” *Public Administration Review*, 19(2), 79–88.

Milz, D., Pokharel, A., & Gervich, C.D. 2023. “Facilitating Online Participatory Planning During the COVID-19 Pandemic.” *Journal of the American Planning Association*, *90*(2), 289–302.

Mualam, N., Israel, E., & Max, D. 2022. “Moving to Online Planning during the COVID-19 Pandemic: An Assessment of Zoom and the Impact of ICT on Planning Boards’ Discussions”. *Journal of Planning Education and Research*, 44(3), 1650-1669.

Pääkkönen, J. 2020. “The rhetorical work of credibility-building for social scientific big data.” *STS Encounters*, 11(1): 281–316.

Pink, S., Sumartojo, S., Lupton, D. and Heyes La Bond, C. 2017. “Mundane data: The routines, contingencies and accomplishments of digital living.” *Big Data & Society*, 4(1): 1-12.

Pink, S., Lanzeni, D. and Horst, H. 2018. “Data anxieties: Finding trust in everyday digital mess.” *Big Data & Society*, 5(1): 1–14.

Plantin, J-C. 2019. “Data cleaners for pristine datasets: Visibility and invisibility of data processors in social science.” *Science, Technology & Human Values* 44(1): 52-73.

Plantin, J.-C. 2021. “The data archive as factory: Alienation and resistance of data processors.” *Big Data & Society*, *8*(1), 20539517211007510.

Potts, R. and Webb, B. 2023, online first. “Digital planning practices: benchmarking planners’ use of information and communication technologies (ICTs).” *Planning Practice and Research* 38(4): 520-540. https://doi.org/10.1080/02697459.2023.2216492.

Rast, J. 2012. “Why history (still) matters: Time and temporality in urban political analysis.” *Urban Affairs Review*, 48(1): 3–36.

Ruppert, E. and Scheel, S. 2021. “Data practices”. In *Data Practices: Making Up a European People* edited by E. Ruppert and S. Scheel, 29–48. London: Goldsmiths Press.

Sanchez, T.W., Shumway, H., Gordner, T. and Lim, T. 2022. “The prospects of artificial intelligence in urban planning.” *International Journal of Urban Sciences* 27(2), 179–194.

Silva, C.N. 2010. “The e-planning paradigm–Theory, methods and tools: An overview.” In *Handbook of Research on E-planning: ICTs for Urban Development and Monitoring*, edited by Silva, C.N, 1-14. Hershey, PA: IGI Global.

Simon, H. A. 1957. *Models of Man: Social and Rational; Mathematical Essays on Rational Human Behavior in Society Setting*. New York: Wiley.

Vertesi, J. 2014. “Seamful spaces: Heterogeneous infrastructures in interaction.” *Science, Technology, & Human Values*, 39(2): 264–84.

Wajcman J and Dodd N. 2017. *The Sociology of Speed: Digital, Organizational, and Social Temporalities*. Oxford: Oxford University Press.

Wilkinson, E. & Ortega-Alcáraz, I. 2019. “’The Right to be Weary? Endurance and exhaustion in austere times’”, *Transactions of the Institute of British Geographers*, 44(1): 155-167.