Working Paper Series

Making public finance digital

Challenges to the emerging digital public financial management paradigm

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Public finance in the digital era

Key messages

For practitioners, digital public financial management (PFM) can support public finance reform by bringing together different specialisms from PFM, digital government and service delivery into a more holistic focus.

Digital PFM approaches will need to help public finance practitioners increasingly blend the capabilities of finance ministries with the goals and requirements of digital service delivery.

There are six major challenges to the emerging *digital PFM* paradigm: a bias towards commercial off-the-shelf (COTS) solutions; an incomplete understanding of user needs and incentives; an inherent aversion to iterative, incremental ways of working; critical gaps in financial ministries; outdated funding models; and legacy technology and sunk cost fallacy.

In realising the benefits of *digital PFM* approaches, public finance experts need to work more closely, and inter-connectedly, with other specialisms within government to overcome key reform and service delivery challenges in making public finance digital.

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Glossary

Digital
Applying the culture, processes, business models and technologies of the internet era to respond to people's raised expectations.

Digital transformation
The act of radically changing how your organisation works, so that it can survive and thrive in the internet era.

Failure demand
Demand in a system resulting from flaws in that system's design or implementation, for example administrative effort taken to verify data because the process by which it was generated isn't trusted.

Greenfield
An opportunity to create something new from scratch. In technology terms, a situation where you can design a new service without needing to consider transition from existing systems.

Information Technology (IT)
Generally, computer systems used for storing, retrieving and sending information. In this paper we use 'IT' or 'IT system' to differentiate the pure technology used as part of financial management from the wider combination of human and technology processes that might comprise a digital approach.

Legacy technology
Often used to simply refer to older technology. Here it refers to technology where the cost of maintenance is greater than the value delivered, because, for example, it is no longer widely supported, has diverged significantly from the way the organisation wants to work, or doesn't fit into the wider architectural direction of an organisation.

Novel
We use 'novel' to refer to the attempt to either solve new problems or apply new approaches to solving pre-existing challenges. This usually means work takes place in an area of high uncertainty, where user needs or possible outcomes are not well understood.

User acceptance testing
A set of practices intended to verify whether software meets its expected requirements/specification. Approaches to user acceptance testing can vary, from business stakeholders agreeing a checklist to quality assurance professionals conducting an agreed set of practical tests, to inviting 'real world' users to try a product and provide feedback.

Utility
A good or service that is highly standardised to the point of fungibility, and usually priced based on consumption, for example electricity or broadband internet access. In recent years, the basics of cloud computing have begun to resemble utilities, though most cloud providers offer a range of services at different stages of commoditisation.

Executive summary

In the first paper in this series – entitled *Digital public financial management: An emerging paradigm* – we make the case that a paradigm shift is needed in how governments and development partners approach digital PFM. We outline an 'emerging paradigm' based on the latest thinking in PFM, digital change in government and digital technology.

Building on this emerging paradigm, this paper discusses how *digital PFM* as a discipline can help make public finance digital and, more broadly, usher in a new era of public finance reform in government. In this way, *digital PFM* brings together different specialisms from PFM, digital government and service delivery into a more holistic focus.

This paper outlines six main challenges to the emerging *digital PFM* paradigm:

1. **A bias towards commercial off-the-shelf (COTS) solutions,** because digitalisation is equated to introducing a financial management information system (FMIS), and the market for FMIS is dominated by a small number of vendors. The focus on technology solutions also makes it harder to take a problem-driven approach.
2. **An incomplete understanding of user needs and incentives**, resulting from a lack of meaningful user research in most *digital PFM* initiatives. The needs of certain users are deprioritised, which in turn impedes digital transformation. Because most users are internal, there is not the same pressure to improve usability that exists for predominantly citizen-facing services.
3. **An inherent aversion to iterative, incremental ways of working** given the ritualised nature of PFM, institutionalised risk aversion and inflexible, hierarchical cultures.
4. **Critical skills gaps in finance ministries,** especially in digital specialisms such as product management and design. Digital specialists tend to be treated as inferior to economists and policy advisors, and truly multidisciplinary digital teams in finance ministries are vanishingly rare.
5. **Outdated funding models** for digital initiatives in both government and development partners reinforce the prevailing bias towards COTS, and 'big-bang' implementation. Finance ministries are in a unique position to help reform these models.

6. **Legacy technology and sunk cost fallacy** will pose a particular problem in the PFM field, given the extensive investment in FMIS and other PFM systems over the past 30 years.

The paper concludes that, although these six challenges are significant, they are not insurmountable. To be overcome, finance ministries will need to adapt their ways of working, and funders will need to adjust their expectations and funding models. Significant supply-side investment will be needed at the national and global levels to create a more vibrant, competitive ecosystem of technology firms and technical assistance partners working on digitalisation and PFM reform, to bring public finance into the digital era.

The paper concludes by outlining a series of topics for future exploration, including the potential for digital public goods (DPGs) and digital public infrastructure to help governments move to an open architecture for PFM; painting a fuller picture of an alternative to an FMIS; and the potential presented by *digital* to more radically accelerate change in PFM processes.

1 Introduction

PFM – the means by which governments manage public resources – can be a rigid and exacting discipline. It is highly process-driven and there is a wide body of literature around best practice. While this leads to a robust practice of PFM in government, it also means that problem-driven, iterative and agile ways of working – key hallmarks of digital-era service delivery – are not always intuitive for professionals and policy-makers.

The first paper in this series on 'Public finance in the digital era' – entitled *Digital public financial management: An emerging paradigm* – contrasts the prevailing approach to *digital for PFM* with an emerging approach inspired by successful digital transformation in other parts of government (Long et al., 2023). By combining digital ways of working with the latest thinking in PFM reform, the paper argued that an emerging paradigm around '*digital PFM*' constituted a markedly different approach to realise the benefits of digitalisation in PFM (and beyond).

The first paper notes that PFM is unlikely to meet the needs of the digital era if it fails to adapt to it. Many of the problems in digital government service delivery (highlighted in this paper) are perhaps most acute in PFM, which is often most guilty of leveraging and being wedded to legacy IT systems and processes. In order for public finance to modernise, it must embrace modern approaches to digitalisation and work more closely with government practitioners focused on digital governance to implement and integrate them. This in turn may act as a force multiplier for governments looking to 'do' digital better.

Table 1 Contrasting the prevailing and emerging digital PFM paradigms

	Prevailing (*digital for PFM*)	**Emerging (*digital PFM*)**
Approach to PFM reform and digital transformation		
Approach	Unchanging ends	Means to an end
Processes	One-off digitization	Ongoing iterative redesign
Policy	Rigid and losing relevance	Flexible and responsive
Approach to technology		

Choices	Buy or build	Range of options including open source and DPGs
Architecture	Closed – modular FMIS	Open – standardised APIs
Data	Siloed databases	Shared registers
Approach to funding and delivery		
Starting point	Technical requirements	Outcomes and user needs
	Solution-driven	Problem-driven
Funding	Capital	Recurrent
	Up-front	Incremental
Delivery	Waterfall	Agile

Note: DPG = digital public good; API = application programming interface.
Source: Long et al. (2023)

1.1 Making public finance digital

Despite significant investments in IT, the first paper demonstrates how the prevailing approach to *digital for PFM* has struggled to deliver successful digital transformation. This has contributed to PFM losing relevance, especially among policy-makers. This second paper makes the case for governments to think more broadly about the process of making public finance digital, a reality which will inevitably be shaped by the emerging paradigm around *digital PFM* (seen in Table 1) as a management discipline.

By bringing together different specialisms from PFM, digital government and service delivery into a more holistic focus, a shift from *digital for PFM* to *digital PFM* can help finance ministries meet the needs of their users, including citizens and civil servants. Indeed, embracing the emerging paradigm of *digital PFM* not just as a *means to an end*, but as part of the whole reason why governments use digital technology for service delivery, will be critical for bringing public finance into the digital era.

Making the shift from the prevailing to the emerging paradigm for PFM requires policy-makers and practitioners to move towards more open technology architectures, in which digital solutions for PFM are part of a wider ecosystem of shared digital infrastructure, data and services, whereby all aspects of public finance and its management are truly digital. To make this possible, governments need to reform their funding and delivery models to be more outcome-focused and problem-driven. This requires (agile) PFM processes – and the digital solutions that underpin them – to support ongoing iterative redesign, such that they remain flexible and responsive to the needs of users and policy-makers.

The benefits of embracing the *digital PFM* paradigm include: a more holistic focus on the intersection between public finance and the tools and processes that shape its delivery; a better approach to reconciling tensions between standardisation and flexibility between the central fiscal agency and other users across government; interoperability between *digital PFM* tools and other government systems, allowing governments to change not just how they do things, but also what they do (particularly in times of crisis); and greater value for money by reducing duplication and making change management easier.

In realising these benefits, it is clear that public finance experts need to work more closely, and inter-connectedly, with other specialisms within government and increasingly leverage *digital PFM* tools and processes to make public finance digital. We recognise that governments are never starting from a blank slate, and that there are big challenges in making the shift towards digital-era ways of working and delivering.

1.2 Objectives of this paper

In order to assess how this shift might happen, this paper addresses the following questions:

- What are the most significant challenges to the emerging *digital PFM* paradigm, as identified in the first paper in this series?
- What is the outlook for decision-makers who want to address these challenges? What are some early hypotheses for how they might go about this?
- Where are the gaps in our knowledge, and therefore what are some future research questions to explore?

This paper is written with three audiences in mind:

- Decision-makers in governments and international development organisations who are dissatisfied with the prevailing paradigm.[1]

[1] Perhaps they are bruised by a previous PFM project where the digital component took many years to implement, overran its budget or produced lacklustre results. Or perhaps they are grappling with legacy PFM IT systems that are a source of growing risk and spiralling costs, and that are increasingly a blocker rather than an enabler of reform. Or perhaps recent IT failures in PFM or in other domains have supercharged incentives to trial alternative approaches. Whatever the cause, this paper should help decision-makers to better understand what is involved in moving to the emerging *digital PFM* paradigm, especially by helping them to anticipate and address likely challenges. This paper could even inform a 'pre-mortem' exercise for governments about to embark on a new digital initiative in public finance.

- Digital specialists[2] interested in working more closely with finance ministries on PFM reforms to improve service delivery.[3]
- PFM experts who may be familiar with some of the challenges, but who want to understand them from the perspective of digital government practitioners.

1.3 Methodology

As well as a review of the relevant literature, the analysis in this paper is based on our collective experience of digital transformation in government.[4] The paper is based on qualitative methods, including 12 interviews with PFM experts, digital experts, government officials and donor organisations; responses to a survey of former and current ODI Fellows covering eight countries; a case study on PFM and digitalisation in Kenya; and a series of workshops organised by ODI, the eGov Foundation and the International Monetary Fund (IMF).

Box 1 Six challenges to the emerging digital PFM paradigm

A bias towards COTS solutions, because digitalisation is equated to introducing an FMIS, and the market for FMIS is dominated by a small number of vendors. The focus on technology solutions also makes it harder to take a problem-driven approach.

1. **An incomplete understanding of user needs and incentives,** resulting from a lack of meaningful user research in most *digital PFM* initiatives. The needs of certain users are deprioritised, which in turn impedes digital transformation. Because most users are internal, there is not the same pressure to improve usability that exists for predominantly citizen-facing services.
2. **An inherent aversion to iterative, incremental ways of working** given the ritualised nature of PFM, institutionalised risk aversion and inflexible, hierarchical cultures.
3. **Critical skills gaps in finance ministries**, especially in digital specialisms such as product management and design. Digital specialists tend to be treated as inferior to economists and policy advisors, to an even greater extent than in other ministries. Truly multidisciplinary digital teams in finance ministries are vanishingly rare.

[2] Who might be working as civil servants, in software vendors, systems integrators, open- source communities, technical assistance providers or civil society organisations. They may be chief digital or technology officers, product managers, designers, developers, tech architects, communicators or digital policy or engagement specialists.

[3] This paper may be of particular interest to those already working at the nexus of digital, PFM and service delivery in a domain such as health or education.

[4] This includes roles as executive directors, chief technology officers and policy analysts working in government; and as consultants working closely with more than 40 governments around the world over the last five years, to support their digital transformation.

4. **Outdated funding models** for digital initiatives, both in governments and development partners, reinforce the prevailing bias towards COTS and 'big-bang' implementation. Finance ministries are in a unique position to help reform these models.
5. **Legacy technology and sunk cost fallacy** will pose a particular problem in the PFM field, given the extensive investment in FMIS and other PFM systems over the past 30 years.

Source: Authors

We have framed the paper around six major challenges (see Box 1). These are not exhaustive, but are based on our research and our experience. We believe they are the most significant challenges for governments looking to shift to the emerging *digital PFM* paradigm. Each section presents a brief description of the challenge in question, before exploring the root *causes* and their implications in more depth. Each section ends with a short discussion of the *outlook* for overcoming that challenge, including what structural changes or global action might be needed to facilitate a shift towards embracing the emerging *digital PFM* paradigm. The boxes interspersed throughout aim to provide advice and guidance based on good practices in digital government.

2 Challenges in reforming PFM for the digital era

Understanding the challenges to successful digitalisation is a recurrent topic in PFM.[5] Commonly cited pitfalls include the absence of a well-prepared conceptual design, lack of ownership and poor management of the systems development lifecycle (Hashim and Piatti, 2018). We agree with these findings, but also see these challenges as stemming from a deeper problem common across government – a partial understanding of what it means to be digital.

We align with Loosemore's (2017) definition of digital as 'applying the culture, processes, business models and technologies of the internet era to respond to people's raised expectations'.[6] However, all too often in PFM, 'digital' and 'digitalisation' are conflated with 'information technology' or 'digitisation'.[7] This partial understanding of what it means to be digital can lead to a focus on specific solutions at the expense of opportunities to change how governments design and implement policy.

This chapter focuses on the challenges in making public finance digital and embracing the emerging *digital PFM* paradigm outlined in Long et al. (2023), and summarised here in Chapter 1. The challenges we list are not exhaustive, and we recognise some important omissions.[8] That said, after talking with a range of

[5] For more on these concepts, see Long et al. (2023). See also, for example, Diamond and Khemani (2005); Pimenta and Pessoa (2015); Hashim and Piatti (2018); Pimenta and Seco (2019); Uña et al. (2019); Hashim et al. (2020).
[6] Similar definitions stress that digital is about 'changing the way we work' (Green and Hunt, 2017), or 'a mindset, which translates into a new way of working that enables people and institutions to innovate with technology' (UNDP, 2022).
[7] Despite recent research on public finance and digital drawing a clear distinction. See Gupta et al. (2017).
[8] There are two obvious omissions from this list. The first is lack of political commitment. Consistent support from senior figures in government is enormously important for digital initiatives (Eaves and McGuire, 2018). However, this challenge has been well covered elsewhere, and is true of any major change initiative in government. Arguably, political sponsorship should be considered a precondition at the outset of a digital transformation project. Losing political sponsorship partway through a project is often a consequence of some of the challenges described in this paper, or due to external changes in the political environment, rather than being a challenge in and of itself. The second obvious omission from this list is political economy challenges, which present particularly acute hurdles for PFM reform. We have not discussed these at length because they represent a challenge

practitioners and experts in the field, it is quite likely that these challenges will be the most significant. They are also interconnected – for example, outdated funding models (Challenge 5) contribute to the solutions bias (Challenge 1) – and we try to highlight these connections throughout the discussion.

2.1 Challenge 1: a bias towards COTS solutions

As discussed in Long et al. (2023), governments have a tendency to think about digitalisation in PFM in terms of solutions such as FMIS. This is reflected in their dependence on COTS from international vendors, and their aversion to using potentially cheaper and more flexible alternatives, including open-source solutions.

While there is nothing intrinsically wrong with governments relying on COTS solutions, this is problematic where it reflects solution-driven, rather than problem-driven, approaches to digitalisation. Public finance reforms often become overly focused on implementing technology, rather than redesigning processes and introducing new ways of working. This can leave governments locked into expensive underperforming solutions, and locked out of new technological opportunities.

Embracing the emerging *digital PFM* paradigm will require actions to promote problem-based approaches, address market concentration and dispel myths about alternative technology architectures.

2.1.1 Cause: PFM has often been biased towards technology-led, solution-driven approaches

While not universal, PFM reforms have historically been solution-oriented, with particular technologies in mind. Thus, digitalisation in PFM became equated with implementing an FMIS.[9] Efforts are framed around a technology solution, with success judged based on effective implementation, rather than delivering positive outcomes.[10]

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under both the prevailing and emerging paradigms. There is a common contention that technology will reduce corruption, but research suggests this is not necessarily the case (Fernandes et al., 2021). Expecting *digital PFM* to tackle political economy challenges is not always realistic. However, we believe that a deeper understanding of different users, their needs and incentives, can help (see Challenge 2).

[9] For example, during Tanzania's first FMIS implementation 'Rather than the FMIS solving these problems, the problems have appropriately become the focus of ensuring successful FMIS reform itself (still, 6 years after reform began)' (Andrews, 2010).

[10] As one World Bank study notes, 'In many cases, there remains a disconnect between having these systems in place and real functional improvements, from more credible budgets to commitment controls to overall more efficient use of funds. Greater attention to embedding and ensuring good use of systems includes shifting the focus of monitoring further to actual use and impact' (Fritz, 2017).

In contrast, good practice in digital government is to start with the problem to be addressed (or the outcome to be achieved), before jumping into specific technologies or solutions. In fact, an appropriate starting point may often be redesigning a paper-based process, either before or alongside introducing digital technology.[11] There is little to be gained by digitising an inefficient analogue process, or adopting a technology that imposes processes that do not fit the context.

2.1.2 Cause: market concentration

High levels of market concentration and limited awareness and/or availability of alternative options contribute to this technology-led, solution-driven approach in PFM. Historically, the technology options have been analogous to the market for enterprise resource planning (ERP) solutions in the private sector, where a few large multinational vendors have dominated (Kimberling, 2022; Weinburg, 2022; Long et al., 2023). And the market has not been disrupted to the same extent as other domains such as health and education by alternative options.

Governments have predominantly relied on COTS, and often the leading providers of ERP solutions to the private sector – SAP and Oracle. This is unsurprising given most public procurement processes and regulations tend to favour large vendors. If something goes wrong, officials tend to prefer a single vendor, rather than a constellation of vendors. Governments frequently lack the flexibility to procure alternatives to the traditional FMIS providers, because procurement officers may assume they can only buy one big software package instead of replacing discrete parts of the system. Established suppliers also benefit from hard-won knowledge of how to navigate procurement processes and decades of incumbency advantage.

This is problematic because it can lead to vendor lock-in, and with it challenges controlling costs (Gates et al., 2022). The power imbalance between multinational vendors and governments, exploitative pricing practices by vendors and limited awareness of alternatives are also cited as reasons for the status quo (ibid.). This also means governments are limited in the advantages they can realise from newer, more flexible technologies that allow for smarter spending and better delivery through pay-per-use, on-demand cloud services (Stewart and Kalar, 2018).

The market concentration in PFM contrasts with other sectors where open-source alternatives benefit from international sponsorship and cooperation. Examples include the District Health Information System (DHIS2)[12] in the health sector,[13] OpenEMIS (UNESCO, 2014) in the

[11] For example, digitalisation in tax administration has often proceeded along these lines to improve tax enforcement. See Mascagni (2017) for a discussion.
[12] See: Our Vision & Partners – DHIS2.

education sector[14] and the Modular Open Source Identity Platform (MOSIP),[15] which has applications to multiple sectors, most notably social protection.[16] In contrast, open-source solutions for PFM remain nascent and untested.[17]

2.1.3 Cause: being 'locked-in', and locked out of, new opportunities

When ERP systems were first introduced in the 1990s, options were more limited, constraints more severe and a technology-led approach was more understandable. However, the market has evolved significantly, and more flexible architectures and delivery approaches are now possible.

While PFM still suffers from problems with vendor lock-in, the wider technology market has been shifting away from software provided by a single vendor and installed on an organisation's own servers towards cloud-based software-as-a-service (SaaS). Some of the same challenges with legacy COTS still exist with SaaS software, but maintenance and integration options can be different (Essex, 2021). SaaS also typically offers organisations significantly more choice and flexibility. However, governments tend to view these solutions warily.

In contrast to the monolithic and inflexible ERP solutions often found in PFM, it is increasingly seen as good practice for large organisations to choose a relatively small core ERP covering a limited number of key processes, which connect to rganizatio SaaS products using APIs (Braun and Östhed, 2019). This approach also enables organisations to take advantage of a new breed of flexible analytics tooling – such as Tableau and Alteryx – rather than assuming that an ERP plus some Excel-based analysis can cover all management and business information needs.

In other parts of government, there is also a move towards more flexible solutions, either built in-house or by an increasingly diverse set of local vendors. These are often built from open-source components. Initiatives such as the Digital Public Goods Alliance's (DPGA) register of DPGs and the GovStack Initiative's building block approach are helping to promote increased use of open-source

[13] Originally developed for South Africa, it is now steered by a permanent centre at the University of Oslo, and enjoys multi-year core funding from development partners.
[14] Developed by, and still supported by, UNESCO.
[15] See: Open Source Platform – National Foundational Id – MOSIP.
[16] Based at the International Institute of Information Technology, Bangalore, and supported by a consortium of funders including the Bill & Melinda Gates Foundation, Norad, the Omidyar Network and Tata Trusts.
[17] 'There are a number of common risks associated with the adoption of technology in PFM. For example, the purchase of IT systems can have a "lock-in" effect for technology that may become quickly outdated. Further research is needed to assess the plausibility of open-source and flexible systems to avoid such lock-ins, and to understand for which types of technology these systems may be most useful' (AlphaBeta, 2018).

software and open standards in government. DPGs are also increasingly seen as an important part of government efforts to build *digital public infrastructure*, because they can help governments avoid vendor lock-in (DPGA, 2021).

However, to date there has been little trust in open-source software and in-house solutions within PFM despite some success in leveraging open-source software for developing an integrated FMIS (IFMIS) in Latin America (Pimenta and Seco, 2019). Within government more broadly, there are still misconceptions around open source being less secure or of lesser quality (Gawen et al., 2021). This is despite success with in-house, open-source solutions in other domains (see above), and even though open source provides crucial infrastructure in banking (Mihaila, 2021), cybersecurity and other critical fields (Ellison et al., 2021).

Aversion to cloud migration – common across many government domains, not only PFM – can also be a block. Misconceptions that cloud-based infrastructure is more expensive and less secure than onsite infrastructure partly explain this, as do data sovereignty concerns and a lack of appropriate policy and legislation.

Box 2 Architectural approaches

It has been common to consider the decision on how to introduce a system as a binary one: either buy or build. Reality is always more complicated as implementation requires configuration, customisation and integration. Decision-making needs to be multidisciplinary, bringing together an understanding of user needs, desired outcomes and rganizational change, at the same time as the technological possibilities.

As technology evolves, there is innovation at the level of packaged systems (such as the move from onsite to cloud-based ERP systems) and also at the level of the more fine-grained capabilities that can be used to compose systems (for example, the way that cloud computing initially provided a faster approach for infrastructure, but now offers a wide variety of user management, data analysis and other components that can be used discreetly).

Understanding the pieces

As well as considering how, organizationally, you want to distinguish functions (such as how close you want the teams responsible for budget preparation and execution to be), mapping the technology components required to support those functions is important to inform decisions about the way you design your financial management systems, and how you anticipate future developments. With most systems lasting years, if not decades, it is vital to design for adaptation and change.

Several governments, particularly the United Kingdom, have made use of Wardley Mapping to lay out the capabilities required to meet a set of user needs. Wardley Maps offer a way of understanding the constituent parts required to deliver a solution, as well as to understand where those parts sit in terms of maturity: from *novel* components that meet emerging needs and/or harness new technologies to *utilities* that meet well-understood needs using stable technologies defined by standards.

Such a map provides a framework to explore which aspects of the system need to be highly tailored to local circumstances, which are likely to change, and the tools you might have (influencing vendors, developing or using open-source components, etc.) to change the options available to you to better match your needs.

Where legacy systems exist, they can be mapped onto the desired capabilities to support decision-making about how and when they should be replaced.

Broader integration and infrastructure

A third lens is a focus on data, and how financial management connects to a wider data ecosystem.

Where a decision has been made to have a distributed or federated financial management system (e.g., where the central system aggregates data from the independent systems of different governmental units) that integration should build on well-understood and open standards. This will enable independent development of the systems and a choice of vendors, rather than being tied into specific vendors' data exchange formats, which can carry hefty costs.

Similarly, attention should be given to where data might exist or be useful elsewhere. For example, if a government already maintains lists of registered businesses (e.g., for transparency of beneficial ownership, or vetting suppliers for government contracts), building on those lists both simplifies cross-checking and deeper analysis and contributes to important digital infrastructure.

Source: Authors

2.1.4 Outlook: an opportunity to change attitudes

While the bias towards COTS remains strong, there are encouraging signs that attitudes are beginning to change within governments. Smaller-scale FMIS solutions developed in one context are beginning to be adapted for use in others,[18] and experiments with open-source

18 These include BISAN, whose government edition was originally developed for use in the West Bank and Gaza and has since been implemented in Libya and the Marshall Islands; and SIMBA, originally developed for French Municipalities and currently being used by the Central African Republic and Comoros. Source: World Bank Group (WBG) GovTech Dataset December 2022.

solutions for PFM are showing promise in Uruguay (Mercapidez and Abilleira, 2019) and India (see Box 3). Similarly, there are signs that government attitudes towards cloud infrastructure are changing, encouraged by initiatives from the World Bank and vendors including Amazon Web Services (AWS) and Microsoft (World Bank, 2022). There has already been advocacy for a transition to a more open technology architecture for PFM (Pimenta and Seco, 2019; Uña et al., 2019).

To realise the opportunities and benefits of a more open technology architecture, further supply-side action is required: to increase competition in the market to break the dominance of incumbent vendors and offer alternative solutions; to develop open standards that allow for interoperability between different components; and to support and advocate for systems integrators and other providers of digital skills to engage with new solutions and open standards.[19]

At the individual government level, practitioners in digital and PFM alike have a role to play in advocating problem-driven approaches to developing a more open and flexible technology architecture (see Challenges 2 and 3) and adopting newer approaches to funding digitalisation (see Challenges 4 and 5). However, governments will also need to recognise that shifting to *digital PFM* will inevitably mean replacing legacy technologies at some point (see Challenge 6).

2.2 Challenge 2: an incomplete understanding of user needs and incentives

For digital change to be successful, initiatives must be designed, developed and introduced with context, user needs and incentives in mind. The best digital initiatives start with user needs, rather than considering them an afterthought.[20] Starting with user needs sounds straightforward but it is often neglected in practice, or is confused with stakeholder consultations.[21]

[19] Ideally this would include a diverse set of local and regional systems integrators, not just a few global players, to ensure that power is not concentrated in a different part of the value chain, and to help ensure that spending on *digital PFM* initiatives bolsters digital economies and ecosystems in the global south.

[20] The first of the *Principles for digital development* – endorsed by 54 development organisations in their first year – is 'Design with the user'. This principle is summarised as follows: 'user-centred design starts with getting to know the people you are designing for through conversation, observation, and co-creation'. Similarly, government digital service standards around the world commonly include as the first principle 'understand users and their needs' (UK Government, 2022), 'design with users' (Treasury Board of Canada Secretariat, 2021) or 'understand what people need' (US Digital Service, n.d.).

[21] As the Ontario Government's Digital Service Standard notes: 'it's also important to do user research with the people who will be end users. This is different from research and testing with internal government staff (unless they are the users) or other stakeholders. Staff and stakeholders have valuable user insights, but they

There are different permutations of this approach in government digital units around the world. For example:

- Irembo (in Rwanda) has digitally transformed more than 100 public services (Keza, 2022). The team behind Irembo used *journey mapping* to better understand citizens' needs, and to prioritise and redesign services accordingly (Uwajeneza, 2020).
- The UK's Government Digital Service redesigned GOV.UK to make government information and services easier to find and access (Public Digital, 2020). In reorganising government information around the needs of citizens rather than government departments, they were able to close more than 1,800 different websites and contribute to cost savings of £4.1 billion (Greenway et al., 2021).
- Singapore's citizen-centric approach has aimed to transform government services around 'life events' to improve adoption and efficiency (Chin, 2016; Ganesan et al., 2019).

This can be difficult in PFM, where user needs vary from country to country, as well as within countries, and across different roles in the PFM cycle. Investing in user research will be critical for *digital PFM*, in order to understand where needs are common, and where flexibility is required.

2.2.1 Cause: user needs vary across countries

While COTS typically embed international best practices, they offer little flexibility or room for addressing different user needs. There can be significant heterogeneity in the roles and capacities of different actors across the PFM cycle within countries, and even more across countries. Among these wide ranging users, it becomes harder to ensure different needs are adequately addressed without extensive customisation of a COTS solution.

For example, the role of *budget officers* can vary substantially across countries (Hadley et al., 2019). Whereas in Myanmar and Malaysia the budget officer must approve and authorise relatively small amounts of spending, the equivalent role in the UK and the Netherlands is more focused on strategic problem-solving. Even between these two countries, processes for managing potential risks of overspending vary significantly. These differences present challenges for the adoption of standardised digital solutions based on generic views of roles and responsibilities.

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also have information and experiences that makes them different from the end users themselves' (Ontario Digital Service, 2021).

2.2.2 Cause: starting with user needs can be more difficult in PFM

Many government digital initiatives struggle to be led by user needs, but digital initiatives in PFM tend to struggle more than most. There are three main reasons for this: the combination of rigid processes and a bias towards COTS solutions (see Challenge 1); the number and diversity of users; and the type of users.

First, when rigid processes are combined with a bias towards COTS solutions, the typical starting point is technical requirements rather than user needs. If procuring an FMIS is a foregone conclusion, and the number of possible solutions is small, it can be tempting to skip user research in favour of 'user acceptance testing' later down the line.[22] User research rarely informs whether, how and which software is introduced.

Second, the number of potential users is large and diverse.[23] As well as different financial management functions, users are in different sectors and at different levels of government. The needs of these users are not always homogeneous, and their capacity to use digital solutions may also vary significantly – in terms of digital literacy, connectivity, device and how many other digital tools they must use for their job. Many governments circumvent this heterogeneity by taking a treasury-centric approach,[24] thereby limiting direct interaction with the FMIS to ministry of finance officials. Subconsciously or otherwise, this tends to prioritise the needs of users in the finance ministry over those of others, and it can adversely affect the capacity to achieve desired outcomes.

Third, users tend to be internal to the public service, rather than citizens or business owners. Tax and benefits are notable exceptions within PFM.[25] It is usually easier to persuade ministers and senior officials of the case for a user needs-led approach with a video of a military veteran who cannot use a poorly designed online service to access essential healthcare (Tavoulareas and Brody, 2016), than it is with an example of a disgruntled civil servant struggling to use a

[22] Joshi et al. (2015) describe user acceptance testing as being 'generally considered the final stage of the project' in implementing an FMIS.
[23] One study estimates the number of users of an FMIS as varying from around 100 (Albania) to over 5,000 (Vietnam) (Hashim, 2014).
[24] For example, they limit direct interaction with the FMIS to staff of the finance ministry. See Hashim (2014) for further discussion of the pros and cons of the treasury-centric approach.
[25] Digital services for tax and benefits tend to be more user-friendly for this reason. For example, 'The Kenya Revenue Authority has set up a customer experience function in 2016. The goal was to improve customer centricity. Learning from the previous challenges encountered with the rollout of iTax, [it] significantly improved [its] approach to roll out ICMS [Integrated Customs Management Systems] and TIMS [Tax Information Management Systems]. There is a lot more prior engagement with the users as well as awareness campaigns to boost uptake' (pers. comm., case study on PFM and digitalization in Kenya).

poorly designed budget management tool, even though meeting the needs of the civil servant may unlock a wide range of benefits.

Box 3 Starting with user needs: the case of iFIX

In India, the eGov Foundation is working with the state government of Punjab to develop a platform – iFIX – for the exchange of fiscal data and information between different departments and layers of government. The purpose of iFIX is to standardise fiscal events,[26] allow data and information to flow in real time, improve visibility, and enable more efficient decision-making and funding flows. The platform was initially piloted through collaboration between the state Finance Department and the Department of Water Supply and Sanitation (DWSS).

The authorities identified poor financial management and a lack of visibility into the operations of Gram Panchayat Water Scheme Committees (GPWSC) – responsible for setting up water connections, billing and collecting water charges from households, paying suppliers and maintaining physical infrastructure – as a problem, resulting in unpaid suppliers, accumulation of arrears, deterioration of assets and adverse impacts on water supply.

The eGov team developed a mobile-based application for the GPWSC for revenue and expenditure management. Revenue and expenditure events entered into the application are posted to the iFIX platform, and a dashboard provides state-level officials with a real-time view of the financial sustainability of their operations.

To inform product development, the eGov Foundation conducted more than 100 interviews over two years to understand the needs and constraints of different user groups.[27] Research with frontline users informed the user experience/user interface (UX/UI) design, as well as the product vision. For instance, interviews with the field team highlighted a lack of confidence in using digital applications. This led to the iFIX team creating a basic design for the solution that could later be iterated on.

The product team also made efforts to ensure the platform is flexible, and that it can be easily configured to serve the needs of other users, which have similar revenue and expenditure assignments, but use different processes and other digital solutions.[28]

[26] For more information, see https://egov.org.in/public-financial-management/.
[27] Interviewees included accounts officers, auditors, data entry operators and budget officers, as well as frontline workers in the Social Team, the Field Team and data entry officers. The team also interviewed people in adjacent departments, such as the Transport Department, and the Department of General Reforms, in addition to the DWSS and Finance Department.
[28] An iFIX adaptor allows for the standardisation of data from other legacy applications.

The eGov Foundation is now in the process of scaling iFIX across more local bodies and exploring the use of iFIX in other sectors such as health.

Source: eGov Foundation (2023)

2.2.3 Outlook: an opportunity for cross-government collaboration

Understanding user needs is critical for *digital PFM* to be successful. Reformers will need to take a broader view of the PFM system than is often the case currently, and invest in practical research skills to understand user needs. This could allow for better insights into the needs and incentives of a broader range of users, and counter biases towards traditional 'technical requirements' and 'best practice' thinking, where it is inappropriate.

Representatives from different communities of practice can also play a role in agitating for their user needs to be met. For example, the health financing community of practice has taken a leading role in demanding more flexibility from the PFM system (Barroy et al., 2019). Better engagement with these communities of practice could ultimately lead to better outcomes.

2.3 Challenge 3: an aversion to iterative, incremental ways of working

Public finance reformers can face an institutionalised aversion to iterative, incremental ways of working given the ritualised nature of PFM. Deep-rooted risk aversion, an attachment to business cases that promote false certainty and inflexible, hierarchical cultures can be challenging.

Cumulatively, these behaviours can lead finance ministries to favour more traditional waterfall approaches to introducing new software, compared with problem-driven approaches such as agile methodologies, an iterative approach to software development and project management. Nevertheless, there is sufficient dissatisfaction with these traditional approaches to suggest that finance ministries may be willing to experiment with new methods to overcome them.

2.3.1 Cause: iterative, incremental approaches are rare in PFM

One of the common causes behind major digital failures is a 'big-bang' approach to rollout, i.e., introducing a new system without a phased adoption or parallel runs (Sheldon, 2016).[29] In contrast, agile

[29] New Zealand's 'Novopay debacle' provides an archetypal example. After a series of lengthy delays, the national payroll system was launched in 2012 to provide services for 110,000 education workers. Relying purely on internal testing left

ways of working start small and scale up only after rapid iterative cycles of user research, testing and improvement. Agile approaches need not mean longer timelines overall, but they do place an emphasis on real-world testing and feedback, to better manage risk, to allow some benefits to be realised faster and to enable better outcomes overall.

Neither approach can eliminate the risk of failure, but agile approaches have been found to reduce them. A 2015 study finds that 39% of digital initiatives that used agile methods succeeded, compared with 11% that took a waterfall approach; 9% of agile projects are considered to have completely failed, versus 29% of waterfall projects (Standish Group, 2015).[30] This is because an agile approach makes it easier to adapt and respond to changing conditions.

Within PFM there is already some recognition of the value of incremental approaches. Interviewees in Kenya told us that they took a modular approach to the implementation of their Integrated Customs Management Systems (ICMS) following a problematic big-bang rollout of the iTAX system. Hashim and Piatti (2018) note that 'FMIS projects are more effective if implemented in phases', while Uña et al. (2019) advocate a 'modular approach' for FMIS.

Nevertheless, PFM's embrace of modern approaches to the development and delivery of software remains half-hearted. Phased or modular approaches are certainly an improvement on traditional big-bang implementations, but there is further to go towards a truly agile approach.

2.3.2 Cause: PFM has not always embraced agile ways of working

Mergel et al. (2021) observe that some policy domains are more suited to agile methodologies than others. For instance, departments engaged in crisis response tend to act swiftly and iteratively as a matter of course. Given the inherently unpredictable and challenging nature of crises, and a greater tolerance of risk, new approaches are tried more routinely, and feedback loops are faster.

In contrast, while the Covid-19 crisis has highlighted the adaptability of some finance ministries, PFM itself tends to be quite a rigid discipline and does not always lend itself to more agile ideas like iteration and experimentation. Indeed, most finance ministries generally have a low tolerance for failure. PFM involves operating at a macro level and implementing government-wide measures. It also involves extensive planning, structure and predictability. Arguably, the nature of the work in PFM makes it counter-intuitive for PFM

hundreds of defects undetected and led to more than 18,000 payroll errors (Calleum Consulting, 2022).

[30] The third, middle category between successful and failed is 'challenged'.

practitioners to embrace iterative ways of working. Prevailing budgeting methods, for instance, are rarely compatible with experimentation.

Furthermore, public finance tends to be under intense scrutiny and mistakes quickly make the headlines. As the custodians of taxpayers' money, finance ministries are under significant pressure to avoid any perception of failure – perhaps more so than other departments – making it harder for them to embrace new methods and release features that may not work at the first attempt.

Nevertheless, there has recently been a shift towards problem-driven approaches to building capabilities within the PFM community (Lawson et al., 2020). While the value of problem-driven iterative adaptation (PDIA) for PFM remains contested (Allen, 2017; Harris and Lawson, 2022), its similarities to agile approaches (see Box 4) provide a potential bridge for collaboration between digital specialists and the PFM community.

Box 4 Comparing agile and problem-driven iterative adaptation (PDIA)

As the name suggests, PDIA – popularised by Matt Andrews, Lant Pritchett and Michael Woolcock in their 2017 book *Building state capability: evidence, analysis, action* – has many similarities to agile delivery approaches. Similar to agile approaches, PDIA encourages reforms that are problem-driven, iterative and locally led (Andrews et al., 2017). This is essential for PFM reform: previous studies recognise that changing attitudes is critical for success (AlphaBeta, 2018), but they can receive limited attention, or may be wrapped up in vague exhortations to prioritise 'change management'.

Like agile methodology, PDIA encourages a shift in mindset. It emphasises the human causes of what appear to be purely technical problems. Officials using PDIA approaches would therefore not simply introduce a technology solution in isolation, but they would also address process and people-oriented issues that, if not considered, would limit the impact of the digital solution.

Both agile and PDIA offer benefits beyond the scope of a particular initiative because – if introduced well – they can expand government officials' capacities to tackle a broader set of problems (Harris and Lawson, 2022). They emphasise building relationships with, and understanding the needs of, a broader set of actors across government and the wider ecosystem. The iterative and adaptive nature of both approaches also means a move away from log frames and linear milestones to 'search frames', which help governments envision longer-term decisions and impacts (Andrews et al., 2017).

There are two important differences between agile and PDIA. Agile has been tried and tested in the software industry for several decades, has become the delivery approach of choice for most major

technology companies[31] and is used globally. By contrast, PDIA has been developed with low- and middle-income (LMIC) governments in mind and is generally only known by public servants and development practitioners.[32]

Additionally, many agile methodologies exist – such as Scrum, Kanban and Lean – with a multitude of supporting training courses, certifications, tools and guidance materials. Some teams will use a combination of these methodologies depending on the context and the objectives of any particular product or initiative. This affords greater flexibility and a far greater number of practitioners than PDIA.

Both approaches also suffer from similar limitations. Both may demand a large investment of staff time to be successful. And in both cases, sustained political support and a focus on well-defined problems are essential (Harris and Lawson, 2022).

Source: Authors

2.3.3 Outlook: an opportunity to try new things

Within PFM there is already sufficient exasperation with the results of big-bang rollouts that practitioners are gravitating towards different approaches. Moreover, problem-driven approaches are becoming more commonplace within discussions of PFM reform and are beginning to be tested in different contexts. Nevertheless, digital practitioners should expect resistance to employing iterative methods as part of a shift towards an emerging *digital PFM* paradigm.

Upfront education is important, though in our experience classroom training is rarely enough. It may be helpful to contrast agile and PDIA approaches with previous failed digital initiatives that have used waterfall methods. Introducing new disciplines into government organisations (such as agile delivery managers and user researchers) can also help facilitate the adoption of new ways of working (see Challenge 4), especially if complemented by strong support from leaders. And crises can provide opportunities to build broad coalitions in support of new approaches (Greenway et al., 2021).

[31] Measures of agile adoption are imprecise as there is confusion between agile as a set of principles and agile as a methodology; but one study has 71% of companies in the United States using agile (Flynn, 2022), while Microsoft began transforming to an agile organisation around 2012 (ARS Technica, 2014).
[32] That said, while not popularised, similar concepts around being adaptive and problem-driven have been current for many years and have been used by governments in a range of countries (including LMICs), if not in exactly the same way (see Lindblom, 1959).

2.4 Challenge 4: skills, experience and culture gaps

The previous two challenges are closely related to a lack of appropriate skills and experience, especially in user research, product management, design and agile delivery management. In our experience, these are critical skills gaps in finance ministries. Where digital specialists are employed, they may be underutilised. And digital specialists tend to be considered inferior to economists and policy advisors, to an even greater extent than in other ministries. Truly multidisciplinary digital teams in finance ministries are vanishingly rare.

2.4.1 Cause: specialist digital skills are not always valued in PFM

Similar to the tendency to equate digital with IT (see Challenge 1), there is a tendency in PFM to think in terms of IT teams with homogenous skill sets. However, good digital teams are multidisciplinary and employ various specialisms (see Box 5).

Different specialisms play different roles in introducing and embedding agile approaches in the day-to-day working of organisations. User researchers specialise in understanding the needs, constraints and contexts of different user groups, and are typically responsible for leading regular testing. Product managers are expert in leading multidisciplinary teams to deliver outcomes, and in employing agile methods to do so. Agile delivery specialists[33] are responsible for establishing agile tools and techniques such as stand-ups and retrospectives, and practices such as sprint planning and road mapping.[34] Agile coaches may also perform this role and be shared by multiple delivery teams.

Greater investment in these and other in-house digital specialisms is required for governments looking to shift to a more flexible architecture based on standardised open APIs (see Box 5). Under such an approach, the amount and nature of input required from digital specialists is likely to increase as governments shift from top-down assurance of a small number of COTS vendors to managing a broader ecosystem of data, platforms and services. Inputs from digital specialists will be needed to design and enforce standards, collaborate with other parts of government to support interoperability goals, evaluate different open-source options (including DPGs) and hold commercial providers to account.

[33] Agile delivery specialists may also be known as delivery managers or scrum masters.
[34] For further discussion of these tools and techniques, see Government Digital Service (2019).

2.4.2 Cause: bringing policy and delivery closer together is critical, but they are sometimes treated separately

The former Chief Executive of the UK Government's Infrastructure and Projects Authority referred to 'the space between policy development and policy delivery as [a] "Valley of Death" because it represents the space in which so many policy initiatives are undermined, sometimes fatally, as they are thrown across the valley from the "policy" team to the "delivery" team' (Meggs, 2018).

Typically, policy and process are designed upfront, turned into a long list of requirements, and then passed on to a procurement team to buy. Policy specialists adopt the mentality of a customer, even if their supplier is an internal government digital team (Reeve, 2017). Bringing policy and delivery specialists closer together is essential for improving performance (Meggs, 2018).

Good practice in digital government is to break down the gap between policy and delivery. One of the practical ways digital teams have done this is to embed policy specialists, economists and frontline operational staff in their team[35] (see Box 5). Our research and experience suggest this rarely happens for digital initiatives in PFM, however, where the divide between policy and delivery tends to be particularly stark.

Box 5 Minimum viable team for digital PFM

Needs will vary from one country to another, but a minimum viable team is likely to comprise four roles:

- **Product manager:** The product manager is responsible for the quality of products and for translating users' needs into deliverables. The product manager also sets priorities for the delivery teams in resource-constrained settings.
- **Agile delivery manager or scrum master:** The delivery manager is responsible for leading agile rituals and for providing coaching on agile practices across the organisation. They will take a lead on planning, maintaining momentum of delivery and team dynamics.
- **Designer:** Designers are responsible for designing the service end-to-end and ensuring that user needs are met. As well as interaction design, this includes designing – and, if necessary, changing – the way both digital and offline services are delivered. In resource-constrained settings, a generalist designer could also take on responsibilities related to user research and testing.

[35] For example, the Universal Credit Scheme, which modernised social protection payments in the UK, included a frontline staff member in every digital delivery team. Each team had access to a policy advisor who was dedicated to a small number of teams (pers. comm., interviews with key informants).

- **Subject matter expert:** A policy specialist or economist familiar with PFM processes, rules and culture also needs to be an integral member of the team. Depending on the scope of the initiative, including someone from frontline operations is also beneficial.

The team would also need access to these skill sets:

- **Technical architect:** The role of the technical architect is to provide technical leadership and architectural design. The technical architect plays a key role in informing technical decisions[36] and technology choices within the digital transformation strategy.
- **Cyber security specialist:** The security specialist helps to build or acquire services and systems that are secure by design. The role of the security specialist is to advise on security-related issues[37] and help assess security risks. This is of particular importance to PFM initiatives given the risk of fraud and corruption that can result from data breaches.

It is good practice to have access to these skills in-house, even if most of the development is being done by an external vendor. Other specialists to introduce over time, depending on size, stage and complexity and whether or not digital tools are being built in-house, include:

- Content designer
- User researcher
- Specialist designers including UX/UI designers and service designers
- Front-end and back-end developers
- Data engineers

Source: Authors

2.4.3 Cause: there are misconceptions around the value and practice of recruitment

A commonly cited challenge is that multidisciplinary digital teams are un-recruitable in resource-constrained settings, including many lower-income countries. It is true that governments in many places – including member states of the Organisation for Economic Cooperation and Development (OECD) – face intense competition from the private sector for technologists (AlphaBeta, 2018). However,

[36] Technical decisions would include, for example, systems specifications, sizing of infrastructure and requirements for redundancy and resilience.
[37] Examples of security-related issues include information security policies, vulnerability assessments, data protection and privacy implications.

there is an increasing array of strategies and tactics that governments can use to attract and retain digital practitioners.

An increasing number of governments are introducing specialist career frameworks, with pay scales that are more competitive with the private sector. Others have established prestigious specialist fellowship schemes.[38] Countries including Peru, Rwanda and Singapore have drawn on their diasporas.[39] Others have attracted talent by setting up central or departmental digital service units that emphasise the public service mission[40] (Greenway et al., 2021).

A second challenge is that digital practitioner skills are unaffordable for many LMICs. This can be exacerbated by funding models that prioritise capital investment over recurrent costs (see Challenge 5). However, we believe that, when combined with modern technology, such as SaaS and cloud-hosting costs (rather than COTS, licences, change fees and consultant fees), investing in in-house digital specialists may be no more expensive – and potentially represents a significant cost saving – than outsourcing all delivery. However, we readily admit that in-depth analysis is needed to weigh up the costs and benefits of different approaches.

A third challenge is that these skill sets may be in particularly short supply in some contexts. For instance, there are 10 times more UX designers in Morocco than in Madagascar or Zimbabwe.[41] In these scenarios, it can pay to focus on a narrow list of essential specialisms initially, and then add second-order specialisms over time (see Box 5).

2.4.4 Cause: ways of working do not always embrace multidisciplinarity

Ways of working are essential for a high-performing, multidisciplinary team to be effective. In a traditional bureaucracy, decisions are made from the top down, and complaints from users emerge from the bottom up. In contrast, multidisciplinary teams using agile methods will expect to make internal and external users part of the conversation from the start.

As opposed to traditional processes, where results are often about reporting, the goal of multidisciplinary teams is to create the conditions for teams to specialise and focus more on outcomes. This, in turn, enables those teams to satisfy constituents by solving their

[38] Examples include France's Public Interest Entrepreneur scheme, the US Presidential Innovation Fellows programme for mid-career practitioners, and the US Digital Corps programme for early-career technologists.
[39] Appealing to individuals' sense of purpose – such as the opportunity to serve one's country, improve service delivery and even to help establish their digital discipline in the public sector – can be effective.
[40] These units are often associated with a start-up culture and office space which can be popular with prospective employees who are otherwise deterred by conceptions of the public service as hierarchical, inflexible and bureaucratic.
[41] Source: Authors based on LinkedIn searches, June 2022.

problems and focusing on achieving outcomes, rather than just producing detailed documentation (Mergel et al., 2021).

Crucially, teams must be given freedom to identify (and adapt) the solution as they learn, rather than being charged with implementing a fixed plan. This is consistent with good digital practice in the private sector, from tech companies to Spotify (Cruth, n.d.) to banks such as ING (Mahadevan, 2017), which give more autonomy to small delivery units in how they achieve business objectives.

2.4.5 Outlook: an opportunity to shake things up

Changing culture and attitudes to enable the introduction of new skill sets and multidisciplinary ways of working is likely to be a particularly large challenge for *digital PFM*.

Pointing to successful central (and sometimes departmental) digital units will help. In Bangladesh, Brazil, Canada, Madagascar, Togo, the UK and elsewhere, for example, such units played an outsized role in enabling governments to respond effectively to Covid-19 (Freeguard et al., 2020; Rockefeller Foundation, 2021; Lowe, 2023). Drawing a line from digital specialisms in these units to positive outcomes may help to inform and persuade sceptics.

For some audiences, drawing on examples from the private sector may be more effective. In all cases, pre-empting scepticism about the inability of the civil service to hire, retain and afford digital specialists will be important. It is also worth remembering that these challenges are not unique to PFM, and they have been tackled with some success in other government domains.

2.5 Challenge 5: outdated funding models

The current funding model is a major challenge in bringing public finance into the digital era. Governments typically tend to allocate resources to a digital initiative as part of a regular budget process for a time-limited period, supported by a business case. These business cases can provide false certainty, and assurance and governance after a business case is approved is often limited (Mann et al., 2021), or it is based on milestones agreed at the outset. These funding processes can reinforce a tendency to focus on meeting milestones associated with implementing a technology solution, rather than achieving public value and demonstrating impact.

2.5.1 Cause: the role of development partners can reinforce waterfall delivery approaches

In LMICs, large PFM reform programmes are often supported by a development partner. Partners often bring their own funding and procurement rules, and often reinforce incentives through project

design plans, asking for a large amount of money upfront and then designing a rigid implementation plan with milestones.

While there is a move among some development partners towards more flexibility in using predetermined milestones and strict logframes, it is nascent and usually does not apply as much to how they fund governments. Together, these incentives reinforce the demand for false certainty, and reduce flexibility.

Funding rules and lengthy approval and governance processes reinforce a tendency towards large-scale implementation using waterfall delivery approaches (Middleton and Bedoui, 2021). And focusing purely on implementation can skew attention away from the recurrent costs of maintaining the system, as well as the opportunities of being able to adapt it to emerging user needs and challenges.

2.5.2 Cause: budgeting for maintenance is critical, but it is not always prioritised

Many governments struggle to budget effectively for ongoing maintenance, particularly the costs of upgrading or replacing legacy systems (see Challenge 6). A vicious cycle is perpetuated wherein a government implements a system that it finds too costly to maintain, and eventually becomes unfit for purpose, but it is too costly to replace. This often arises because the recurrent costs were either underestimated or ignored when the reform programme was designed and the solution chosen (Hashim and Piatti, 2018).

Some low-income countries have, due to budget constraints, invested in fewer user licences than they actually needed (Uña et al., 2019), while others have failed to upgrade or maintain their systems properly (Pimenta and Seco, 2019). Gaps in the maintenance of existing systems may not only undermine the effectiveness of PFM systems, but also expose them to vulnerabilities and security risks.

This risk can be reduced by finding solutions that are less costly to maintain in the long term by carefully assessing the total cost of ownership when choosing the technology, and not falling into the trap of focusing only on the upfront capital investment. More fundamentally, it can help to consider different technology options (see Challenge 1) and new funding models that emphasise recurrent expenditure over capital expenditure (see Box 6).

2.5.3 Cause: the wider costs of reform are not always accounted for

In addition to the focus on implementation over maintenance, funding models for PFM reforms rarely take into account the wider impact of introducing a new system on government operations more broadly. At best, some assumptions will be articulated in the business case

about operational efficiencies, but these usually take a narrow rather than system-wide focus.

With a narrow focus, decisions often service the business case rather than operational effectiveness or efficiency. As discussed above, the way licences are funded can create financial liabilities or operational constraints. An architectural decision around interoperability may make things simple for the implementation programme, but place constraints on those who need to provide data. A better understanding of user needs and incentives, increased ability to iterate and a funding model that better balances recurrent and capital expenditure can all help reduce the risk of falling into these traps.

Box 6 Reforming funding models

Digital initiatives benefit from more agile approaches to funding and governance. Good practice includes:

1. **Funding in smaller increments, and releasing funding more often.** This reduces the risk of sunk cost fallacy, i.e., if an approach is found to be not working, it is easier to stop something or course-correct part way through. This often necessitates reforming the business case process so that it is faster and more proportionate.
2. **Funding persistent, mission-driven teams** rather than time-bound technology implementations. This provides more flexibility to change course in response to evolving needs and constraints, and to focus on real-world outcomes over artificial milestones.
3. **Shifting focus from capital to recurrent expenditure.** The main costs associated with developing and maintaining digital technology are people, cloud hosting and SaaS. These are all regular, ongoing costs rather than the large upfront capital expenditures associated with buying data centres, servers and software implementations. Shifting the bulk of technology budgets from capital to recurrent funding demands a shift in mindset, as well as a change in budgeting practices.

Source: Authors

2.5.4 Outlook: an opportunity to pull some levers

Studies show that large and complex IT projects that use traditional funding models fail at high rates and succeed at low rates.[42] With such high failure rates, there is an opportunity for advocates of the emerging *digital PFM* paradigm to persuade sceptics of the need to trial a new approach, even though significant procedural and cultural change will be needed.

[42] A 2016 study finds that large digital projects in government only had a 13% success rate overall (World Bank, 2016). Other research has shown that the success rates of government IT projects decline in proportion to size and complexity (Mann et al., 2021), and that digital initiatives using waterfall delivery methods are less likely to be successful (Standish Group, 2015).

Redesigning funding models would not just benefit PFM reform, but it could also be enormously impactful for digital initiatives across government. As the custodians of funding rules and processes, finance ministries are uniquely placed to influence funding and governance models for digital across the broader public sector.

Given the challenges with the current approaches to funding, there is a significant opportunity for development partners and other funders to support and seed new approaches.

2.6 Challenge 6: legacy technology and sunk cost fallacy

It takes an average of eight years for a government to implement an FMIS at an average total cost of around $39 million[43], and in some instances the duration and cost can be substantially higher (Long et al., 2023). This presents a two-fold challenge for shifting to the emerging *digital PFM* paradigm.

First, transitioning from legacy systems can appear prohibitively complex and expensive, even if maintaining these systems effectively is costly, and is an impediment to realising the wider benefits of digitalisation. Second, where an FMIS implementation has not resulted in the benefits anticipated, but has consumed significant time, money and political will, *sunk cost fallacy* may inhibit decision-makers from shifting to a new approach.

2.6.1 Cause: the sunk cost fallacy can make it hard to see the value of reform

Sunk cost fallacy is a major problem in technology initiatives (Timmins, 2021), whereby substantial investments can result in stakeholders becoming reluctant to invest further time, money and political capital in replacing legacy systems and adopting a new approach. The sunk cost fallacy may mean that transitioning to the emerging *digital PFM* paradigm is particularly difficult for policy-makers if the results of introducing an FMIS have been disappointing, and decision-makers are still waiting for a return on their investment.

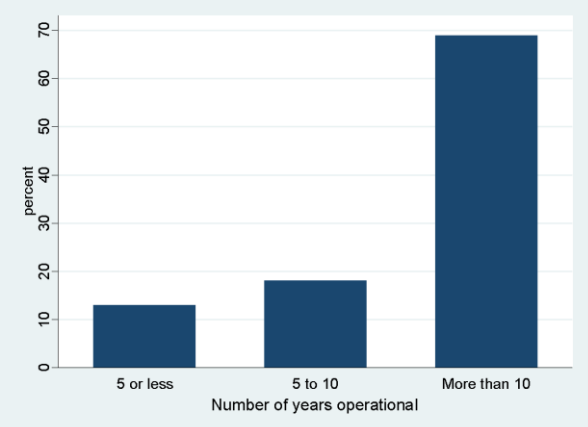
2.6.2 Cause: legacy systems create a growing problem for PFM

While many governments are shifting towards a more modular approach to FMIS, achieving interoperability between new and legacy systems can be challenging and costly (Botton, 2017). At the same time, the cost and risk associated with replacing legacy

[43] For 124 completed projects approved over the period 1995–2017. See World Bank FMIS Projects Database (July 2022) (https://datacatalog.worldbank.org/search/dataset/0037882/financial_management_information_systems_database).

systems with new ones can be high. For example, migrating data from legacy systems can be complex. Governments are often faced with a dilemma: high maintenance costs make systems hard to properly maintain, but not maintaining them makes them unfit for purpose, and their replacement is equally if not more costly.

Figure 1 Age of FMIS



Note: For 193 of the 198 countries with an FMIS.
Source: WBG GovTech Dataset (October 2022)

Addressing legacy systems is an emerging problem for PFM. Close to 70% of FMIS are now 10 years old or older (see Figure 1). Estimates of the useful life of software are 6–8 years on average and 12–14 years for larger, more complex programmes (Mitopia Technologies, 2022). Some of these COTS will need to be replaced as vendors discontinue their support for these products to focus their efforts (and research and development spend) on cloud-based ERPs (Kimberling, 2023). Moreover, the ERP market is changing as consolidation lessens and the market opens up, offering a range of potential new options for governments (Pimenta and Seco, 2019; Kimberling, 2022). These factors make it imperative for many governments to start considering when and how they should replace their legacy systems (see Box 7).

Box 7 When is the right time to replace a legacy system?

For policy-makers working in finance ministries, it is often unclear when a given system might not be serving its function any longer, and when it might be time to replace it. Consider the following:

1. **When a system is soon to be unsupported by the vendor, there is no other choice than to plan the replacement of the system without delay.** Vendors usually publish ‘end-of-life’ timings for their systems in advance, so that clients can plan for the retirement of their old systems and think about their replacement. Making the review of legacy systems and their replacement a recurrent activity as part of the annual budgeting process should help identify systems that need replacement, and plan for that in a timely manner.

2. **When systems become flaky or inefficient, it might be time to consider replacing them.** With time, systems may become clunky, slow or difficult to use. This may simply be because they weren't designed to cope with new circumstances. For instance, they may not have been intended to cater for a high number of users, or their database may not be designed to hold the volume of data they now need to handle.[44]
3. **A system must be flexible enough to be changed to reflect new user needs or adapt to new requirements (for instance new legal requirements) throughout its lifetime.** With time, it may become costly and difficult to make changes to legacy systems even to keep them compliant.[45] If changing the system becomes too cumbersome, it is time to think about replacing it. Another indication is if there is significant growth in manual effort to work around the gap between new requirements and the system's capabilities. Such workarounds are common but increase overall cost and risk.
4. **A system may still be working well on its own, but unable to interact with more recently built systems or with systems that it used to interact with but that have been upgraded or changed.** Lack of interoperability is a major challenge to achieving the desirable PFM outcomes discussed throughout this paper. If legacy systems become blockers to integration with other systems and data-driven decision-making, serious consideration should be given to planning their replacement even if it may not be immediate. It would defeat the purpose of having a digital system if that system cannot deliver on its intended outcomes.
5. Sometimes maintaining an existing system costs more than replacing it. This may be because the system is too old or because newer technology is much more efficient and affordable. Cost may not be the only factor, but other considerations, such as the complexity and resources required to replace the legacy system, will certainly inform the decision to move to a new system. Nevertheless, if an existing system is no longer cost-effective, it is sensible to start thinking about or at least consider its replacement.

Source: Authors

2.6.3 Outlook: an opportunity to build momentum

Given a confluence of factors – the age of legacy systems, the importance of interoperability and an evolving ERP market – many

[44] This was the case for the TABMIS rollout in Vietnam, where the infrastructure was not designed to handle the load of data after full rollout (Joshi et al., 2015).
[45] A recent example is a UK Chancellor being prevented from raising benefits twice in the same year simply because these benefits are paid from a 40-year-old IT system that takes months to process changes. In contrast, benefits that have been migrated to universal credit can be updated in weeks (Allegretti, 2022).

governments need to start seriously considering when and how to replace their legacy FMIS. This provides an opportunity for governments to shift more purposefully to the emerging *digital PFM* paradigm.

This is unlikely to be easy. Decision-makers may be understandably attached to legacy systems given the amount of time, money and political capital it took to implement them, and may not want to subject themselves to another round of the same. Therefore, it will be important for advocates to be able to illustrate the potential benefits of *digital PFM*, compared to previous experience with traditional approaches. For lower-income countries, development partners hoping to support a shift to *digital PFM* through the replacement of legacy systems should be sensitive to the fact that governments may need additional support (particularly in areas like data migration) as well as different approaches to funding (see Challenge 5).

3 Conclusions

A paradigm shift is needed in order to reform public finance using *digital PFM* approaches, and to accelerate the digital transformation of public finance. Moving forward, *digital PFM* approaches will need to help public finance practitioners increasingly blend the capabilities of finance ministries with the goals and requirements of digital service delivery. The road ahead is challenging, but the obstacles outlined in this paper are not insurmountable.

Decision-makers and practitioners can reframe some challenges as opportunities or non-negotiables – such as the potential to bring more diverse skill sets into finance ministries, or the urgent need to address legacy systems. Other challenges – especially the need to diversify the vendor ecosystem and reform funding models – will likely need international cooperation. More research, experimentation and collaboration will be needed to help address these challenges, and ultimately to enable governments to take advantage of the full potential of *digital PFM* (see Box 8).

Finally, it is worth stressing that this paper is the beginning of a wider discussion on how *digital PFM* approaches can support public finance reform. It has intentionally not tried to provide comprehensive answers to how these challenges can be overcome. Rather, the paper aims to provide an intellectual basis for what will surely be robust debate and exchange between digital practitioners, government officials and development partners. These different groups will need to come together to understand the relevance of these challenges in different contexts, and to help create and deploy different strategies and tactics to overcome them at the global, regional and national levels.

Box 8 Questions for future research, convening and experimentation

This paper flags two major areas for future research, convening and experimentation.

First, what might be the alternatives to a traditional, modular FMIS? How might the growing agenda around DPGs and digital public infrastructure support this? In the first paper, we briefly outline an alternative, more flexible architecture based on standardised open APIs. This could include:

- more investment in national digital infrastructure that simplifies elements of FMIS, such as improved national payments infrastructure, or reduces operational challenges, e.g., better connectivity for relevant offices;
- the provision of open-source or platform building blocks that allow parts or whole of governments to build bespoke tooling without the overhead of doing that from scratch (e.g., design libraries for user interface design and reporting);
- a standardised way of recognising staff identities for approvals logs/audit across departments;
- common tooling for risk management and supply chain visibility.

This raises some ancillary questions, which will need intervention from global actors and coalitions of like-minded governments:

- Could open-source software for PFM contribute towards a more open architecture, and help governments avoid vendor lock-in? If so, what suitable DPGs already exist that might help? And what are the gaps where technology companies, open-source collectives and development funders might focus their efforts?
- How might we introduce new heuristics for evaluating COTS options to better recognise challenges of customisation and integration?
- How might we stimulate the vendor ecosystem at global, regional and national levels to provide a broader range of options, both in terms of software providers and systems integrators? To what extent will existing vendors be willing to embrace such an approach, and what incentives or advocacy might be needed?

Second, for a government willing to experiment with the emerging *digital PFM* paradigm, what are the preconditions? For development partners, what should a package of support look like?

- How might budgets, timelines, sequencing and objectives change? How exactly will funding, governance and procurement models need to evolve in support of this? To what extent can *digital PFM* initiatives act as a ‘sandbox’ to test new models?
- What is the absolute minimum viable in-house digital capability needed within a finance ministry for the new paradigm to be successful, both initially and over the longer term? How might this capability be funded? What accompanying government human resource reforms might be needed to support this?

What are the alternatives for countries with extremely limited access to local digital talent?

- To what extent can finance ministries position themselves as facilitators and champions of digital transformation across government? Aside from becoming beacons of best practice, how else might finance ministries – and other ministries, departments and agencies involved in PFM – act as agents of change for other digitalisation initiatives? Are there opportunities to create sandboxes to test new approaches?

Source: Authors

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