Introduction

This is the Executive Summary of an independent report "Foundations Of The Digital State". It makes a series of detailed recommendations about establishing the foundations of the digital state that are intended to underpin state activities in this sector for 100 years.

They are both banal and radical at the same time. They are banal because they say we should continue to do what we currently do. They are radical because they recommend doing these same things in a different sequence, in different parts of the state, under different rules, more consistently and with greater velocity.

Getting the right thing done at the right time involves adjustments across the piece. The changes touch parliamentary procedure and the structure of both bills and bill packs, the organisation of the programme for government, training for policy staff and changes to the structure of bill teams, new institutions on the parliament and government side, new ways of creating infrastructure standards and adjustments to the relationship between key civil servants, ministers and parliament.

The implementation of the recommendations of this report is also complex. The fact that adjustments on both the parliamentary and governmental side are required makes it quasi-constitutional and requires a co-implementation approach between government and parliament.

This report provides a clear roadmap to make Scotland the finest digital state in the world and I commend it to you.

Declarations

I am grateful to the Scottish Government for the opportunity to undertake my Digital Fellowship under the First Minister's Digital Fellowship scheme and write this report.

The main report with the detailed recommendations, and an associated collection of working papers that contain technical discussions and implementation details also available for download.

This report would not be possible without the myriad of people who gave me the benefit of their time and experience. The recommendations largely come from them, but the errors are mine and mine alone.

But I must point out this work is independent of Scottish Government and does not speak for them nor my many interviewees.

I have not received any payment (from Scottish Government or otherwise) in the course of this research.

Gordon Guthrie
Digital Fellow under the First Minister's Digital Fellowship Programme

Executive Summary

> "We've had a decade of good work done and teams built. But the institutionalisation of it, I think, is the hard work for the next little bit."
>
> Hilary Hartley - former Deputy Digital Minister, Ontario

The problems that this report is trying to address can be summarised as:

The government needs a single organisation with the mechanism to make decisions about how digital systems should work, and parliament needs a single structure to oversee those decisions.

Decisions about what digital systems should do are made sub-optimally by parliament using ad-hoc repurposed mechanisms.

The state lacks a research capability for digital systems.

This report lays out a roadmap to make Scotland the best digital state in the world. It addresses these 3 problems and is backed by evidence and based on extensive research and experience.

Recommendations

It makes 26 recommendations and proposes 10 legislative enactments over 3 to 5 years. Those enactments will be consolidated into a much smaller number of bills.

The recommendations span the entire political system, from measures that would help think-tanks and political parties get a better understanding of how the digital state works, changes to parliamentary procedures and the structure of Bill Packs and legislation alike, through new government and parliamentary institutions to the organisation and responsibilities of the civil service.

The recommendations fall under 3 major headings:
1. unitary specification of services and systems - the how
2. better iteration in service development - the what
3. developing a research capability - the research

Unitary specification involves creating new institutions - one of them becoming the technical leadership of the civil service.

It is appropriate that that body supervises both Better Iteration and Developing A Research Capability.

These recommendations combine to make a coherent system design, and incorporate a theory of state for the digital age. The implementation and roll-out is complex and will be iterative.

The recommendations span the executive, legislature and, indirectly, the judiciary. Implementation needs to have a constitutional and not a party flavour.

Scale of the impact

This report is explicitly ambitious. It recommends institutional changes which are intended to endure for at least 100 years.

These changes for parliament and government are on a par with the creation of the Scottish Law Commission. The work is substantive but not overwhelming. It is an adjustment but not a reconstruction.

Conceptual basis

There are two separate types of specification for computers systems:
- functional specifications which describe what the system does
- non-functional or infrastructural specifications which describe how it does it

Close examination of the 3 social security acts and the 76 pieces of secondary legislation about Scottish Social security conclusively demonstrate that specification is partial.

Primary legislation contains the functional specification - but the non-functional or infrastructural specification is scattered over Scottish and UK government guidelines and standards, partly codified best-practice and departmental ways of working.

In the old world, say the 1950s, the infrastructure for social security (buildings with canteens, roofs and windows, on a bus route) was totally decoupled from the functionality of the administrative process (forms and calculations).

In the new world there are additional non-functional and infrastructure considerations: sign-ons, databases and backup, cybersecurity, joined-up government and data sharing. This is tightly coupled with the functional administrative software but lacks any institutional deliberative and enforcement apparatus comparable to legislation and judicial review.

Unitary specification of services and systems

This stream of work addresses the non-functional or infrastructural problem. It is about changing how the state makes decisions about how digital systems should work.

This part of the report recommends two new institutions.

The first is a government body - the Digital Services Reform Office (DSRO). In its work and remit it rhymes with the Scottish Law Commission. The DRSO has the power to issue technical standards and recommend both legislative changes and programmes of work. These activities need to be adopted by the government of the day to proceed.

The second is a parliamentary body - the Digital Services Scrutiny & Audit Commission (DSS&AC). It works under the supervision of a parliamentary committee. In its scrutiny work it rhymes with the Scottish Commission on Social Security and in its audit work it rhymes with Audit Scotland.

The two streams, functional and non-functional & infrastructural specification come together in the Bill Pack. Legislation continues to specify the functionality that state computer systems must implement. An additional Systems Impact Assessment in the Bill Pack addresses the non-functional or institutional requirements. It lists what data must be reused, what technical standards the new systems must adhere to, which supporting functions (payments, sign-on and identity, etc) are to be used.

However, the two parts of the specification have different development cycles. The functional specifications are system specific and go through the normal legislative process. The non-functional or infrastructure specifications are shared across the public sector and require an entirely different development and oversight process.

Critically the process of creating the technical standards that underpin the non-functional or infrastructural requirements will be led by technical specialists - with oversight provided by other experts who report to the parliament and not the government.

The standards-based approach is modelled on the standards regime of the internet, which enables co-ordination without communication and have proved spectacularly successful.

This institutional approach makes possible the unity of specification when the minister introduces the bill.

A full list of the recommendations and legislative enactments supporting this work please is appended to the Executive Summary.

Better iteration in service development

This stream of work addresses the issue of how the state can better make decisions about what state digital systems do.

Iteration is the super-power of the internet age, testing plans against reality. Building physical infrastructure is a monolithic and complicated process - but one that is amenable to up-front planning. A project can be specified, broken down into tasks and sub-tasks which can be scheduled and costed.

This approach was initially attempted with software, and has been everywhere abandoned, even in government. Small-a agile[1] is now a mantra.

Software development is fundamentally complex. It changes the team making it and the organisation implementing it. It changes the behaviour of citizens, and it changes the basic understanding of the problem. Testing assumptions early and then changing course is the proven way forward.

The quicker you test things with real people, the quicker you find errors and shortcomings and the quicker you fix them. It's simply cheaper, much cheaper.

But agile in government starts too late. This report recommends a set of immediate changes and a more strategic long term ones.

The first pass of improving iteration is to bring design and testing activities from the end of the process to the beginning. For major projects prototype systems should be developed before legislation is drafted. These would have limited functionality, not be scalable, or perhaps just be paper prototypes. Policy and delivery teams need to be integrated.

On first glance, the legislative process puts iteration into the deep freeze. Once the law is the law, the systems must comply with it. Close examination shows that major systems like Universal Credit or Scottish Social Security have a more continuous specification of functionality - and the mechanism used is just secondary legislation. The recommendations include making legislative iteration a first class and, crucially, designed process.

Shifting these activities affects not just how the state is organised, but parliamentary oversight, public engagement. It presents a host of delicate political and constitutional issues. As such it must be approached carefully and in an appropriate cross-party manner.

The bulk of the work falls on the government side, and this work will be overseen by the institution created for better specification - the DSRO.

A full list of the recommendations and legislative enactments supporting this work please is appended to the Executive Summary.

Developing a research capability

Unitary Specification and Better Iteration both involve building capability of the state. That will enable a more ambitious digital future. Scotland needs to start planning to use it to be more ambitious.

There are two elements to the research brief. The first is small teams of 3 or 4, with 6 to 9 month briefs to research and prototype new ways of organising the state. It will be delivered by CivTech, the Scottish Government's innovation arm moving its work earlier in governmental processes.

The proposed topics are:
- Rules as Code
- Generating MVPs as part of policy and legislative design
- Macro-economic modelling
- Property-based testing
- Components
- Remixability
- Revisiting on-prem and global scale capacity

But there are additional strategic research programmes covering:
- a law reform process for data
- a review of legislative processes for major digital programmes
- a review of legislative process for local government and other sub-state bodies

A full list of the recommendations and legislative enactments supporting this work please is appended to the Executive Summary.

Implementation

The implementation plan uses existing powers of the Scottish Parliament and Government to create shadow versions of the final state organisations on both the parliamentary and civil service side.

The Scottish parliament will use existing powers to co-opt external experts as advisers. The Scottish Government will second civil servants, bolstered by external expertise recruited under the existing First Minister's Digital Fellowship Programme.[2]

The parliamentary side of the work will be overseen by a special committee which will represent the Scottish Parliament Corporate Body in the discussions with Ministers.

That committee will create temporary procedures of the Scottish Parliament to pilot the new ways of working, new forms of the Bill Pack and so on, and take individual bills through parliament in the new way. This process will be iterative.

Once there is consensus and agreement across the political divide the task of drawing up the legislative enactments and changes to parliamentary standing orders, and taking them through parliament will be on the committee. The government will play an appropriate supporting role.

Where the work touches on the format of legislation, in particular the law reform proposal, it would be appropriate for the Scottish Law Commission to bring its expertise to bear.

Costs

The recommendations fall into one of the following five categories:
- do what we currently do, but in a different sequence
- do what we currently do, but in a different part of the organisation
- do what we currently do, but under different rules
- do what we currently do, but more consistently
- do what we currently do, but with greater velocity

This report will be approximately cost neutral. The Scottish Government spends, acknowledged or not, about 15% of its IT budget on routine maintenance and addressing technical debt. This long-running and continued spend is the basis for bringing existing systems into compliance with the new proposed standards regime.

None of the recommendations involve capital programmes.

Skills

During my interviews I found no evidence that there are significant skills gaps between civil servants and the major internet companies I have worked in. There is no magic just-one-trick or flash-of-light methodology that will unlock the digital state.

The impact of implementing this report

This report focuses on foundational changes that support the infrastructural underpinnings of the digital state.

The changes will provide the capacity and competencies needed to make Scotland the best digital state in the world and their impact will be felt in a variety of ways.

Empower the wider political class

Leadership from the top will be essential on this journey. Nobody goes into politics to make a worse Scotland, all politicians are ambitious for the better, although they disagree on how and why.

Changing the context in which political decisions are taken is a major focus of this report.

25 years into the parliament it is time to take stock and re-assess:
- the information we publish that helps the wider political class understand where Scotland stands on digital.
- the institutions that propose and develop technical options to the point that they are amenable to scrutiny and supervision by the parliament and government.
- the support we provide to parliamentarians, whether in opposition or government, in their decision-making and scrutiny for services based on digital systems
- the provision of the right information, at the right time, in the right format to decision makers.
- the design of the processes and structures that parliamentarians live within to be the most effective ways of creating new services based on digital systems.
- the mechanisms by which civic society can understand and critique our digital services and cultivate proposals to make them better and generate political pressure to implement them.

The reasons for this disempowerment are structural and the root of this problem is three-fold.

Firstly, timing. Holyrood and the modern digital world were born about the same time. In 1999 the digital future was but dimly emerging and the implications of the modern internet for society and the economy were far from clear.

Secondly we (the political class) have not reviewed our constitutional and institutional assumptions in light of the development of the digital world.

Thirdly we (the technical class) have not articulated our requirements about the structure and flow of decision-making in political and constitutional terms. The technical class within the civil service are bound by constitutional taboos, it is not their place to boss ministers and parliamentarians around. We (the technical class out in the private sector) have largely kept our distance, failed to engage with and understand how and why government works, and contributed platitudes.

This report does not shy from recommending changes to the structure and working of parliament, the organisation of legislation, the machinery of government, accountability lines and the relationships of civil servants to ministers and parliament alike, or changes to the technical and policy trades.

Fix structural problems

Infrastructure and functionality were uncoupled in the old analogue state. In the digital age infrastructure and functionality are mixed together in software.

Simply by building an institution to conceive, plan, design and maintain that infrastructure, and another to provide political oversight and audit, Scotland can take a lead.

There are simple steps to better, more usable state websites and joined up systems that ask for information once and work together.

Fixing the structural problem will enable the empowerment of our political class by changing what the politicians discuss and when they discuss it - moving oversight from abstract principles to concrete systems.

Change when decisions are being made

The structure of legislative decision-making is changing from a 13th century model to a 21st century one - Social Security Scotland shows the way. That programme has had 3 primary Acts of parliament and 76 pieces of secondary legislation over 6 years.

That planned legislative programme learned as much from Universal Credit as possible. The challenge is to generalise that learning, to switch from the particulars of Social Security to the general of legislative decision-making for major software systems.

It should start with a smaller bill that authorises and funds basic design, prototyping and testing, before moving onto the main bill later. This will change the context of parliamentary oversight. Parliamentarians and stakeholders will spend more time discussing a shared tangible thing. At the moment each MSP has to conjure a system from their reading of legislation and argue over who has the better imagining of it.

At its heart, this approach simply redistributes parliamentary oversight from points in time where it can't be effective in shaping the systems to ones where it can.

Do less, get more (reduce costs and get better government)

Digital technology is opaque and hard to reason about. You can't see it, taste it, touch it or smell it. You can only use it. And you can only use it when it is in a working state. For big bang implementations that is when it is finished.

Iterative working, building the smallest working thing and asking "is this what we really wanted" is about making the opaque visible. Moving to more iterative approaches has already saved the UK and Scottish governments millions and delivered immense benefits. The shorter the iterative cycle, the less the programme can go off course, the shorter the course correction, the less rework, the less cost. And the less rework and correction the teams are doing, the more time they have to concentrate on citizens' needs. Focusing on iterative speed and responsiveness creates a virtuous circle of better systems, built more cheaply and more quickly.

Thinking systematically about it, and making strategic changes to the format of bills and bill packs and planning major software developments as iterative sequences of legislative acts will unlock these benefits.

Better iteration and better and more appropriate feedback loops to connect politicians, policy makers and citizens will improve the political class's understanding of the impact of policy, and ultimately improve the quality of policy making itself.

The recommendations improve iteration without compromising parliamentary scrutiny.

Do less, get more (reuse data and get more joined up government)

Iteration can reduce rework, but it can't reduce work. Only data consolidation can do that. The same data in 2 places needs 2 sets of administrators and has twice the data maintenance costs. Duplicated data generates its own work on top of that - in reconciliation, correction and data matching.

The institutions this report recommends will be able to understand the data landscape and co-ordinate the organisational, legislative and technical changes required to reorganise the state to eliminate data duplication. That simplification will improve data quality and benefit everyone.

Improve outcomes

The 3rd major benefit of eliminating rework is better outcomes. Shorter iterative cycles means more contact with citizens and end-users and less time focusing on internal issues of the state.

The goal here is not to deliver a single better outcome, but to improve all outcomes across the piece by systematically changing how the civil service works. Rework and correction is always a waste of resources that should be put to better use.

Empower citizens, society and businesses

The state is the servant of the citizens. The state collects and organises, but also hordes, much data.

That data needs to be opened up for citizens and companies to use - not statically as spreadsheets, but as Application Programmable Interfaces (APIs) for building things: travel apps, planning portals or land usage sites.

The recommended institutions and changes are a systematic and institutional approach to maximising the utility of state data for society.

Do things we currently can't do

The more capability the state has, the more opportunities are unlocked. Scotland should prepare to exploit this.

If we can generate proof-of-concept software directly from legislation we can improve decision-making. Draft legislation can be explored by examining systems that implement it.

Regulation is popular (stop sofas burning) but regulatory compliance costs aren't (red tape). The internet shows another way. A simple web page must comply with about 1.7 million words of technical standards. But a teenager can build a compliant website just by using software (browsers, web servers, javascript frameworks, test runners, etc) that embed the standards.

This is a big tech company superpower - turning process compliance into software. This must be checked, that must be checked, this must happen, that must not happen - all implemented in code, press button compliance.

Scotland should be researching how to develop ease-of-compliance legislation.

The state is where the citizens are - and the citizens are on screens now, mostly, But there will always be people who struggle with screens, because they are old, they are disabled or their lives are chaotic. We need to systematically research how to blend on-screen and in-person support for state services - and solve that problem once for Scotland and not once for every service.

With new institutions and standards we can make the state more malleable by building systems from components and platforms, that can be stood up, stood down, changed and recombined and remixed as circumstances change.

The tools to build the future

Digital systems are not a fad, they are the fabric of modern life and the sooner we start laying the foundations of the digital state the better we can start benefiting from the use of technology.

The recommendations of this report provide a blueprint for those foundations. Scottish politics should rise to the occasion and help make Scotland the best digital state in the world.

This work is not going to go away, it will endure, now is the time to start.

Recommendations

The recommendations are organised by which part of the full political-legislative-in-service cycle they impact. Each recommendation is marked as what, how or research appropriately.

In-service recommendations

1. An obligation to publish non-functional & infrastructural statistics about state operations - what
2. Registers of Services, Powers and Policies - what

Election and politics recommendations

3. Widening access to data - what
4. Widening access to research fellowships - what
5. Short money considerations – what

Government institutions and the programme for government recommendations

6. Create a Digital Services Reform Office - how
    6.1 - the foundations of the DSRO - how
    6.2 - changes to the PLU's Bill Handbook - what
    6.3 - improved organisational support for the PLU and Bill Teams - what
    6.4 - make non-functional & infrastructural work visible in the Programme for Government - what
    6.5 - a law reform process for data - research
    6.6 - the development and proposition of Machinery of Government changes - what
    6.7 - run the strategic research programme and commission new research - research
    6.8 - participation in a joint review of legislative processes with the parliament - research
    6.9 - a user-centred design roadshow - what
    6.10 - an information architecture - what
7. Review the process of creating legislation for local government and other sub-state bodies - research

The Bill Pack, etc recommendations

8. Changes to the Bill Pack, etc - how
    8.1 - changes to the Bill Pack for primary legislation - how
    8.2 - changes to the Explanatory Notes for secondary legislation - how

8.3 - approvals process for day-to-day services implementation - how
9. A new gazette to publish technical standards in – how

Parliamentary institutions and processes

10. Create a Digital Services Audit & Scrutiny Commission - how
11. A review of legislative processes for major digital programmes - research
12. Publication of legislative amendments - what
13. Additional capabilities for SPICe – what

Testing recommendations

14. Testing needs to be made a first class professional discipline in Government - what

Delivery recommendations

15. Changes to lines of responsibility in the civil service - how

Legislative enactments required

The following legislative enactments will be required. These separate enactments will be bundled into a smaller number of Bills and will be introduced in Committee and not as Government Bills.

1. Putting the Digital Services Reform Office on a statutory basis
2. Putting the Digital Services Scrutiny & Audit Commission on a statutory basis
3. An Enabling Act
4. New register of services
5. New register of powers
6. New register of policy
7. Amendments to The Interpretation And Legislative Reform (Scotland) Act 2010
8. Obligation to publish data
9. Obligation to publish non-functional statistics
10. A Data Bill of Rights

In addition, Recommendation 11 may also require technical changes to Section 36[3] of the Scotland Act 1998.

Conclusion

This report recommends 3 interlocking system redesigns. These improve both what the state does through services built on top of digital systems and how it does it. In addition it recommends building a small and focused strategic research function to maximise the impact of these new capabilities.

These recommendations are evidenced, prudential and precedented. They are cost neutral, strategic and institutional. They have been designed with a 100 year impact in view - but will start delivering immediate benefit.