Fellows Paper

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From Backend to Citizen: Design Systems as the Translation Layer for Digital Government

digital impact alliance

Contents

1. Executive Summary

While digital public infrastructure (DPI) provides the technical foundation for government services—enabling identity verification, payments, and data exchange—citizens experience government through design, not technology. Design systems serve as the critical bridge between powerful backend capabilities and accessible citizen experiences, transforming complex bureaucratic processes into coherent, trustworthy interactions. Without this design layer, even the most sophisticated DPI fails to deliver on its promise of inclusive digital government. This research was guided by three central themes explored through semi-structured interviews with ten participants spanning design practitioners, DPI experts, and current/former public officials:

1. **Conditions and structures** that help a design system emerge, be sustained, and delivered
2. **Understanding design systems** in government beyond visual standardization—the "behind the scenes" elements that make a design system truly systemic
3. **The value of design systems**—how it progresses and is shared across government

The UK and Brazil were selected as primary case studies, representing two distinct developmental archetypes: the UK's community contribution-driven system that evolved from consolidating fragmented efforts, and Brazil's approach of scaling effectively from a single, mandated visual element. These contrasting models provide clear, replicable pathways for governments at different starting points and highlight insights for implementors, policymakers, and design teams:

The infrastructure analogy that changes everything: Just as highways need signage to be navigable, DPI needs design systems to be usable. This research reveals how design systems function as the "signage layer" of digital government—not merely aesthetic choices, but essential infrastructure that determines whether citizens can actually access services.

Two proven pathways to success: The cases of the UK and Brazil show how governments can successfully implement design systems through different approaches—one through community-driven evolution from fragmentation, the other through a strategic mandate starting from a single visual element. Both models offer replicable strategies for any government's digital transformation.

The hidden ROI that justifies investment: Beyond visual consistency, design systems deliver measurable public value—52 pandemic services built in weeks, 40-50% reduction in development time, millions saved in costs, and automatic accessibility compliance. These metrics provide the business case that treasury departments and decision-makers need to hear.

The AI-Ready framework: As governments integrate artificial intelligence into service delivery, design systems provide essential infrastructure for responsible AI deployment—managing transparency, user control, and trust when services become predictive and proactive.

The missing link in digital transformation: This research demonstrates why DPI initiatives fail without design systems, and how the two create a virtuous cycle when properly integrated—DPI provides the capabilities, design systems make them comprehensible and accessible to all citizens.

2. Introduction

For a fictional citizen like *Alex*, who's about to turn 65 and preparing to retire, the process of applying for his pension requires navigating a bureaucratic system. Depending on the country, he'll face different ministries and government departments in order to start receiving his pension payments. While country processes may vary, generally, a pensioner like Alex will need to complete the following steps:

1. Gather his general registry
2. Make sure he can access his government account
3. Approach the tax office to check his individual taxpayer registry
4. Obtain his income tax statement
5. Enable a personal bank account where he'll receive monthly payments
6. Head to the National Social Security Department to check his contribution statement and work records
7. Apply to elderly assistance and available funds
8. Send the application
9. Head to the Department of Health to make sure he's covered by the health public system

During this process, he'll encounter different touchpoints that require him to undergo user authentication (digital ID), send and receive money (digital payments) as well as exchange information (data-exchange functions); all three encompass foundational digital public infrastructure (DPI).

Reaching a milestone such as retirement can be bittersweet and an emotional process itself: ideally, the application process for pension payment will reduce, rather than increase, any stress he feels during this time. Let's say that Alex is a Brazilian citizen: while applying for pension payments, he can easily access his

account using a digital ID, complete transactions thanks to Pix,[1] the country's publicly run digital payments system, and share his data securely through public platforms - all thanks to a DPI approach.[2] And yet, these underlying platforms don't determine Alex's experience - rather, the design elements do.

A design system helps keep the user's journey consistent and clear across every interface and step. Without one, Alex's experience would be vastly different. For instance, after logging into the tax office website - that let's imagine has a familiar blue banner - he might be redirected to the Social Security Department's site, which looks completely unrelated—a different logo, new colors, and a login button that's now a link hidden in a menu. This inconsistency could make him question whether he is even on a legitimate government page. He might struggle to simply enter his birth date because the sites ask for different formats. For Alex, this isn't a minor inconvenience; it's a source of genuine stress. Such a confusing and fragmented experience could leave him feeling frustrated and fearful that a simple mistake might risk or delay the pension he's depending on.

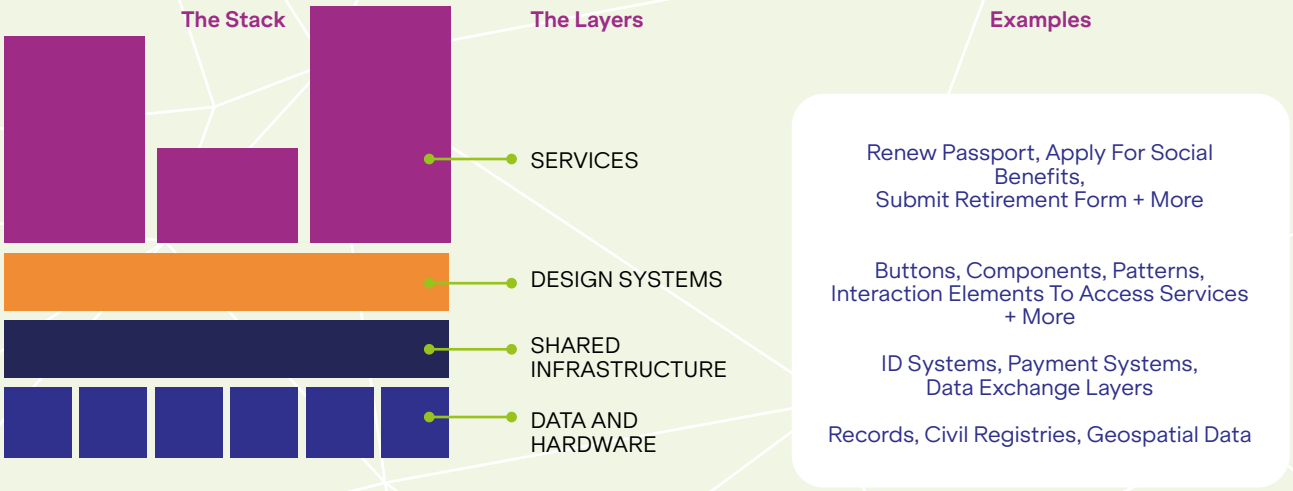
Examples of Actions	Departments	DPI Involved
Access his government account	National Social Security Department	ID access
Check in the Tax Office his individual taxpayer contributions	Finance and Tax Office	Payment exchange system
Obtain his income tax statement	Department of Social Assistance	Data exchange
Enable a personal bank account	Social Security Department	
Check his contribution statement and work records	Department of Health	
Apply to elderly assistance and available extra funds		
Send the application		
Access health services		

Therein lies the importance of design systems - while DPI delivers capability, design delivers legibility. When either side is missing, citizens and civil servants experience failure - and they blame the government, not DPI or a design system.[3]

3. Background and Context

3.1 DPI and the design layer

Digital public infrastructure (DPI) refers to foundational, reusable digital systems that governments use to enable various public services effectively. Experts commonly visualize DPI within a stack consisting of three layers.



At the bottom of this stack are foundational registries and hardware, which provide the essential data sources and physical infrastructure necessary to support public services. These include national databases such as civil registries, tax records, and property databases, as well as the hardware—servers and data centers—where this information is securely stored. For instance, when Alex applies for his pension, his personal information stored in these national registries is the authoritative source validating his identity and eligibility.

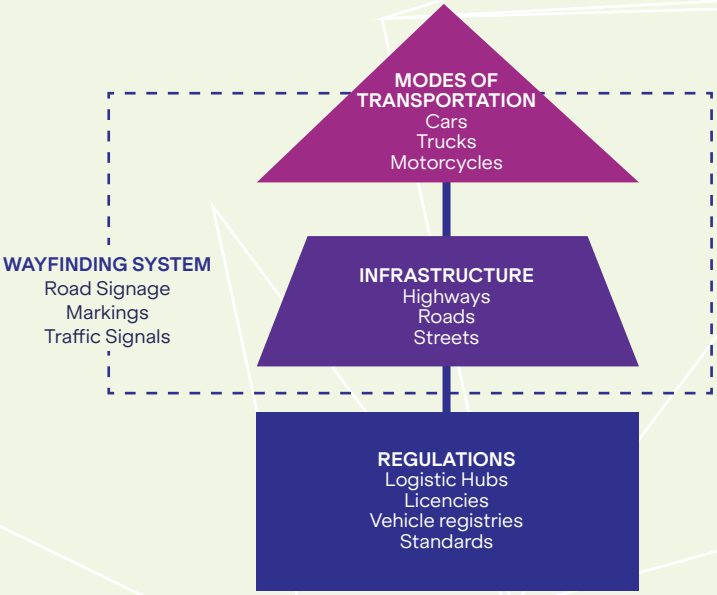
At the top layer of the stack are the public-facing services. These are the points of direct interaction between citizens and governments—examples include applying for retirement benefits, accessing healthcare services, getting a passport or registering a business. Alex directly engages with this layer when submitting his pension application through an online government portal.

Between these two layers lies the middle layer: DPI. This layer comprises the common, reusable components necessary across multiple services. Functions here include digital authentication (digital IDs), payment gateways, and secure data-exchange mechanisms. In Alex's scenario, DPI allows him to securely authenticate himself using a digital ID, receive pension payments digitally, and share his personal data seamlessly across relevant government agencies without needing to submit the same documentation multiple times.

Although design systems are not normally included within DPI frameworks, their

integration as a supportive layer between services and DPI is critical. Acting as a translator, they shape how citizens experience services and how shared infrastructure is presented, both visually and functionally, ensuring coherence, accessibility, and trust in digital public services.

Physical infrastructure also has a design layer.



To better understand the connection between DPI and design systems, we can think about transportation infrastructure. Highways, state roads, and local streets represent the middle layer (infrastructure): the shared means to many ends.[4] These are common pathways used by many different people to reach various destinations. People use different vehicles and modes of transport such as personal cars, delivery trucks, and motorcycles to achieve their specific goals or provide a service. These vehicles and their functions represent the services layer, which interacts directly with users. The equivalent of the bottom layer (hardware and registries) in this analogy includes the physical infrastructure such as ports, airports, logistics hubs, and other facilities essential for connecting users to larger markets or destinations. In addition, it also includes regulatory frameworks and supporting data such as vehicle registrations, licenses, safety regulations, and environmental and sustainability standards (data), all ensuring that transportation infrastructure operates safely, efficiently, and sustainably.

Within this analogy, a design system equates to road signage, markings, traffic signals, and wayfinding systems. These elements do more than merely standardize appearance; they guide different users clearly and safely through infrastructure. Can you imagine driving through a highway with no signage?

Design helps us trust infrastructure.
Consider the public transportation system in London, where overground trains, underground lines, and buses follow consistent design standards.[5] Beyond aesthetics, good signage and clear voice announcements inform passengers about their journeys and help them feel secure. This is especially important

in emergencies, when knowing exactly what steps to take if something goes wrong can make all the difference. Likewise, in digital services, consistent design patterns reassure users that they are interacting with genuine, secure government platforms, providing a sense of trustworthiness.

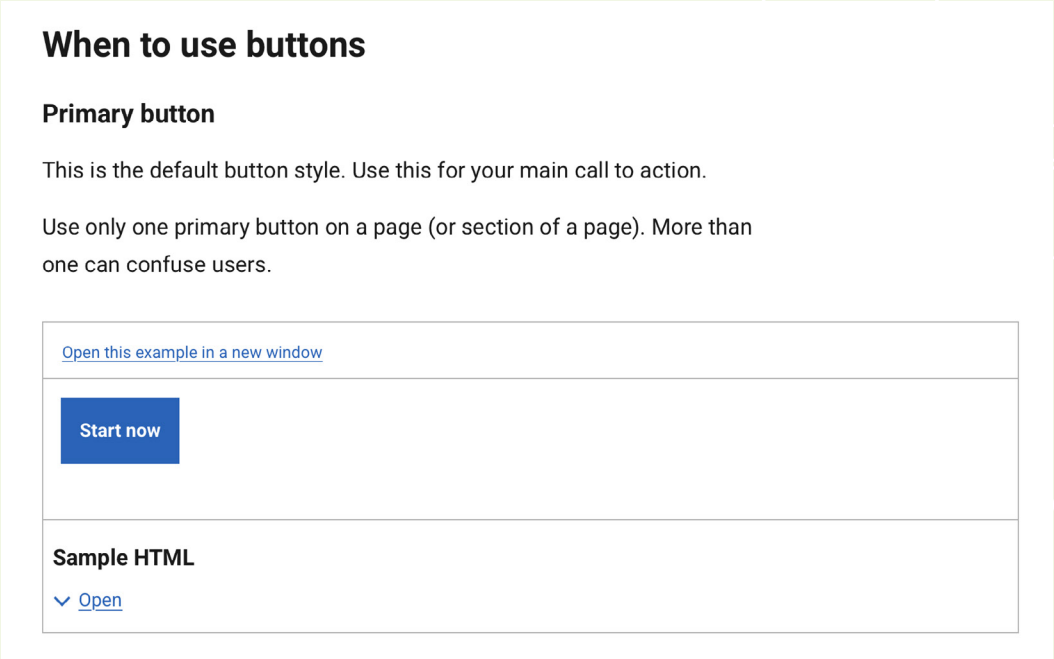
Design helps people to use infrastructure correctly.
In terms of user experience, well-designed road signage in highway systems ensure predictable and intuitive navigation. Drivers anticipate exits by standardized messages and understand the logic behind route numbering and sign colors. Similarly, Italy's government design system creates consistency across websites,[6] allowing users to anticipate interactions, like knowing precisely how many steps are required to complete an online form or transaction. This predictability enhances usability and reduces uncertainty in digital interactions, offering a solid user experience, just as consistent highway signage enhances driving experiences.

Design makes infrastructure accessible for more people.
Design enhances accessibility and inclusion in our streets. Tactile pavements, audible street-crossing signals, and high-contrast signage ensure that people with disabilities can navigate safely and independently. In the digital space, government design systems standardize and clarify interactions with core DPI functions, ensuring all citizens, regardless of their technical ability or specific needs, can either authenticate themselves, pay, or exchange information, prioritizing accessibility and inclusion. Such is the case of the United States Web Design System accessibility principles,[7] which prioritize operability and clarity in order to cater to a wide range of disabilities.

3.2 What constitutes a government design system

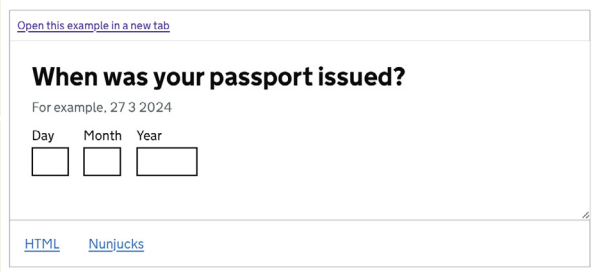
Just as clear signage and design standards make physical infrastructure safe, intuitive, and inclusive, a comprehensive government design system makes DPI consistently usable, trustworthy, and accessible for citizens. A design system achieves this by creating a shared language and standardized approach to building digital services, ensuring clarity, consistency, and ease of use.
At its core, a government design system consists of several interconnected elements:

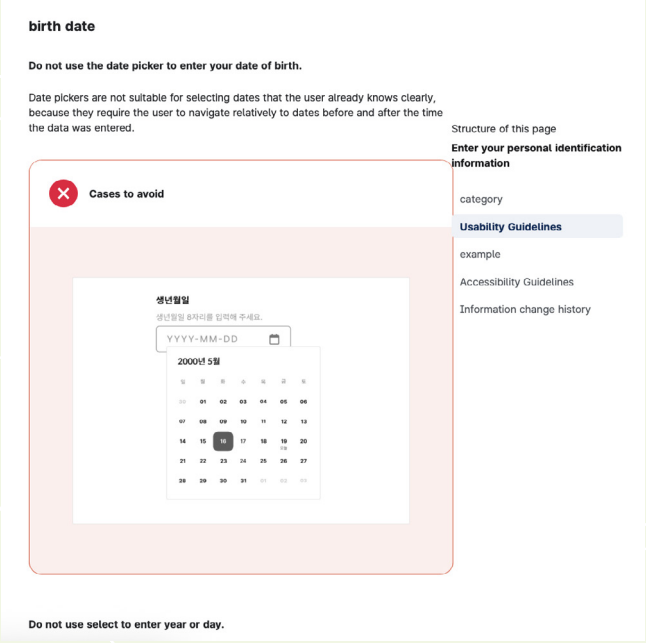
- **Components**: These are reusable building blocks or interface elements, such as buttons,[8] forms, and navigation bars. Each component is pre-designed, documented, and available for use across different government websites and applications.



Scottish Government main button as included in its Digital Scotland Service Manual.

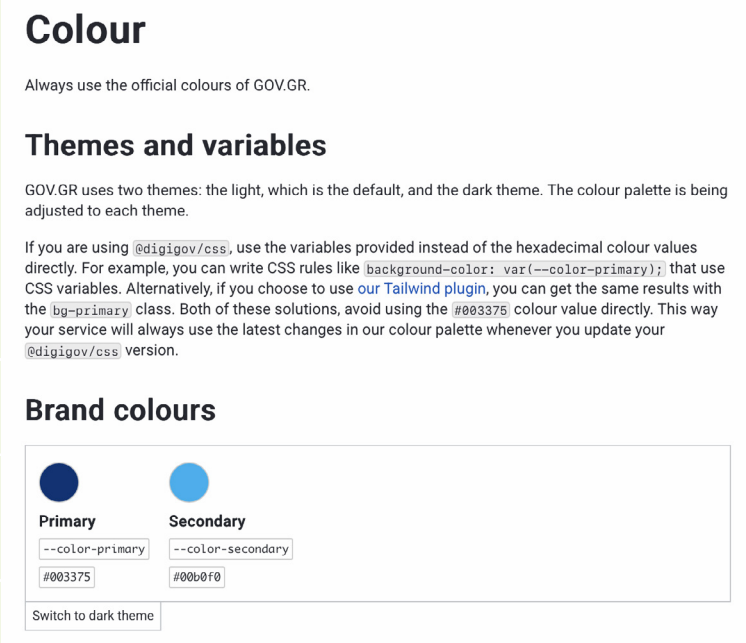
- **Patterns**: Patterns combine multiple components into common layouts or templates to solve specific user tasks, such as submitting an application or registering for a service. Patterns help maintain a consistent user experience by standardizing how services are presented and interacted with, and can be present in design systems as simple guidelines like the ones presented by Korea's Design System,[9] or even as downloadable patterns such as the one in GOV UK Design System.[10]





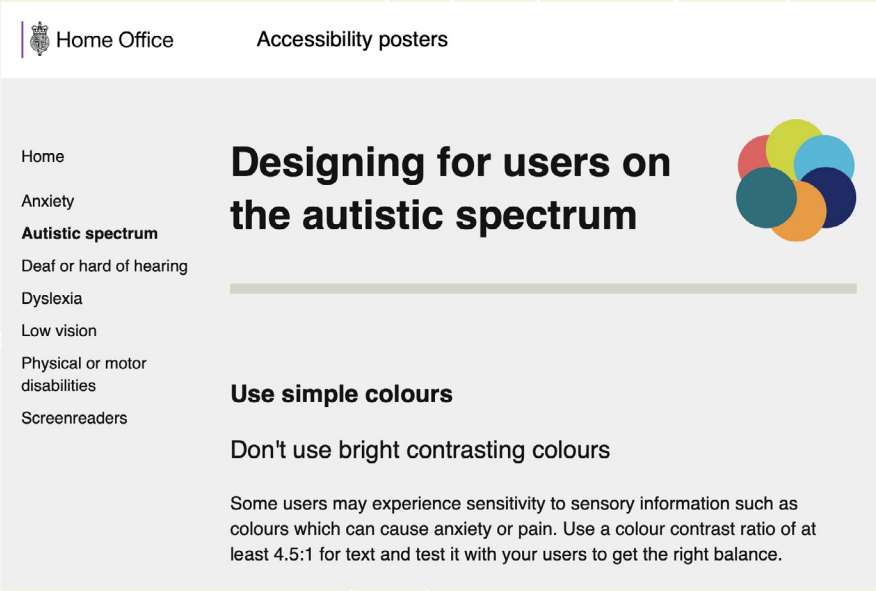
The first image shows GOV UK's fully downloadable pattern for date submission. Right, we can see Korea's Design System recommendations.

- **Styles**: These guidelines define the visual identity and user interface standards, including colors,[11] typography, and spacing. Styles ensure a homogeneous look and feel across all government platforms, reinforcing familiarity and trust among users.



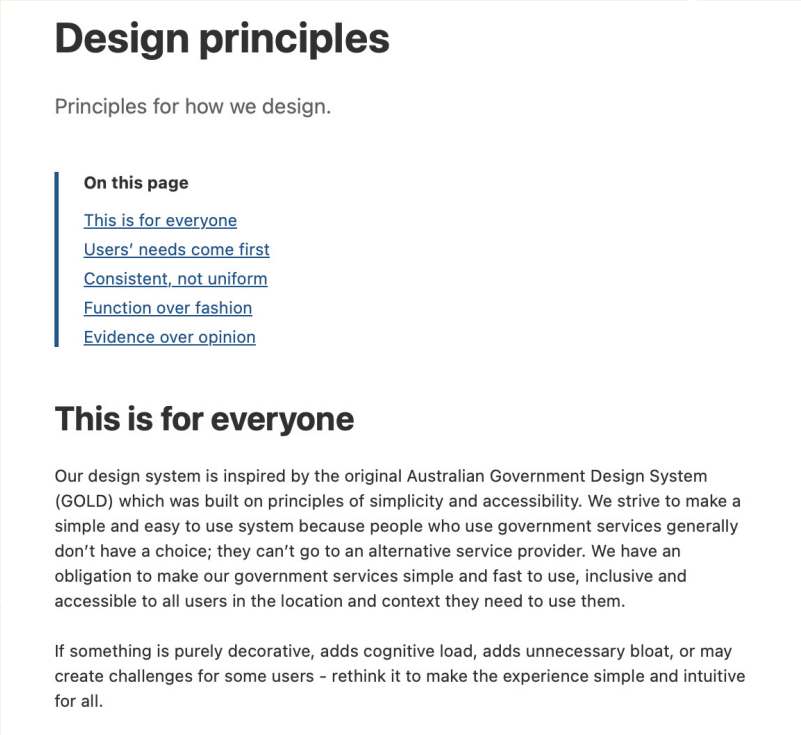
Greece Government Design System brand colors and applications.

- **Standards**: These refer to compliance guidelines and best practices, particularly for accessibility,[12] privacy, and usability. Standards help ensure that digital services can be accessed and effectively used by all citizens, including those with disabilities.



The UK Home Office's accessibility standards include physical disabilities as well as developmental conditions such as those on the autistic spectrum, or mental health diagnoses such as anxiety.

- **Principles**: These overarching values and guidelines[13] shape the overall design approach. Principles guide design decisions, emphasizing clarity, simplicity, inclusivity, and user-centeredness.



Design principles

Principles for how we design.

On this page

This is for everyone
Users' needs come first
Consistent, not uniform
Function over fashion
Evidence over opinion

This is for everyone

Our design system is inspired by the original Australian Government Design System (GOLD) which was built on principles of simplicity and accessibility. We strive to make a simple and easy to use system because people who use government services generally don't have a choice; they can't go to an alternative service provider. We have an obligation to make our government services simple and fast to use, inclusive and accessible to all users in the location and context they need to use them.

If something is purely decorative, adds cognitive load, adds unnecessary bloat, or may create challenges for some users - rethink it to make the experience simple and intuitive for all.

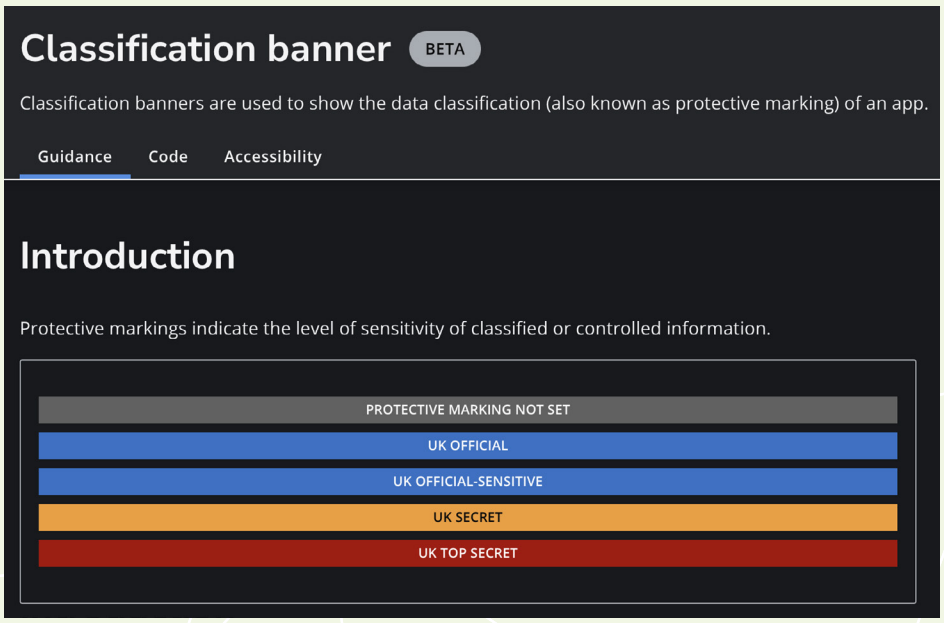
Australia's Department of Agriculture Design System (based on AUS GOLD Design System) established two main principles for its approach.

- **Governance:** This refers to how the design system is managed, maintained, and continuously improved. Effective governance involves collaboration among design teams, clear feedback processes, version control14 (see France's Design System documented versioning) and documentation to ensure the design system remains relevant and useful.

Ultimately, while a design system codifies specific components and patterns, it is the product of a much wider design process. This process shapes both the front-end and back-end of a service[15] through early work like user research and journey mapping, which takes place long before any buttons or color tokens are finalized.

Design systems across public sector services

While government design systems primarily focus on citizen-facing services, they are also valuable for internal or "backend" processes. For example, the Ministry of Justice in the UK employs tailored components[16] within their case management systems, streamlining internal processes. Design systems can vary significantly depending on context, from national-level systems that serve entire countries, to regional systems serving specific administrative areas, to sector-specific systems such as the UK's Intelligence Community Design System[17] (ICDS) used by MI6 and MI5. This system even includes specialized components like classification banners[18] to indicate document security levels. These specialized systems remind officials about the security level of the information they handle, thus ensuring compliance across government operations.



UK'S Intelligence Community Design System five classification banners.

Together, these elements create a cohesive framework that enables governments to deliver digital services that are consistent, intuitive, accessible, and reliable, enhancing both user trust and overall public value.

4. Findings

The following findings are drawn from primary case studies exploring design system approaches in the UK and Brazil, supported by detailed interviews with key stakeholders. Each of these countries reveal distinct patterns of development. While the UK provides an example of a community contribution-driven system that grew from consolidating many separate efforts, Brazil showcases how a system can scale effectively from a single, mandated visual element. These contrasting models provide clear and compelling archetypes to explore.

4.1 Incubation – how governments set up a design system

Design systems in government emerge through different pathways, each shaped by local context, political will, and organizational readiness. The following cases are two archetypal approaches that demonstrate how design becomes crucial for digital transformation. The first one embarks on an evolutionary path from scattered resources to a unified system, and the second one takes on a legislative path from a single mandated element to a comprehensive framework.

UK: From fragmentation to a federated system

The United Kingdom's design system emerged from a landscape of fragmented resources. Throughout the 2010s, design patterns and code emerged and spread out across multiple channels such as the GOV.UK Elements,[19] the GOV.UK Prototype Kit,[20] GOV.UK Template,[21] and the Frontend Toolkit.[22]

This fragmentation created practical challenges. Users often struggled to find what they needed as isolated efforts duplicated solutions that other teams had reached previously, out-of-date styles were applied, and different code bases were being used.

Between 2016 and 2018, prototypes were gradually introduced, such as GOV.UK Frontend Alpha,[23] a project that integrated frontend code into a single package. This prototype in particular highlighted major gaps that needed to be standardized. By 2018, the Government Digital Service officially launched the GOV.UK Design System.[24] This system established an important precedent and allowed all stakeholders involved to access everything (components, styles, and patterns) in one place in an easy-to-use manner, while being fully supported by a single robust, accessible code. More significantly, the system introduced a governance model open for contributions[25] since its launch. Rather than positioning GDS as the sole source of material, the system established processes for any department to propose components, share research, and collaborate on solutions through a community-driven approach.

This federated approach transformed how teams worked together, as it allowed them to continuously solve problems and avoid bottlenecks, while ensuring quality and adhering to its standards. Departments can address their immediate needs while contributing solutions that benefit everyone.

Brazil: From a visual element to an ecosystem

Brazil's design system journey began not with fragmentation but with a single, strategic intervention. In the early 2010s, the government introduced *Barra Brasil*[26] – a standardized identity bar which Brazil's federal executive branch mandated across all federal government websites through legislation.[27] This visual element went far beyond mere aesthetics: it established a communication channel between citizens and government, provided consistent navigation to government portals, ensured compliance with Brazil's Access to Information Law, and created an organizational precedent to follow unified standards.

The success of Barra Brasil laid the groundwork for broader transformation. As agencies implemented the mandatory bar, they further developed minimum adherence standards to adopt. This experience set in motion the next phase: the *Padrão Mínimo*[28] or Minimum Standard, which allowed agencies to progressively adopt design patterns to improve their digital services.

The full *Padrão Digital de Governo (Brazil's Government Design System)*[29] grew as agencies demonstrated readiness for comprehensive standards. Building on the foundation established by Barra Brasil, the government formalized the complete

design system through mandate,[30] ensuring consistent adoption across federal services. This progression from a single element to comprehensive standards demonstrates how incremental steps can achieve systemic transformation. Brazil's governance model centralizes strategic direction under the Ministry of Management and Innovation[31] with Serpro[32] (the government-owned IT solutions company) providing technical implementation. This structure ensures consistent evolution and support while respecting the varying digital maturity levels across federal institutions.

These two case studies show that what matters is not whether a system begins with consolidation or mandate, but whether it addresses real user needs, gains institutional support, and creates mechanisms for growth. For Brazil and the UK, each of their paths ultimately led to mature systems that serve citizens better through consistent, accessible digital services.

4.2 Maturity – deepening and scaling the system

Design system maturity presents itself in diverse ways, such as technical improvements (i.e. creating prototyping environments), institutional legitimacy (i.e. mandating the use of a design system) or service improvement (i.e. how the design system impacts public service delivery). The UK and Brazil have two different approaches on how design systems mature in government. Both models, however, show how design systems become crucial for broader digital transformation, enabling capabilities far beyond their original scope.

Practice-based evolution: The UK's community-driven maturity

The UK's design system has reached a level of maturity that is reflected in contribution, department-specific additions, and integration through practice. First, many of these additions originate beyond the Government Digital Service[33] (GDS). This shift from centralized development to distributed innovation marks a fundamental transformation in how the system evolves. The Design System Working Group[34] reviews contributions from departments as diverse as HMRC (UK's tax office), Home Office, and the Scottish Government, creating a cycle where users become contributors.

This continues to manifest most clearly in the proliferation of departmental design systems that extend the GOV.UK central design system. The Ministry of Justice Design System,[35] Intelligence Community Design System,[36] and even local government implementations like Hackney's[37] demonstrate how a mature federated model enables specialization without fragmentation. Each system maintains compatibility with the central one while addressing specific operational needs, from case management interfaces to security-critical components.

The fact that the design system is a solution used actively by multisectoral departments enables it to be key in new digital developments. An example is the new GOV.UK Forms[38] service, which transforms how the government creates and

manages online forms. This platform leverages the design system's components to allow civil servants to build accessible, user-tested forms without coding knowledge. Because every element draws from the established design system, forms automatically meet accessibility standards and maintain consistency across government. The platform represents how a mature design system becomes infrastructure for innovation, enabling non-technical staff to create services that would previously require developer resources.

A maturity based on practice and contribution makes experiments a natural thing. Tools like Joe Lanman's LLM-powered prototyping system[39] demonstrate how community members are pushing boundaries by integrating emerging technologies with established design patterns. This tool allows users to describe desired functionality in natural language and automatically generates GOV.UK-compliant components, dramatically accelerating the prototyping process. Such innovations emerge precisely because the design system provides a stable, well-documented foundation that anyone can build upon.

Systematic progression: Brazil's quality-driven maturity

Brazil developed a framework where design systems are relevant in the pathway to digital maturity. The closer its adherence to quality standards and broader design system implementation in a public service, the higher score is given to the digitization evaluation. The Padrão Digital de Governo *(Brazil's Government Design System)*[40] serves not just as a technical resource but as a measurable indicator of organizational capability, with clear pathways from basic compliance to advanced service delivery.

The Federal Digital Government's Public Service Quality Laboratory (LabQ)[41] is an integrative space that focuses on bridging together citizens and digital government through methodologies, best practices, and guidance material. As part of their work, they developed two main tools: a Quality Service Standard and a Digital Maturity Level to assess public services. The first one proposes a quality assessment framework,[42] an approach that evaluates services according to its ideal status for the provision of public services across seven dimensions. Specifically, dimension 4 (Unified Experience) explicitly requires progressive design system adoption. Departments discover that implementing more components from the *Padrão Digital* naturally improves their scores across multiple quality dimensions – accessibility, usability, and technical robustness all benefit from standardized patterns.

The framework creates powerful incentives for adoption. A Digital Maturity evolution pathway is available to teams navigating this progression by focusing on comprehensive design patterns, integrating citizen feedback mechanisms, and ensuring multichannel consistency – all facilitated by the design system's ready-made components and guidelines.

As part two of the assessment, LabQ ranks services' digital maturity based on five distinct levels[43] that evaluate both technical and user experience attributes in regard to efficiency, user-friendliness, and digitalization. This tool integrates

the quality of public service framework results in order to improve and enhance both assessments to continue to consolidate a digital government. One notable technical attribute is the second-level criterion: “Digitization of all stages of the service (where possible).” While not explicitly mentioned, access to patterns and components provided by a design system makes it easier to digitize each step of the service.

Regular training sessions, detailed documentation, and mandatory adoption requirements create an environment where the design system becomes synonymous with digital service excellence.

4.3 Two models, complementary takeaways

These contrasting approaches to maturity – the UK’s organic, practice-driven evolution and Brazil’s systematic, quality-linked progression – offer valuable insights for governments worldwide. The UK model demonstrates how community ownership can drive continuous innovation, with external contributors becoming the primary source of system enhancement. This approach fosters creativity and ensures the system evolves to meet real user needs as they emerge.
Brazil’s model shows how explicit linkage between design standards and service quality can accelerate transformation. By making design system adoption a measurable criterion for organizational maturity, Brazil creates clear incentives and pathways for improvement. Departments understand exactly how implementing design patterns will enhance their capabilities and ratings.

5. Insights

The research uncovered synergies between design systems and DPI beyond individual country experiences. These insights emerged from examining how design systems function within broader digital transformation efforts, their often-undervalued impacts, and their potential to shape future government services.

5.1 DPI and design systems create mutual conditions for success

Design systems make DPI comprehensible and usable for citizens through well-tested interface patterns that make authentication flows, payment confirmations, and data consent screens feel more familiar and trustworthy. However, the relationship runs both ways: DPI creates the technical environment where design systems can reach their full potential.
When governments implement robust application programming interfaces (APIs)

and data standards as part of their DPI approach, design systems shift from static pattern libraries to dynamic service enablers. For example, a form component can pull data from authoritative registries just like a payment button can connect to actual transaction systems, and identity verification patterns can be linked to real authentication services. GOV.UK Forms demonstrates this potential, while currently focused on form creation, its forthcoming features[44] will integrate directly with payment, notification, and authentication services. This isn't just about making forms look consistent: it's about making complex government capabilities accessible through standardized interfaces.

DPI connects real functionality to design systems' components. These interfaces then become the mechanism through which citizens interact with sophisticated government services. This creates a virtuous cycle: DPI adoption improves when interfaces are intuitive and consistent, while design systems gain value when they connect to meaningful government functions.

5.2 Design systems need a broader value narrative to secure support

Design teams often struggle to secure funding because they frame design systems primarily as tools for institutional branding standardization - but they miss the larger story. The real value shows up in government operations, service delivery metrics, and citizen outcomes.

Take development efficiency. During the height of the COVID-19 pandemic, the UK was able to build 52 services in mere weeks[45] by using their design system, with one website being built and launched in just five days[46] and contributing to services that save millions[47] to the government. Civil servants tracked how the design system reduced carbon emissions[48] by cutting page-reload loops, server calls, and data transfers through the adoption of optimized patterns available in their design system. In the case of France, the pandemic propelled the country to pursue and officially launch its own design system Système de Design de l'État[49] (DSFR) in 2020 and make its implementation obligatory as of 2023. France estimates between 40% to 50% time savings[50] across their services development timeframe. These numbers matter to treasury departments.

In terms of inclusion, design systems shift accessibility from being an aspiration to being a tested, practical reality. Mature systems bake accessibility principles directly into their core components and patterns. This means crucial elements like sufficient color contrast, simple language, and support for assistive technologies are included by default. This approach fundamentally changes the development process: it becomes easier to build an accessible service using the system's pre-approved elements than to create a non-compliant one. Consequently, government services can align with standards like the Web Content Accessibility Guidelines[51] (WCAG) by default, rather than through a final compliance check. Brazil's approach exemplifies the institutional power of this, as it directly links design system adoption to service quality scores that include accessibility for all, creating clear incentives for inclusive design [Section 3.2]. This transforms

accessibility from a mere checkbox into a core, measurable attribute of a quality public service.

Design leaders need to articulate these impacts when making their case. A design system that reduces service deployment time by 40%, cuts development costs by millions, and automatically ensures accessibility delivers measurable public value. That's the narrative that resonates with decision-makers controlling budgets and policy priorities.

5.3 Service coherence across channels prevents new forms of exclusion

Digital services risk leaving people behind when online experiences diverge from phone, paper, or in-person channels. Design systems offer a framework for preventing this fragmentation—not just by making digital forms match requirements on paper ones, but by creating shared understanding of how services work across government, offline or online.

When design teams map user journeys and document service patterns, they reveal how different channels actually connect. A well-designed digital process for a service like *updating addresses* should guide how call center staff handle the same request, what documents that offices require in-person, and how backend systems process changes regardless of entry point. This coherence matters most for people who need to switch channels mid-journey due to digital access issues, language barriers, or other reasons.

Scotland's approach[52] to service design explicitly considers multi-channel delivery from the start. Their patterns address not just screen interfaces but service touchpoints, ensuring citizens receive consistent help whether online, by phone, or in person.

5.4 Design systems enable responsible adoption of AI and emerging technologies

As governments integrate artificial intelligence (AI) into service delivery, design systems provide essential infrastructure for responsible deployment. The challenge isn't just technical integration—it's about maintaining transparency, user control, and trust when services become predictable and proactive.

AI-powered services introduce new design requirements[53] around explainability and user agency. Citizens need to understand why they received specific recommendations, what data informed automated decisions, and how to challenge outcomes. Design systems that already emphasize clear communication and user control can extend these principles to AI interactions. The UK's experimental chatbot[54] includes source revelation features, while SAP Fiori provides explainability components.[55]

Proactive services powered by AI fundamentally change interaction paradigms.

Instead of citizens searching for benefits, services anticipate needs and present pre-qualified options. Design systems help manage this shift by establishing patterns for presenting automated recommendations, obtaining informed consent, and maintaining user autonomy. The same contribution processes that evaluate traditional components can assess AI patterns for bias, test them with diverse users, and ensure they meet ethical standards.

The institutional knowledge embedded in design system governance becomes crucial as technology evolves rapidly. Working groups, contribution guidelines, and testing protocols create frameworks for evaluating new interaction patterns regardless of underlying technology.

6. Recommendations

This research demonstrates how design systems and DPI amplify each other's value when properly integrated. To realize this potential, different stakeholders must take coordinated action. These recommendations outline specific steps governments, funders, multilateral organizations, design leaders, and vendors can take to establish design systems as a foundational layer in the DPI stack.

6.1 Governments

- **Fund permanent design system teams** rather than treating design systems as one-time projects. Without dedicated resources, design systems stagnate—components break, patterns become outdated, and adoption falters.

- **Embed design systems in digital government frameworks** as mandatory requirements, not optional guidelines. This approach ensures consistent adoption rather than piecemeal implementation.

- **Compel ministries and departments to adopt service pattern practices** through clear directives and incentives. Linking design system usage to service quality metrics creates institutional pressure for adoption, moving beyond voluntary uptake to systematic implementation.

- **Ensure parity across digital and physical channels**, preventing citizens from encountering different experiences when switching channels.

- **Finally, embed design in DPI procurement**. When contracting for identity systems, payment platforms, or data exchanges, require compatibility with existing design systems or development of interface standards.

6.2 DPI funders

- **Treat design systems as a legitimate layer for investment**. Design systems deserve dedicated funding streams alongside identity, payments, and data exchange components in order to make each of them legible and easy to use.

- Grant requirements should **couple DPI funding to usability and inclusion standards for interaction design**. Funders are in a position to **require grant applicants to demonstrate design principles** in their proposals. Evaluations could give more points to developments with plans for user research, interface standardization, and accessibility compliance.

6.3 Multilaterals and standard bodies

- International organizations could consider **design as a legitimate research layer in digital transformation frameworks**. GovStack's UI/UX Working Group[56] demonstrates this approach by developing standardized design patterns for common government interactions—from service registration to payment flows that work across different government contexts.

- **Develop starter resources for countries without existing design systems**. This includes pattern libraries, accessibility guidelines, and implementation roadmaps adapted to different digital maturity levels. Rather than each country starting from scratch, they can build on proven foundations while adapting to local needs.

- Standard bodies are equipped to **embed design maturity questions in their diagnostic tools**. When assessing digital government readiness, evaluations should examine not just technical infrastructure but also design capabilities, user research practices, and interface standardization efforts. This positions design systems as essential components of digital transformation, not optional enhancements.

- Finally, **create regional peer networks** where design leads, policy makers, and DPI developers share experiences and collaborate on common challenges. These networks accelerate learning, prevent duplicate efforts, and build communities of practice that sustain design system development over time.

6.4 Design system leads inside government

- **Identify and document connections with DPI components** to demonstrate value and secure funding.
- Teams should **publish open component libraries with API documentation** that DPI developers can easily integrate. This includes maintaining clear version histories, changelogs, and interoperability specifications.
- **Create transparent contribution workflows** that welcome input from across government and anticipate future needs. This means establishing clear guidelines for proposing new patterns, documenting how AI-driven interactions might be incorporated, and ensuring the system can evolve with emerging technologies.
- Finally, **provide vendors with comprehensive documentation and clear contact points**. This reduces friction in procurement and improves the quality of delivered services.

6.5 DPI vendors and platform developers

- DPI vendors have the capacity to **include design systems as core components of their platforms**, not afterthoughts. Vendors who have already developed multiple DPI implementations possess the expertise to create reusable design patterns that work across contexts.
- Platform developers should **embed compatibility with existing government design systems** when available. This means building APIs and interfaces that connect seamlessly with established patterns, reducing integration time and ensuring consistency across the government's digital estate.
- Finally, vendors can **actively participate in design forums and working groups**. By engaging with government design teams early, vendors can anticipate interface requirements, contribute tested patterns from their implementations, and ensure their platforms support emerging interaction paradigms like AI-driven services. This positions them as partners in digital transformation rather than just technology suppliers.

7. Conclusion

This research reveals how design systems serve as essential infrastructure that make digital public services accessible, trustworthy, and effective for all. While visual consistency matters, the deeper importance lies in how design systems transform technical capabilities into human experiences.

In the built environment, universal access to public infrastructure is both expected and increasingly recognized. Clear road signs help us navigate regardless of language barriers, transit systems work for everyone through consistent wayfinding, and public buildings accommodate all visitors through thoughtful design. DPI promises similar universality in the digital realm, enabling all citizens to prove identity, perform transactions, and exchange information securely. But without design systems, these powerful capabilities remain difficult to access and understand, like highways without signage or buildings without entrances. Design systems bridge this gap, transforming DPI's technical functions into experiences citizens can navigate with confidence. When someone applies for benefits or updates their information, consistent patterns guide each interaction. When civil servants create new services, established components ensure quality while accelerating delivery. The evidence confirms: where design systems and DPI co-develop, digital transformation succeeds.

DPI and design systems share fundamental qualities that make their integration natural. Both embody a way of thinking—about standardization, scalability, and public value—that transcends individual implementations. Just as design thinking transformed how organizations approach problems, the DPI approach reshapes how governments build digital infrastructure. Design systems fit seamlessly into this framework, adding the human layer that makes infrastructure usable.

Today, creating effective digital government is increasingly a matter of choice rather than a technological constraint. Governments that choose to invest in design systems alongside DPI create the conditions for services that truly work for everyone. By establishing design systems as a foundational layer in the DPI stack, we move toward digital government that excludes no one and empowers all.

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