UKAuthority
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APIs for the public good

Underpinning the next generation of public services

UKAuthority

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Cognizant

APIs as universal translator

"The phrase I hear a lot from non-tech people is, 'making the computers talk to each other - that's what an API does'."

Matt Hancock, Secretary of State for Health & Social Care

Contents

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Executive Summary

Application programme interfaces (APIs) are becoming an increasingly important tool in the transformation and evolution of public sector digital services.

So much so that in a survey of UKAuthority public sector readers, 87% are already exploring the potential of APIs today. Whilst many are just at the start of the journey the potential is clear - three quarters (75%) believe that APIs will help them to optimise the citizen experience, 73% to integrate legacy systems with new forward facing services and 71% that they can help pull holistic services together around the citizen.

87% Exploring APIs today

71% To pull services together around the citizen

75% To optimise the citizen experience

73% To integrate legacy systems with new forward facing services

Whilst the enthusiasm of the public sector for using APIs is evident so is an antipathy towards legacy system or standalone solution suppliers that many feel are obstructing the drive to deliver excellent digital service experiences by placing restrictive contracts on their systems or unreasonable charges for the APIs to access them.

However the message is clear: such suppliers are likely to fall by the wayside as a new breed of high-end vendors supports the sector in building skills and mining their legacy applications and data to transform digital services.

Meanwhile emerging work on standards by GDS, HM Revenue & Customs and NHS Digital, is being met with significant appetite for direction from the centre on the consistent and replicable use of APIs across all parts of the public sector to underpin transformation.

What benefit to the public sector?

Essentially, APIs allow different systems and applications to talk to each other and exchange information both within and between organisational silos, and with digital developers and data scientists in the wider community.

In doing so they provide a crucial part of the 'plumbing' system for delivering cross-agency services designed around our citizens' needs.

Our survey of UKAuthority readers and series of 13 in-depth interviews with public sector digital leaders across central and local government, police and health, has provided a clear view of the approach to using APIs in public service transformation, pointing to a challenging but positive outlook on the benefits that can be gained.

Right data, right time

APIs provide significant benefits in support of digital transformation, many of which derive from enabling a controlled flow or use of data between the perennial information silos in the public sector. This supports the coordination of different services, drawing on specific datasets for specific groups, helping to fulfil certain types of service requests and making public authorities more responsive to their citizens. And, when appropriate, they can open up data to communities of app developers, data scientists and researchers to fuel economic growth and innovation.

Big Advantages

Flexibility in developing new services
Ability to re-use and re-purpose
Ability to share open APIs

Flexible, cost effective & future proof

They can also provide a cost-effective alternative to the wholesale replacement of legacy systems, enabling information to be surfaced in new digital citizen experiences and powering innovative new end to end transactional services. This can both significantly reduce the need for major investments and redevelopments and also underpin a more flexible information architecture that opens up myriad possibilities for using an organisation's data in different, agile, ways.

Three Big Barriers

Restrictive contracts with legacy suppliers
Charges from legacy suppliers for individual APIs
Quality of data in the systems

This agility and flexibility provides organisations with the scope to respond not just to foreseeable demands on systems and services, but also to those that can emerge from over the horizon - effectively future proofing an organisation's digital infrastructure.

71%
Comon Standards essential

67%
Open Standards essential

58%
Have some skills in-house

It was notable that more than 70% of our survey respondents were exploring three key use cases: using APIs to integrate legacy systems with new services; helping to optimise the citizen experience; and pulling together different services together around the citizen.

The design process for APIs can also feed into an assessment of the data risk profile, avoid the need for wholesale data sharing and lead to measures to strengthen data security and trust among partner organisations.

What's stopping us?

But despite the widely understood potential there are significant barriers to effective adoption. There are often problems around the quality of data held in the systems that could be connected via APIs. There is a lack of awareness and clarity around the use of the standards needed to support APIs – covering processes such as how to exchange and manipulate the data.

The survey showed more than two-thirds of respondents believing that use of agreed standards is essential, with 70% wanting common standards – for which there is a consensus on their use but no official accreditation and 67% wanting accredited open standards. Efforts are being made to establish these standards, especially in central government and the NHS, but there are still plenty of gaps and it is a painstaking process.

In addition, many organisations lack the in-house capacity to create, curate and maintain APIs, and the right external support can be essential. A common complaint is that some suppliers of legacy systems are uncooperative in making APIs available - or attach a high price tag to doing so - and may not ensure that they work effectively.

However there is consensus that the working models of public authorities must change to cope with ever tight finances and rising demand for their services. Their leaders know that they will have to work more effectively with partner organisations, and bring other third parties and members of their communities into the loop to deliver the excellent public services that their citizens deserve. This means sharing information more efficiently, building forward facing modern digital services - and APIs provide a means to deliver that.

Need for standards and leadership

Open standards and open APIs should, feel many, be at the centre of procurement discussions for digital systems. There is a strong view that public authorities should insist that any new software procurement comes with a clause that APIs should be available at no extra charge, and that systems should comply with relevant common and open standards.

Suppliers must rise to this challenge and work with the public sector to make open standards and open APIs the norm in a mutually beneficial working environment. Those leading edge suppliers helping the sector to build excellent new citizen-facing services whilst making the most from current and legacy technology investments will thrive.

But, building on the excellent work under way by GDS, HM Revenue & Customs and NHS Digital, there is a clear need for leadership and guidance from the centre to spread awareness and drive the consistent and replicable use of APIs.

The rise of the API is set to be one of the major trends of public sector digital transformation over the coming years, enabling the flexible, future proofed digital infrastructures that will underpin the next generation of agile, citizen-focused public services.

Foreword

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APIs for the Public Good

An increasing number of public sector organisations are seeing the great potential in APIs to help build the next generation of digital citizen services whilst unlocking value from their legacy and existing systems.

APIs enable the data flows between organisations for cross-agency services surfaced in new digital citizen experiences whilst building on legacy infrastructure, rather than embarking on an expensive and risky wholesale replacement. They provide the building blocks for new capabilities and contribute to a more flexible and agile infrastructure that can evolve to meet demands.

But there are challenges, not least from legacy contracts and poor data quality, and a clear need for work to encourage the wider adoption of standards and APIs across the public sector. If these are not addressed they will continue to restrain progress and the sector will be slow to obtain the benefits on offer and drive maximum value from the technology it has invested in over the years.

At Cognizant we are pleased to sponsor this report as an important contribution to the wider debate and deployment of APIs. It provides insights into the key issues around their adoption, highlighting the benefits, barriers and steps that can be taken to achieve progress. It can help to strengthen the understanding of the issues, help public officials see what they can achieve and give them the confidence to take the next steps.

Among the stand-out features are the need for common or open standards to provide sufficient consistency in the construction of APIs and the structure of the data behind them. Some have emerged, but there is a need for a stronger framework coming from a central body.

There is a great opportunity to open up the market with procurements that specify adherence to standards but allow the benefits of digital disruption to be realised. This would open the door for public authorities to deal with new suppliers, taking advantage of a more competitive market and the stream of new ideas and innovation that they can provide.

There is also a challenge in the reluctance of some legacy suppliers of IT systems to provide APIs, without a high price tag. But new options are arising for public sector buyers, with the emergence of suppliers such as Cognizant who embrace the concept of APIs as a tool to deliver end-to-end next-generation services, who believe in transferring skills to the sector and bring a philosophy of continuous integration, continuous deployment in the pursuit of excellent customer experience. Cognizant calls for the need to make technology transparent and from their work across sectors have seen great value in connecting new technologies and new digital citizen experience interfaces and bringing these together with the legacy systems to transform the way the public sector operates and delivers services for the public good.

We look forward to a future where public authorities will not have to ask for APIs to be built into new systems as they will come as part of the package, when a new generation of suppliers will enable them by nature.

APIs present a great opportunity to build robust, flexible digital infrastructures and cross-agency services for our citizens and businesses. We welcome this report and look forward to the rise of the API for the public good.

1. Introduction

1.1 API's role in public service transformation

APIs are becoming an increasingly important element in the evolution of public sector digital services. While there may be a limited appreciation of what they are – or what they do - outside of the tech community, there is a growing awareness of their potential to support delivery of new customer-focused service models. As public services increasingly rely on the cross-exchange of information both within and between public authorities – and with digital developers in the wider community – APIs can provide a crucial enabling capability.

Leaders of many organisations know that they will have to digitise and change their working models in the coming years, increasingly in collaboration with others. But no one can foresee every potential change that may be required and the sustained pressure on public sector finances makes it unrealistic to always aim for a wholesale reinvestment in core digital systems every time requirements change. To do so would be an expensive, high risk approach, and it is unfeasible for most bodies to plan for a single solution managing all their data flows today and tomorrow in an uncertain world.

The key is in ensuring access to the necessary datasets within the organisation's own systems and those of partner organisations, and that they can make their own data available to others as appropriate whilst minimising the security risks in wholesale data sharing. Throwing the emphasis onto APIs as the 'universal translator' can enable this and provide for a more gradual and nimble approach that gets the most out of legacy IT and provides flexibility for the future.

The technology community in the public sector is increasing its focus on APIs, but they often need to work on winning the support of business leaders and laying the foundations of the approach for the long term.

This paper draws on a survey of UKAuthority readers and a series of 13 in-depth interviews with public sector digital leaders across central and local government, police and health, to explore the benefits and pitfalls surrounding the successful adoption of APIs to transform public service efficiency and delivery.

1.2 What is an API?

A technical definition of an API and what it does is 'a set of protocols, routines, functions and/or commands that programmers use to develop software or facilitate interaction between distinct systems'.[1]

A briefer – and perhaps more user-friendly - definition for the non-technical business leader is that it is simply a connector element that allows different systems to talk to each other. A couple of analogies are often used to describe the concept to non-techies: that it is the information systems' equivalent of the electric plug and socket that conveys electricity from the mains to a device; or the glue that holds together the various elements of an organisation's information architecture.

Defra creates API for rainfall data
A recent addition to Defra's open data programme is a useful API for its rainfall. The data, which is already used by the Environment Agency for flood warnings and to assess water resources, provides the scope for other organisations to develop new services to complement those already operating. The data will be supplied from Defra's network of automatic rain gauges across England, and manually-read gauges that are operated by volunteers - transferred via telemetry in near real time. Read more...

[1] techopedia.com - https://www.techopedia.com/definition/24407/application-programming-interface-api

Examples of the best explanations encountered during the research include:

"An API is analogous to using the telephone to order a take-away. You order from a menu and the food is delivered to your door. You don't need to know who is cooking the food or what language the chef speaks."

"It's like google translate but for technology - it allows two applications to talk to each other, even though they speak different languages."

"It saves us from having to buy new stuff to introduce new processes... Instead it helps us to knit together the capabilities of existing systems."

Or, as the Secretary of State for Health & Social Care, Matt Hancock – an advocate for the use of standards and APIs to improve and integrate the UK's heath systems – put it to us: *"Making the computers talk to each other - that's what an API does."*

The crucial factor is that APIs facilitate the exchange of information between systems, at high speed or even in real time, helping to knit them together and increase their combined capability by 'working as one' from the citizen perspective. With the right conditions, this can be done between organisations that are using different technology stacks: as long as they adhere to the relevant standards, systems from alternative suppliers can enable each other in the data flows. In turn this makes it possible to join up both the internal and sector silos, develop cross-agency public services, support joined up operations and the provision of data for analysis and policy formulation.

2 The big benefits

A number of key benefits were identified in both the interviews and the survey that relate to issues that have troubled business leaders in the public sector for years - dealing with the legacy and standalone systems and breaking down the information silos both within and across the public sector.

2.1 Just the data needed

The way in which data is often confined within organisational systems, or even locked inside those of individual departments within organisations, has long been seen as a barrier to building joined up services. While APIs may not smash apart the silos, they can tap into them to make the right data available to the right people at the right time - enabling controlled flow of the information that fulfils service requests, and supports more coordination of different services to provide better support for individuals.

HMRC pre-population APIs for self-assessment

HMRC made six new APIs available for software developers to provide routes into its digital self-assessment services in April 2018. Tony Heap, business analyst in HMRC's API Platform Team, says the move follows a trial in which agents reported a 16% reduction in the need for contact with their clients and a 19% reduction in the need for contact with the department. By the end of 2017 the department's API platform had received more than 100 million calls for the exchange of data. Read more...

This was reflected in two of the leading three current uses to emerge from our survey, with 75% of respondents saying that APIs were being used to optimise the citizen experience and 71% that they were being used to pull together different services around the citizen.

In addition to this they can be used to make things easier for employees in pulling the right information together to do their jobs and contributing to the organisation's efficiency – a factor highlighted by 52% in the survey.

Service eligibility

There is also the potential to use APIs to help organisations check an individual's eligibility for their services by tapping into the systems of another organisation with relevant information – for example, to confirm benefit status, address or car ownership - an aim being explored by 25% of our survey respondents. The clear benefit here is that APIs can enable this essential element of public service delivery to be done without actually transferring the data – just checking that information provided is correct – thereby supporting efforts to preserve privacy in people's interactions with public authorities.

TfL's APIs for travel data

Transport for London's (TfL) open data APIs make it possible for developers to incorporate live travel information into travel apps, covering tubes, buses, river bus services and trams, accessibility and car park information for all TfL stations and live travel information on the status of roads. The real time data is available free of charge through the organisation's developer portal. More than 8,500 developers have now signed up to access its open data, which powers more than 500 apps. Read more...

Opening access to information

APIs can also, when appropriate, open up data to communities of app developers and researchers in both the public and private sector who wish to experiment with their potential – a possibility already being explored by 31% in the survey. Making the data more easily available effectively makes it easier to get at its value, providing scope to improve existing services and create new ones. Re-use of definitive government data can also provide fuel to the burgeoning app and tech start up economy demand for data from, for example, Transport for London which has sparked a thriving community of app developers, whilst demand for government data via the National Archives' suite of APIs continues to grow.

2.2 Exploiting legacy systems

In addition, as organisations seek to break away from the constraints of legacy and standalone systems to build new digital, citizen friendly digital experiences, APIs can provide a cost-effective alternative to replacing them all. If organisations can tap into those systems with APIs to surface the data and transactions within high quality digital experiences it allows them to find new value, laying the ground for new agile developments and a gradual transition to new systems rather than wholesale 'rip and replace'. Perhaps most importantly, this approach provides a new lease of life for the legacy systems, extending their use beyond initial expectations by modernising the front end user experience.

There was significant interest in this ability of APIs to integrate legacy - and even modern stand-alone - systems with new digital citizen service experiences. It was seen as a key benefit by our in-depth interviewees and was being explored at some level by 73% in the survey.

2.3 Sharing and re-use

There is also the fact that APIs can be shared: once constructed they can be made available for any appropriate organisation or individual to re-use. In our survey this ability to re-use and re-purpose APIs scored 2.7 ★★★ out of a maximum three stars in terms of perceived benefit. The ability to share Open APIs was also seen as a big benefit, again scoring 2.7 stars. ★★★

This capability feeds into the vision of government developing a platform on which organisations support each other in their operations and build new approaches to serving the public. Different channels can be customised, drawing on specific datasets for specific groups, helping to fulfil certain types of service requests and making an authority more responsive to customers.

2.4 Trust, data security and good governance

The process of designing APIs can lead to a different stream of benefits. In looking at the data an organisation should think carefully about all the implications in information governance, and how the data can be stored and managed to comply with the General Data Protection Regulation (GDPR). This contributes to the process of examining its provenance, usage, storage and disposal, and can help to build an effective structure for good information governance.

National Archives – Explore 1,000 years of history

The National Archives Discovery service holds more than 32 million descriptions of records and more than 2,500 archives and institutions across the United Kingdom, as well as a smaller number of archives around the world. The organisation's API allows developers to query the search engine and database within the Discovery service application programmatically, and returns results in XML or JSON for further processing. The service is currently offered as a beta with some functionality still to be developed – as with all good developments, feedback on the release is welcome.

Read more...

The National Archives

It extends into examining the risk profile around access and attributability, prompting questions such as who should be able to use the APIs, how it can be justified and what type of audit process is in place. But in turn, this can support the security of data and help to build trust among partner organisations and the public – a priority that affects every initiative in the public sector.

Designing APIs is just a stage in the process but one that, by prompting an organisation to think about the wider picture, can contribute to a robust and long lasting regime.

Another benefit is that, with the growing application of data science in the public sector, APIs can provide a channel for specialists in the field to connect to systems and interrogate them for the data and answers they need. With APIs it can become a smoother, more routine process in which the data scientist does not have to log in and seek specific permissions every time they start research, but can work within access protocols that make clear what they can, and cannot, access.

2.5 Flexible citizen-focused future

Overall, APIs can do a lot to facilitate the transformation of digital systems and processes, reducing the need for major investments in new back end systems, and helping to create a more flexible information architecture. They open up a wide range of possibilities for using an organisation's data well beyond its boundaries, with the capacity to set up new data use arrangements with organisations from the private, public and third sectors.

FSA Food Alerts & Hygiene

The Food Standards Agency has transformed its ability to alert citizens about vital allergy or product recall information with release of a beta of its Food Alerts API. It provides access to current and recent alerts and notices along with the facility to filter and receive updates.

Meanwhile use of its UK Food Hygiene Rating data API continues to grow. The API provides the food hygiene rating or inspection result given to restaurants, pubs, cafés, takeaways, hotels and other places consumers eat - as well as supermarkets and other food shops - and reflect the standards of food hygiene found on the date of inspection or visit by the local authority.

Food Standards Agency

APIs can underpin the delivery of citizen-centric services, designed to meet holistic need across organisational boundaries - with the agility to adapt, change and take advantage of new technologies as they evolve.

They can also help to transform the relationship between the citizen and the state by giving people who want to examine and use the appropriate data a smooth channel to do so.

This technical flexibility is a major asset for public authorities, as it provides the scope to respond not just to the foreseeable demands on their systems and services, but on those that can emerge from over the horizon. APIs can make a big contribution to future proofing an organisation's digital infrastructure, making it fit for responding to challenges that are not yet visible in our rapidly changing world.

3 The main barriers

While a significant number of people participating in our research confirm that they and colleagues are seeing the potential, they are also highly aware of the barriers to creating and utilising APIs to deliver the promised benefits.

3.1 Supplier conundrum

A common complaint is that some suppliers of legacy systems are uncooperative in making APIs available; even though they provide customers with a channel to what is essentially their own information. One interviewee commented: "*Some software suppliers are more amenable than others to signing up to APIs. We've had mixed responses from a push on the issue.*"

Indeed, the highest scoring barrier in our survey was 'Restrictive contracts with legacy suppliers' (2.8 stars ), closely followed by 'Charges from legacy systems suppliers for individual APIs' (2.7 stars ).

There was a suggestion that this may be partly down to such suppliers not wanting to devote time and resource to building features into their software when they worry there will not be sufficient demand to deliver a return on the investment. Or that it may be a mistaken attempt at 'vendor lock-in'.

But it also takes the form of companies saying they will create the APIs for legacy systems but with a high price tag. There have been numerous reports of quotes of hundreds of thousands of pounds for the provision of an API - figures that can be high enough to undermine the transformation business case.

There have been instances of some local authorities setting up forums to discuss how to deal with this, but these have had limited success and there is a widespread perception that suppliers have the upper hand in the market.

There have also been reports of vendors creating APIs that then fail to work effectively. The chances of this are higher when they are moving onto unfamiliar ground, creating the interfaces on systems that were not originally designed to accommodate them, and it could require a process of trial and error.

3.2 Data quality

A familiar problem also influences the outlook: the worry that the quality of data going through the system may not be fit for purpose figured highly as a barrier in our survey – (2.3 crosses ). Poor data quality will undermine the effectiveness of any API, and an organisation that is not confident in its own data quality has to be highly cautious about pressing ahead with the strategy.

The priority must always be to clean up and properly organise the data held on organisational systems – often through a master data management project – and this will often require an effort that can put the API approach on hold for some time.

Then comes the issue of consistency in how APIs should be put together and used. Different organisations have their own requirements and ways of looking at data, and those that can implement APIs do not always have the incentive to make their data available in ways that suit others.

3.3 Lack of standard approach

Even when organisations are working with APIs there can be challenges and there is clear evidence of the need for standards for the protocols used in the exchange of data and API development. The survey showed more than two-thirds of respondents believing that this is essential, with 70% wanting use of common standards – for which there is a consensus on their use but no official accreditation – and 67% wanting use of accredited open standards.

Open standards are not yet agreed across the public sector, and while more common standards are emerging, there is limited awareness and organisations have been slow to adopt them. It is not possible to write an API without standards, and some authorities are unsure of which to follow. Subsequently they can accept the case for APIs but not be certain about the best approach.

The current lack of standards was seen as a sizeable barrier – (2.2 out of 3 ) - to the effective use of APIs. Related to this is the need to get the technical specialists together to find a consensus on what will work. Efforts have been made by various bodies, including the GDS, but it needs a critical mass in numbers for agreements on standards that will stick. When they are brought together, people from different organisations have their own priorities and perspectives. There may be an early consensus among a small group but taking this out to a wider community for feedback can be a long, painstaking process.

3.4 Skills and capacity

Another familiar barrier are the limitations on in-house skills and capacity to create API interfaces. Whilst the survey showed that a small majority – 58% – of organisations had some in-house skills, nearly four in 10 (38%) were actively building these skills, suggesting that skills were in scarce supply.

The findings paint a reassuring picture of the importance placed on skills across the public sector but emphasis that many have capability shortfalls, especially smaller councils and agencies. Such organisations cannot realistically meet the cost of building their internal capability for the long-term and are instead looking to buy in highly-skilled support from consultancies (22%) as an alternative.

3.5 Maintenance, curation and evolution

Beyond that, the APIs must be effectively documented and kept up to date, responding to changes in the data requirements and the demands of emerging technologies and new requirements. This in itself is resource intensive and highly skilled work, and the longer necessary changes are allowed to drift the more of a barrier it will become - and the potential for reuse will be lost.

Standardisation and agreed best practice will be especially important as authorities explore the use of machine learning, robotics and artificial intelligence, and seek to share developments within the sector. This effort will require dedicated capacity or resource over time.

3.6 Lack of awareness and guidance

The survey also pointed to a lack of awareness of guidance for API use and the legal frameworks surrounding them, despite significant initiatives under way in the NHS and Central Government (see boxes on following pages).

While it is debatable whether a legal framework beyond the GDPR and Data Protection Act is needed, these highlight an inexperience in approaching API development and a general lack of awareness of current initiatives. Overall it suggests that many feel a need for / would like strong guidance around the relevant regulatory and technical issues.

Connecting Care uses API for drug prescriptions

In September 2018 Bristol's Connecting Care Interoperability Programme started to use its first Care Connect FHIR (Fast Healthcare Interoperability Resources) API to help identify people who can have the prescription for OST drugs. It links Bristol City Council's Theseus drug and alcohol system with Orion Health's integrated digital care record in a bid to reduce the risk of duplicate prescriptions being issued for controlled drugs. Dr Mike Taylor, lead GP at The Homeless Health Service in Bristol, said: "GPs working 'in hours' or 'out of hours' now have a reliable, quick, efficient way of knowing whether the patient in front of them is receiving opiate substitutes from drug workers outside practice-based care. Clinicians in hospitals can also be aware of this source of prescription. This has real potential for saving lives and reducing drug related deaths." Read more...

4 Making APIs work for the public good

Despite these problems, the advocates of APIs are looking at the intricacies of and developing the priorities for successful applications – and much of it revolves around the adoption of open or common standards.

But who should set the lead here? In our survey suggestions overwhelmingly centred around the Government Digital Service, NHS Digital and other sector-convening bodies such as the Local Government Association, the MHCLG and LocalGovDigital. Comments and suggestions included:

> *"Central government - for use in the whole of the public sector."*
> *"Central government needs to mandate all government bodies to only purchase from suppliers that provide free of charge in perpetuity, open APIs. They should outlaw the charging for any APIs."*
> *"The public sector, with each area owning their own specialist APIs, with input from suppliers."*
> *"We find that open standards are easier to work with, otherwise we end up with suppliers dictating what is needed and charging a lot of money for consultancy."*

Echoing the frustration towards some legacy suppliers, one respondent warned: *"The market won't - not in its interest!"*

4.1 Standards, standards, standards

The point of this is to provide sufficient consistency in API construction and the structure of the data behind them. Building APIs on robust standards helps to build trust in their effectiveness, makes it easier for people who want to consume the data, and supports the management of any risk around how it is handled. It can also contribute to the long-term preservation of data in providing a basis for it to be accessed.

Guidance is already emerging: GDS has catalogued a series of standards[2] extending into several areas relevant to the construction of APIs. It emphasises the importance of the Government's open standards principles[3] for software interoperability, data and document formats as a starting point, and highlights the widely used standards that are relevant to the process.

Among those that are very much part of the broad dialogue is RESTful (REpresentational State Transfer), which uses HTTP verb requests to manipulate data and provides a core baseline of interoperability. Others include JSON (Java Script Object Notation), a data interchange format for web APIs that can help in the machine-to-machine exchange of less structured content; URIs (Uniform Resource Identifiers) for identifying certain data; and the Unicode Transformation Format (UFT-8) for encoding text. In many cases they emerge from the work of standards organisations such as the BSI Group and World Wide Web Consortium, which gives them weight with the software developers who are looking towards a wide market.

GDS' API for GOV.UK content

GDS launched an API beta for content from GOV.UK in April 2018 to encourage re-use of government data and as a significant step towards making more open data available from government sources. The API enables third parties to draw on data from the central government web platform in developing new applications. It has also committed to the international Open Governments Partnership to provide APIs for government content as part of the UK Open Government National Action Plan. Content has been documented using version three of the OpenAPI specification, which is the proposed open standard for government, and the results will be fed back to the Open Standards team at GDS.
Read more...

[2] GOV.UK API technical and data standards - https://www.gov.uk/guidance/gds-api-technical-and-data-standards
[3] GOV.UK Open standards principles - https://www.gov.uk/government/publications/open-standards-principles

Relevant to all

By nature, APIs must be relevant to specific public services, and bodies such as GDS are looking at how they can align the user needs of the sector - building up more specific and relevant guidance on how to use and implement APIs. The importance of these can vary for different APIs for different systems, but they provide a useful toolset in their construction and do a lot to provide the consistency that everybody needs.

The underlying process here is to begin by using what exists, working to improve it to meet specific needs, and if necessary building something new. This should feed into the creation of standards that support a catalogue of high quality, re-usable data.

Other bodies such as NHS Digital are working on open standards for their sectors. It is a painstaking process that needs to find a balance between the international standards and the practices being deployed by the organisations in their fields. This demands agreements among the lead organisations that reflect a general consensus and it will only be fully effective when pursued at a national level.

Government opens up MasterMap data APIs

Five datasets within OS MasterMap – the Topography Layer, Greenspace Layer, Highways Network, Water Network Layer and Path Network – will be made available through a suite of APIs to be developed by Ordnance Survey and under the Open Government Licence. They will be available for free up to a threshold of transactions through the APIs.

Chancellor of the Duchy of Lancaster and Minister for the Cabinet Office David Lidington (pictured), said: "Opening up OS MasterMap underlines this Government's commitment to ensuring the UK continues to lead the way in digital innovation. Releasing this valuable government data for free will help stimulate innovation in the economy, generate jobs and improve public services. Location-aware technologies - using geospatial data - are revolutionising our economy. From navigating public transport to tracking supply chains and planning efficient delivery routes, these digital services are built on location data that has become part of everyday life and business. Read more...

Ownership and common purpose

There is also a need for an organisation to be accepted as 'owner' of the relevant standards for APIs, with the ability to define and develop them over time. Different parts of the public sector generally have central bodies to lead the work on digital technology, and they are best placed to set the foundations on which the interfaces will work for everyone.

One point that emerged from the interviews for this paper was that there is a big incentive for an organisation to develop and curate the standards if its core business depends on the relevant APIs itself. The extension of this is that organisations that see great potential in the interfaces become actively involved in the development and are ready to share what they have learned. This will increase the chances of the emergence of common and open standards that support successful APIs for their sectors.

4.2 Mining the value

Advocates of APIs press the financial case that they are tools to extract more value from legacy systems, reduce the need for big new investments and save on costs. There is a strong argument that, despite the efforts of some suppliers to levy high charges, APIs they can give an organisation long-term control over development of agile digital services and flexibility for the future.

They can also increase the value to an organisation through allowing others easier access to its data. This is particularly the case for those that see significant gains to both themselves and the UK economy in opening up their data for re-use - and to those looking to reduce the pressure on themselves by enabling partner organisations to improve their services without depleting their own resources. The latter could be an especially pertinent factor in the current drive for integration between health and social care.

The business case is likely to vary between organisations, and the bodies leading an initiative need to clearly outline the incentives – reflecting the benefits outlined above – for others to engage and collaborate.

4.3 Privacy at the core

It is also possible to draw on the issues around compliance with GDPR in safeguarding data and privacy. In the months around its implementation in May 2018, GDPR focused minds on the need to understand why an organisation should hold and process personal data, with a clear rationale to justify its use.

This has encouraged a deepening of the overall understanding of data issues, which can provide a launch pad for promoting an increase in the legitimate use of personal and other types of information. As the value of this becomes apparent the case for APIs becomes stronger, with their potential to expand data processing within legal constraints.

Discussions around how datasets sit within GDPR can show what opportunities can be created with APIs to provide next-generation digital services designed with privacy at their core.

4.4 Procurement as a community

The other big step is to push the cause for common and open standards to the centre of procurement discussions for digital systems.

There is a growing view that public authorities should insist that any new software procurement comes with a clause that APIs should be seen as a standard element in line of business solutions and will be made available on request at no extra charge to enable integration into enhanced digital citizen experiences. Systems should also comply with any open standards to make this possible, and it should be clear that the public authority, not the supplier, owns the API along with its data in these systems.

This would undoubtedly meet resistance from some suppliers - indeed those legacy suppliers most highlighted during this research - and there is a degree of caution in the public sector as it would take organisations towards new contracts. But a common purpose and strength in public sector procurement could take the lead.

Indeed, there was a view that over time the companies that do not conform to this new open and agile way of working will begin to fall away in the competition for new business - to be replaced by a new breed of suppliers focusing on their capability to integrate legacy systems with modern services and excellent customer experiences.

Underlying all of this is the concerted push from the centre - mirrored in the core parts of the public sector it will do much to spread the use of APIs and deliver the sought after benefits. As can be seen in our sector boxes this work has already gathered momentum with some bodies beginning to provide strong and clear leadership on the issue.

GDS' API technical and data standards
GDS released its new set of data and technical standards for APIs in February 2018 describing the move as a significant step in improving digital services and reducing costs. It includes an emphasis on following the Technology Code of Practice, the criteria for designing and building technology in government, and a series of detailed points on good practice in creating APIs. There has been a growing emphasis on the significance of APIs for digital public services, as they provide the interface for developers to tap into data sources from government systems - helping government bodies to share and re-use technology and make better use of data. This provides the scope for the creation of apps by public authorities or third parties, reflecting a shift in sentiment towards creating ecosystems rather than more tightly controlled structures for app development. Read more...

Central Government

There has been a strong lead from the **Government Digital Service (GDS)** in recent years, with its work on standards to support APIs having begun in 2014.

While this is a work in progress, it is attracting feedback from around central government and has produced guidance, which is broad rather than strongly prescriptive, on how to approach the creation and curation of APIs.

This includes the creation of the aforementioned API technical and data standards[1], which have been built up to provide a range of recommendations, including:

- Follow the Government's Technology Code of Practice.
- Use RESTful, HTTPS, URIs to identify data, JSON, Unicode for encoding and IP address whitelisting.
- Authenticate an API at the appropriate time.
- Authorise users of an API.
- Iterate an API.
- Set clear depreciation policies.
- Test for performance, scalability and compliance.
- Keep a local dataset copy up to date.
- Document an API and publish over the internet by default.

The organisation is focused on working with standards development organisations, bringing together expertise across government and finding consensus. The overall aim is to find what works most effectively for most of government – a painstaking process but one that is gradually producing results as can be seen on GDS' Github challenge forum on open standards[2].

It recently launched an API for content on the GOV.UK platform, enabling third parties to draw on data from it in developing new applications. This was accompanied by a commitment to the international Open Governments Partnership to provide APIs for government content.

A significant contribution has also come from **HM Revenue & Customs (HMRC)**, which recently launched a hub to help developers integrate their software with its APIs.[3] In October 2018 it reportedly hosted 48 APIs and was taking around a million calls per day on them with 99.99% availability.

Earlier in the year an HMRC Digital blogpost[4] highlighted the development of a standardised process for API design and efforts to develop principles for the producer teams. It said these should help to decouple API documentation from any complexity in the back end systems and to prevent any changes from having a negative impact on software developers. The department has also worked on a domain model to represent entities that interact with it, and emphasised the use of RESTful and JSON.

Such steps are highly important to the Making Tax Digital programme, one element of which is based on businesses and their tax agents using third party software that can feed and extract data from HMRC systems. But it is also providing lessons that could be valuable to other central government departments.

[1] https://www.gov.uk/guidance/gds-api-technical-and-data-standards
[2] https://github.com/alphagov/open-standards/issues
[3] https://hmrcdigital.blog.gov.uk/2018/10/18/the-developer-hub-is-live/
[4] https://hmrcdigital.blog.gov.uk/2018/02/05/considering-user-needs-in-an-api-first-strategy/

Health & Social Care

In October 2018 **NHS Digital** published a Beta Digital, Data and Technology Standards Framework[1] that includes an emphasis on the importance of open APIs, saying they should be developed in line with Fast Healthcare Interoperability Resource standards (FHIR), which in turn have been developed by the Health Level 7 group and are regarded internationally as the main guide for APIs in healthcare.

Writing in the report's foreword, Secretary of State for Health Matt Hancock says: "This sets a new bar for quality and efficiency. Our new standards will be demanding and much work will be necessary across all NHS organisations and within supplier communities to move quickly towards achieving these higher expectations."

"...As we see migration towards standards, we will quickly see an increase in our ability to share data across the system, an increase in our ability to analyse and drive insights from the huge amount of data we hold across the system, and an ability to procure and redeploy technology with greater efficiency and at lower cost than has ever been possible historically."

NHS Digital has already created constrained FHIR profiles in the form of the Care Connect[2] and Transfers of Care[3] specifications, which outline the profiles of clinical concepts. It has said it will now go on to develop and agree the necessary set of semantically interoperable FHIR API specifications to support safe patient care. These will be created in collaboration with healthcare providers, system vendors and standards bodies, such as the Professional Records Standards Body (PRSB) and INTEROPen.

The latter has been in place for some time, providing a forum for technical interoperability standards of UK healthcare systems, taking in areas that include the definition of APIs. Recent contributions have included the publication of a curation guide for FHIR[4] and guidance for using the standard in child care[5].

[1] https://digital.nhs.uk/about-nhs-digital/our-work/nhs-digital-data-and-technology-standards/framework#all-nhs-digital-data-and-technology-services-should-support-fhir-based-apis-to-enable-the-delivery-of-seamless-care-across-organisational-boundaries
[2] https://developer.nhs.uk/library/interoperability/care-connect-api/
[3] https://digital.nhs.uk/services/transfer-of-care-initiative
[4] https://www.interopen.org/2018/07/05/fhir-curation-guide/#
[5] https://www.interopen.org/2018/07/16/1187/

NHS Digital opens API Lab

NHS Digital announced plans to speed up the development of open source APIs in health and social care in November 2017. Its API Lab in Leeds will follow principles on openness and transparency laid down by INTEROPen, the action group to support interoperability in health and social care. All APIs developed by the Lab will be open source and will be built on the base FHIR (Fast Healthcare Interoperability Resources) standard from HL7. The APIs and associated tools and guidance will be made available under a permissive open source licence. Head of the API Lab Richard Kavanagh said: "I'm really excited by the API Lab's potential to drive forward work on a number of significant open source APIs. By partnering with INTEROPen we will be able to create APIs even faster, delivering real benefits for the health and care system." Read more...

Local Government

While there has been no big coordinated effort to spread the use of APIs in local government so far, it has been on the agenda of those who are promoting the causes of standardisation and interoperability across local services for some time.

As far back as 2014, public sector IT association **Socitm** said in its Digital Vision to Value[1] there was a need among local authorities to embrace the concept and called for the sharing of common APIs. And in 2016 the **LocalGov Digital** group comprising digital practitioners in local authorities developed the Local Government Digital Service Standard[2] which includes a recommendation to use open standards in developing services.

Individual councils are pressing ahead with relevant work, and some are sharing their experience to encourage wider adoption. For example, **Hackney Council** has an API strategy[3] that involves all its key datasets being available through RESTful APIs that can be used independently of each other.

However, publication of the Local Digital Declaration[4] in the summer of 2018 by the **Local Digital Collaboration Unit at the Ministry of Housing, Communities and Local Government (MHCLG)** is seen by many as a starting point for collaboration and coordination on the emergence of APIs from within the sector and, indeed, there is scope for relevant work to be included in the projects to be chosen for funding from the MHCLG Local Digital Fund[5].

[1] https://www.socitm.net/publications/digital-vision-to-value
[2] https://localgov.digital/service-standard
[3] https://blogs.hackney.gov.uk/hackit/Developing-our-API-strategy
[4] https://localdigital.gov.uk/declaration/
[5] https://localdigital.gov.uk/fund/

Police

The potential for APIs has recently moved up the agenda for the digital leaders of police forces. Led by the **National Police Technology Council** and the **Police ICT Company**[1] (PICTO), they have intensified efforts to improve interoperability between their systems, and there is a growing sense of the need to coordinate their work.

In October 2018 IT industry association techUK reported[2] that there had been early discussions with PICTO on the question of interoperability, acknowledging that suppliers have been asked to pay more attention to APIs in future developments, and that there was a need for a policing initiative similar to INTEROPen for healthcare.

[1] https://ict.police.uk/
[2] http://www.techuk.org/insights/event-round-ups/item/14082-the-future-of-policing-technology

5 Supporting trends

Whilst the survey indicated that 87% of public sector organisations are now working with APIs in some way, the interviews suggested that many are still in the early stages of exploring the potential. However, there appears to be a trend towards standards and best practice, with clear policies emerging from parts of central government and the NHS and early work in local government and the police service.

A handful of other factors are adding to the momentum. One is that the public sector's gradual move towards cloud services is providing the scope for a rethink of how it uses its digital systems and for organisations to look for API capabilities in any new contracts. It is not always at the top of the agenda, but an increasing number of authorities are bringing APIs into the equation as part of a move to cloud.

Similarly, a move away from the Public Services Network (PSN) can also encourage change. In early 2017 GDS signalled that an improvement in technical controls for the internet, including the use of standards for email security and virtual private networks, was reducing the need to rely on the PSN as a secure network for information sharing[4]. There is a perception that authorities now have more flexibility in their network arrangements, and this can provide more opportunities for building in APIs.

"Reliance on the PSN for security was a major inhibitor in terms of how we provisioned APIs," was one comment. *"The demise of PSN and government trying to use the same provisioning as the rest of the world reduces a friction point."*

There have also been signs of organisations requiring the provision of APIs within software procurements when they undertake them in groups. There has been a driver for this in the health and social care sector, as the creation of sustainability and transformation partnerships (STPs) is bringing healthcare bodies and local authorities into natural aggregations that are giving them more clout in the market. This is encouraging some observers to believe the market is on its way to a tipping point where it becomes the norm.

Another factor is the publication during the summer of the Local Digital Declaration as a set of principles for local authorities in designing digital services and a move towards digital collaboration across the local government sector[5]. While they do not make a specific reference to APIs, they do include ambitions to build safe and secure ways of sharing information and use open standards to provide a common structure for data.

Some interviewees for this paper commented that this provides a firm starting point for an approach to building digital services in which APIs can play a prominent part.

Hackney's call for suppliers to join 'digital ecosystem'

The director of ICT at the London Borough of Hackney, Rob Miller, believes that software suppliers need to change their approach to dealing with local government or they will lose ground in the market. He posted an open letter to suppliers in August 2018, declaring the council's support for the Local Digital Declaration and its intention of breaking away from a dependence on inflexible and expensive technology that does not join up effectively. Hackney has a strategy to make its key datasets available through REST (representational state transfer) APIs as a step towards developing new digital services. It has made progress, but also found the legacy suppliers have often insisted that cooperation comes at a heavy price. "What we've found, and this has been a problem for a long time, is that traditional vendors tend to make those APIs quite expensive," he says. "You're thinking 'Here's a useful way to make a digital service better for our residents', but for reasons of the capability of the API, the commercials around it or the quality of the data we can't do it." Read more...

[4] https://www.ukauthority.com/articles/gds-says-use-internet-to-exchange-data-not-psn/

[5] https://localdigital.gov.uk/declaration/

6 An unstoppable momentum

Developments are moving in the right direction for the wider development and adoption of open or common standard APIs across the public sector.

While many organisations are still at the exploratory stage, this is a growing appreciation of the potential in enabling disparate systems to talk to each other and support a flexible, agile and cost-effective element of digital transformation.

The underlying drive is that the working models of many public authorities have to change to cope with ever tight finances and rising demand for their services. Their leaders know that they will have to work more effectively with partner organisations, and bring other third parties and members of their communities into the loop to deliver the excellent public services that their citizens need. This means sharing information more efficiently, building forward facing modern digital services - and APIs provide a means to deliver that.

But there are still barriers to overcome, including a lack of understanding of 'what' this technical element can achieve and a lack of awareness of core sector leadership in driving the change. The change will not come overnight.

Digital leaders need to convince senior executives of the business case for the change, and persuade people in their organisations, and potential partners, that there are mutual benefits in the exchange of data through common and standard APIs.

Then comes the technical effort to make it happen. Public authorities need to concentrate their efforts in supporting the creation and adoption of data standards, and getting the technical capabilities in place for the operation of APIs. They need to become involved in the growing dialogue around each of the points highlighted above. They also have to be prepared to take ownership of critical APIs, ensuring that they assume control from software suppliers where appropriate, and make the requirement for APIs a central element of future tenders for digital systems.

Suppliers must also rise to this challenge and work with the public sector to make open standards and open APIs the norm in a mutually beneficial working environment. Those leading edge suppliers helping the public sector to build excellent new citizen-facing services whilst making the most from their existing technology investments will thrive.

If public authorities present more of a common front – whether it is through aggregated procurement or the adoption of a widely recognised set of rules for their requirements – they can make their weight in the market count for the better. Over time this will change the market dynamics to the point where any supplier that does not work towards this common purpose risks falling by the wayside - provision of APIs should be acknowledged as a prerequisite for a sale.

There is a consensus that in future organisations will have to work together more effectively and do so in ways that are currently difficult to foresee. It requires a flexible, future proofed infrastructure that can be made possible by the widespread use of APIs.

The rise of the API is set to be one of the major trends of public sector digital transformation over the coming years.

7 Research methodology

UKAuthority's Research Director, Helen Olsen Bedford, and Managing Editor, Mark Say, conducted a series of in-depth interviews with public sector leaders and undertook desk research into the activity and policy within specific parts of the public sector.

This in-depth view of the use and potential of APIs within the sector was checked against a wider on-line survey of UKAuthority readers.

Details of interviewees and survey respondents are below. The full results are available on request.

7.1 In-depth interviews

- Geoff Connell, CIO, Norfolk County Council
- Honor Howell, Assistant Director, Borough Council of King's Lynn & West Norfolk
- Ian Bell, Chief Executive, Police ICT Company
- John Sheridan, Digital Director, National Archives
- Julie Pierce, Director Openness, Data & Digital, Food Standards Agency
- Linda O'Halloran, Head of Local Digital Collaboration Unit, MHCLG
- Nadira Hussain, Director of Leadership Development & Research, Socitm
- Nicola Graham, CIO Aberdeenshire / Socitm President
- Paul Maltby, CDO, MHCLG
- Phil Rumens, Digital Services Manager, West Berkshire Council / Chair of LocalGovDigital
- Rob Miller, Director of ICT, London Borough of Hackney
- Rosalie Marshall, Lead Technical Advisor and Head of Technical Writing, Government Digital Service (GDS)
- Terence Eden, Open Standards Lead, Government Digital Service (GDS)

7.2 Survey participants

Organisations

Improvement Service – Scotland, National Audit Office, Planning Portal, UK Research & Innovation, Northern Ireland Housing Executive, Anonymous - Central Government, Aberdeenshire Council (x 2), Borough Council of King's Lynn & West Norfolk, Bracknell Forest Council, Breckland Council, Brighton & Hove City Council (x2), Bristol City Council, Calderdale Metropolitan Borough Council (x2), Cardiff Council, Carmarthenshire County Council, Cherwell District Council, Cheshire East Council, Colchester Borough Council, Corby Borough Council, Derbyshire Dales District Council, Dorset County Council, Epping Forest District Council, Essex County Council, Gateshead Council, Gravesham Borough Council, Halton Borough Council, Kent Commercial Services, Kent County Council (x 2), London Borough of Hackney, London Borough of Havering, London Borough of Merton, Manchester City Council, Milton Keynes Council, North Lincolnshire Council, North Norfolk District Council, North Yorkshire County Council, Rutland County Council, Solihull Metropolitan Borough Council (x 2), Somerset County Council, South Bucks District Council, Southend-on-Sea Borough Council, Stroud District Council (x2), Sunderland City Council, Surrey County Council (x 2), Telford And Wrekin Council, Tonbridge & Malling Borough Council, Tunbridge Wells Borough Council, Warwickshire County Council. Wirral Council (x2), Capgemini, Clue Computing Company Ltd, IronMountain, JKM Care Solutions, Libraries Unlimited, Web

Labs Ltd, Web-Labs, NHS Wales Shared Services Partnership, South London and Maudsley NHS Foundation Trust, University Hospitals of Morecambe Bay NHS Foundation Trust, Velindre University NHS Trust, Unknown

Job titles

Chief Clinical Information Officer, Chief Technology Officer (x2), Director, Director of Digital Value for Money, Director of Informatics, Head Of Digital, Head of Digital & Communications, Head of Digital and Data (x2), Head of ICT (x 2), Head of IT, Head of IT Systems, Head of Technology, Head of Technology Solutions, Lead Member Technology & Support Services, Managing Director, Applications Manager, Business Intelligence Officer, Business Solutions Manager, Business Systems Analyst, Contact Centre Manager, Corporate Development Officer, Customer Insight Lead, Data & Engagement Strategist, Data Migration Manager, Deputy Strategic Change Manager, Developer, Development Manager, Digital and Customer Access Strategy, Digital Development Officer, Digital Manager, Digital Partnerships Officer, Digital Project Manager, Digital Service Manager, Divisional Manager, Dynamics Development Manager, Enterprise Architect, GIS Officer, Health and Social Care Integration Manager, ICT Business Services Manager, ICT Service Delivery Manager, Information Systems Manager, Internal Shared Services Customer Relationship / Operational Manager, IT Architect, IT Manager, Lead CRM Developer, LLPG, Manager, Operations Manager, Partnership Analyst, Performance Development - Systems Implementer, Product Development Manager, Programmer, Project Officer, Public Access & Web Officer, Records Library Manager, RPA Solution Architect, Senior BDM, Senior GIS Officer, Senior IT Officer, Senior Web Developer, Spatial Team Lead, Transformation Officer, Unknown, Webmaster

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