Department for
Business & Trade

Data Standards for Smart Data

Evaluating how existing data standards can support future Smart Data schemes

November 2025

Contents

Acronyms & Definitions

Acronym	Definition
API	Application Programming Interface
ASPSP	Account Servicing Payment Service Provider
ATP	Authorised Third Party
BASPI	Buying and Selling Property Information
BEIS	Department for Business, Energy and Industrial Strategy
BSC	Balancing and Settlement Code
CDSP	Central Data Services Provider
CFIT	Centre for Finance, Innovation and Technology
CHAPS	Clearing House Automated Payment System
CMA	Competition and Markets Authority
CMS	Case Management System
CRM	Customer Relationship Management
DBT	Department for Business and Trade
DCUSA	Distribution Connection and Use of System Code
DESNZ	Department for Energy Security and Net Zero
DNO	Distribution Network Operator
DPMSG	Digital Property Market Steering Group
DTS	Data Transfer Service
DUIS	DCC User Interface Specification
EDI	Electronic Data Interchange
EES	Electricity Enquiry Service
EPC	Energy Performance Certificate
ESA	Energy Smart Appliance
FAIR	Findable, Accessible, Interoperable, Reusable
FAPI	Financial Grade Application Programming Interface
FCA	Financial Conduct Authority
GBCS	Great Britain Companion Specification

GES	Gas Enquiry Service
GLEIF	Global Legal Entity Identifier Foundation
GLN	Global Location Number
GTIN	Global Trade Item Number
GVA	Gross Value Added
HACT	Housing Associations' Charitable Trust
HBSC	Home Buying and Selling Council
HMLR	His Majesty's Land Registry
HMT	His Majesty's Treasury
ICC	International Chamber of Commerce
IUNC	Independent Gas Transporters' Uniform Network Code
ISO	International Organization for Standardization
ISA	Individual Savings Accounts
JSON	JavaScript Object Notation
LEI	Legal Entity Identifier
LGA	Local Government Association
MHCLG	Ministry of Housing, Communities, and Local Government
MPAN	Meter Point Administration Number
MPRN	Meter Point Reference Number
MRA	Master Registration Agreement
MVP	Minimum Viable Product
NESO	National Energy System Operator
NUAR	National Underground Asset Register
ODI	The Open Data Institute
OECD	Organisation for Economic Co-operation and Development
Ofgem	The Office for Gas and Electricity Markets
OPDA	Open Property Data Association
OSCRE	Open Standards Consortium for Real Estate
OSIP	Open Savings, Investments, and Pensions

PDP	Pensions Dashboards Programme
PDTF	Property Data Trust Framework
PSD2	Payment Services Directive
RDS	Royal Institute of Chartered Surveyors Data Standard
REC	Retail Energy Code
RECCo	Retail Energy Code Company
RICS	Royal Institute of Chartered Surveyors
RTGS	Real-Time Gross Settlement
SEC	Smart Energy Code
SECAS	Smart Energy Code Administrator and Secretariat
SIPP	Self-Invested Personal Pension
Smart DCC	Smart Data Communications Company
SPAA	Supply Point Administration Agreement
SSEN	Scottish and Southern Electricity Networks
TA	Transaction Form
TISA	The Investments and Savings Alliance
TOUT	Time Of Use Tariff
UNC	Uniform Network Code
UPRN	Unique Property Reference Number
USRN	Unique Street Reference Number
XML	Extensible Markup Language

1. Executive Summary

1.1 Report overview

Smart Data has the potential to be revolutionary for the UK economy. The most mature Smart Data scheme currently, Open Banking, has already benefitted over ten million consumers and small businesses in the UK.[1] Through its ability to reduce costs for citizens as well as generating new economic growth opportunities, Smart Data can play a key role in delivering the Government's 'Kickstarting Economic Growth' agenda,[2] including through supporting its Industrial Strategy.[3]

Smart Data refers to the secure sharing of customer data, upon a customer's request, with Authorised Third Parties (ATPs).[4] Providers then use this data to offer personalised and innovative services for the consumer or business user, for example automatic switching or better account management. To enable sharing, there must be rules for how data is described, recorded, and shared: we can refer to these rules as 'data standards'. Data standards help ensure that any exchanged data is high-quality, secure, reliable, understandable, and reusable by a third party. Standards also have a role in ensuring that customer privacy is protected, data is held securely, and that organisations only share data where consent has been granted.

Under the powers in the Data (Use and Access) Act, the Department for Business and Trade (DBT) intends to support other government departments, each covering different sectors, to enable and accelerate the growth of new Smart Data schemes. In support of this, DBT commissioned a research project, which this report summarises, to:

- Understand the current state of data standards in priority sectors of interest (Finance, Energy, Property, Retail), with a focus on how data is described and recorded.
- Understand the suitability of the current state to facilitate the development of new Smart Data schemes.
- Develop a set of 'design principles' to guide the development of data standards that can support Smart Data schemes.

The desired outcome of this project is that government departments and regulators developing Smart Data schemes have a comprehensive view of the standards already in place, and a shared set of principles for developing new common data standards where they are needed. The report is intended to support individual sectors as well as attempts to develop cross-sector Smart Data schemes, maximising the potential benefits to consumers, businesses and the economy.

1.2 Report findings

Data standards, while important to Smart Data schemes, are just one of several enablers to their success. Throughout this research, it was made clear that data standards, and the need for them, must be put in the context of the other required enablers for creating a Smart Data enabled economy. Data standards can only facilitate data sharing and be adopted if supported by interoperable and consistent approaches to consent, accreditation, authentication, security, governance, standards development, data sharing, liability, funding, and ecosystem performance.

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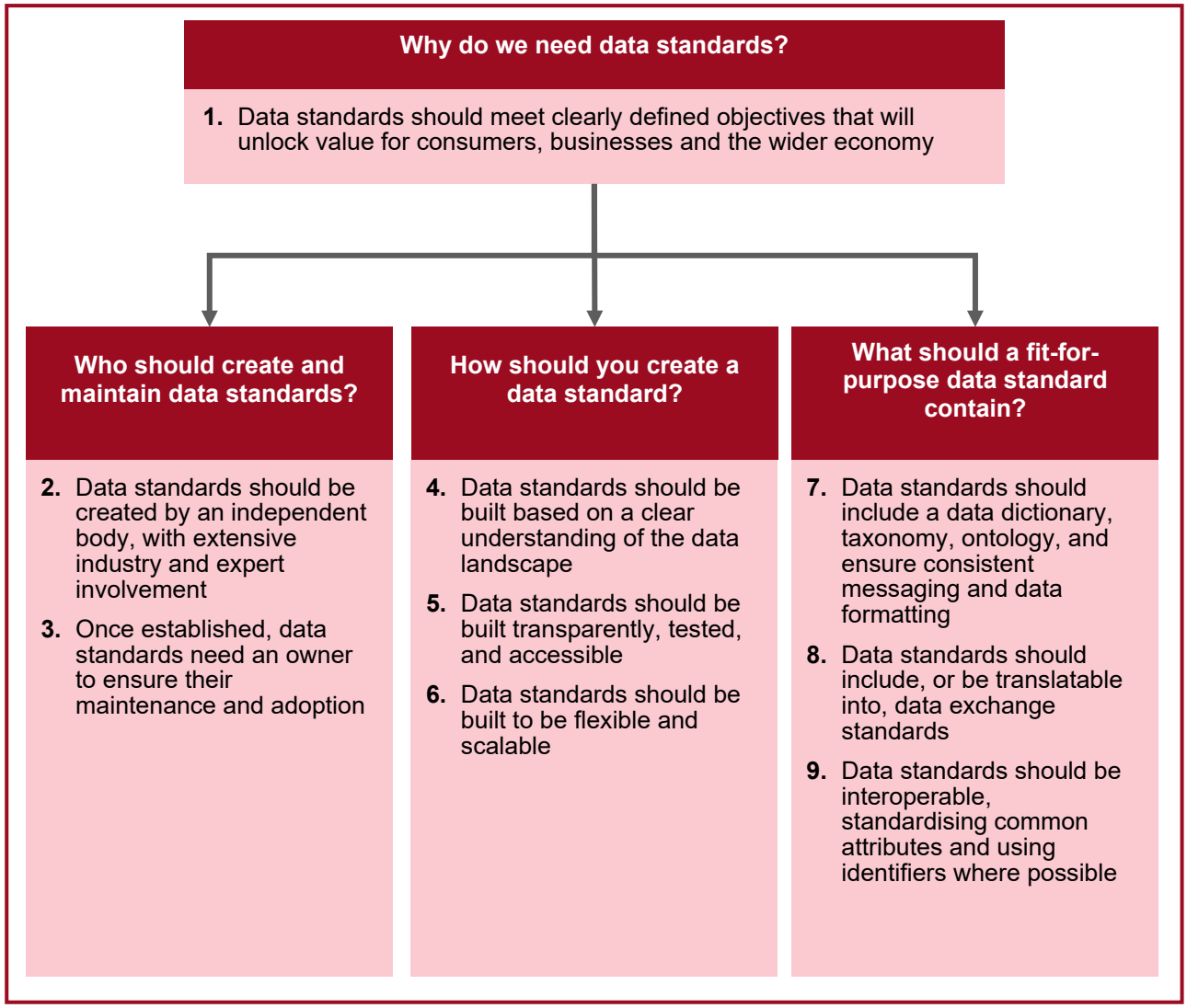
[1] API performance stats (Accessed December 2024) Open Banking
[2] Kickstarting Economic Growth (December 2024) GOV.UK
[3] Invest 2035: the UK's modern industrial strategy (November 2024) GOV.UK
[4] Creating a Smart Data Economy (2024), GOV.UK

While only one component of what is needed, data standards are important for ensuring that data can be seamlessly exchanged, understood, and used by the authorised third party. Our research has generated a set of design principles for new Smart Data data standards, that aim to help ensure that new data standards are relevant, interoperable,[5] and able to meet their stated purpose.

These design principles detail why data standard should be created, who should be involved in creating and maintaining them, how they should be created, and what a fit-for-purpose standard should contain. They are as follows:



The data standards within the research's priority sectors meet these design principles to differing extents, and achieving sector-wide adoption of these data standards is often restricted by a lack of the other enablers of Smart Data. The current state of each sector is as follows:

Within **finance**, organisations' readiness for Smart Data schemes varies and partially depends on familiarity with Open Banking. Organisations involved in Open Banking, who adhere to its common

[5] Interoperability can be defined as 'the ability of two or more systems to exchange information and to use the information that has been exchanged' (Institute of Electrical and Electronics Engineers)

standards, are most prepared, while levels of digitisation and familiarity with data sharing for finance firms outside of Open Banking varies considerably.

Within **energy**, customer data sharing between market participants is essential to the operation of the retail energy market and is supported by various existing standards. This lays strong foundations with some Smart Data style sharing already taking place, but enabling Smart Data schemes will require the creation of additional data sharing standards and governance arrangements – although work is underway to improve enablers of data sharing (i.e. consent) and create new standards.

Within **property**, data is shared and used across all parts of the sector, with certain areas underpinned by well-established data standards. However, on the customer facing side, in the residential and commercial property markets, digitisation and data standardisation is low – acting as a contributing factor to high transaction fall-through rates,[6] and stress for property buyers and sellers. Data standards have been developed that could support on these problems, but adoption is hampered by a lack of digitisation among sector participants.

Within **retail**, digitisation is widespread for online retailers, and international standards that support product identification and the sharing of product information have been widely adopted. While new standards would be needed, the main barrier to Smart Data is the reluctance of data holders to share customer data, due to its business value, and lack of current incentives to share it.

Overall, this research has shown that while data standards do exist to support Smart Data, there is a general perception that much work is still needed by government and industry on data standards and other enablers to unlock the value of Smart Data. Digitisation remains a significant barrier, and industry must have the incentive to invest in digital and data transformation. There is also a need to promote cross-sector interoperability, e.g. by ensuring standard approaches to common data attributes, and interoperable approaches to data sharing standards and principles.

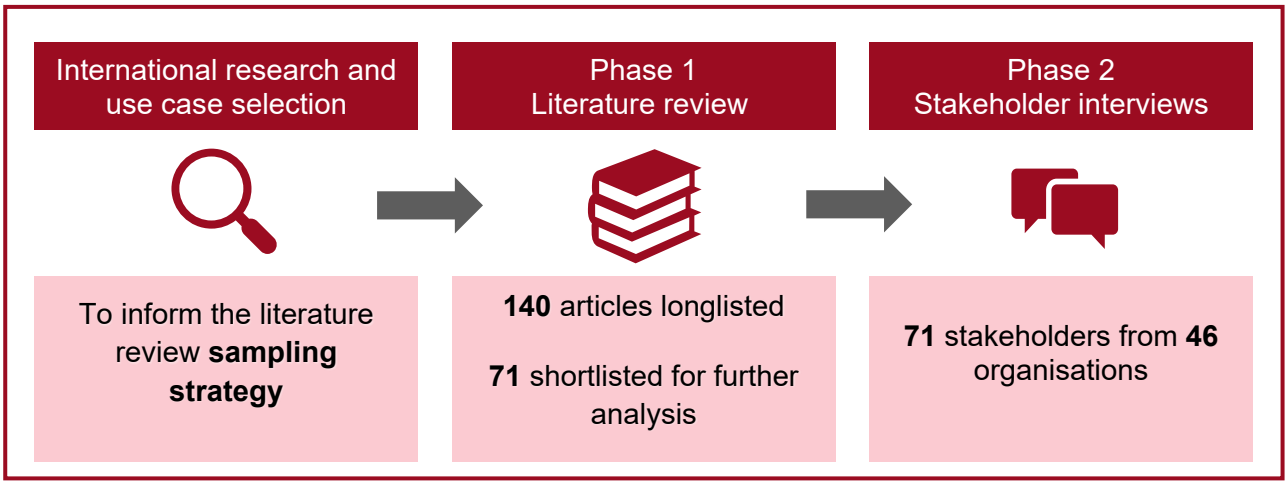
Despite these challenges, respondents were optimistic about the potential for Smart Data to support innovation and drive growth.

1.3 Methodology

This research and analysis was conducted by The Public Service Consultants (The PSC), a consultancy specialising in digital and data in the public sector, between August 2024 and January 2025.

The report is based on two phases of work. The first of these was a literature review into existing data standards in the UK and internationally, which informed the subsequent qualitative research phase of work.

[6] The UK property sector had an average transaction fall-through rate of 24% in the first 6 months of 2024: Fall Through and Time to Exchange by Month (Accessed January 2025) The Home Buying and Selling Council



Literature Review

To identify relevant literature, we first collated country profiles to understand appropriate key words across both UK and international literature. We also agreed priority use cases with the DBT team to determine the sectors that this literature review focuses on. Together, these informed a sampling strategy that used agreed databases and search engines with a list of key words derived from preliminary research into Smart Data schemes both within the UK and internationally. Using this sampling strategy, we identified a longlist of 140 articles and shortlisted 71 for further analysis. These spanned all four priority sectors in the UK. We shared the findings from this analysis with the Department for Business and Trade and wider government stakeholders for feedback and further refinement.

The literature also highlighted 'knowledge gaps' about the effective design of data standards, which gave us priority questions to answer in our qualitative research.

Qualitative Research

We then commenced qualitative research with stakeholders from across our priority sectors, exploring perceptions of the current state of data standards, how they might evolve, and the main challenges to enabling successful Smart Data in different sectors.

The findings from the literature review were tested with our qualitative research participants. In most cases, stakeholders agreed with the literature review findings, referenced in the footnotes in this report.

In certain cases, stakeholders provided insights which had not been identified in or were complementary to the literature review. Where these points were uncontroversial among research participants, they are included in this report without direct reference. In cases where stakeholders provided important insights that could not be validated either in the literature or through other interviews, these insights are included but referenced in the footnotes as resulting from the qualitative research.

Finally, in cases where stakeholders or the literature disagreed, this report presents both sides of the argument and leaves it to the reader to decide.

In total, we completed interviews with **71 stakeholders** across **46 organisations** (see **Appendix 4: Participating organisations**). These stakeholders cover all the sectors selected for this research, and include a mix of data holders, authorised third parties, government departments, and sector experts. The views of each of these groups are referred to frequently in the report and correspond to the following colour coding as below:

Data-holders/processors Organisations who hold customer data (e.g. a bank) or who process it on behalf of the customer (e.g. payment card service provider)	**Authorised Third Party** Organisations who receive customer data from a data holder as part of Smart Data and provide a service to the customer through access to their data
Government and Regulators Government departments and agencies who will support the development of Smart Data schemes	**Other experts** Sector and cross-sector experts, on data standards or otherwise, interviewed as part of this research

2. Introduction

2.1 Introduction to this report

This report seeks to support government departments, regulators, and other interested parties to have a clear understanding of data standards already in place that could support new Smart Data schemes, and a shared set of design principles to inform the development of new data standards where needed.

In section 3, **Enabling Smart Data** we present a whole economy perspective to Smart Data, the required elements to design and implement a new Smart Data scheme, and the role of data standards within this. We include a set of design principles to inform the development of new data standards for Smart Data schemes, supplemented by the examples provided within **Appendix 5: Required elements of a data standard**.

The following sections **Expanding Smart Data in the finance sector**, **Expanding Smart Data in the energy sector**, **Expanding Smart Data in the property sector** and **Expanding Smart Data in the retail sector** describe in detail the current state of data standards and data sharing in each priority sector and the additional work necessary for each sector to successfully implement data standards that can support Smart Data. Where relevant, the report considers how the current state aligns with the necessary enablers of Smart Data and design principles for data standards, supporting the reader to retain a whole economy perspective even when considering individual sectors.

Appendix 2: Use Cases puts the above into practice, by analysing to what extent each sector's current state can support specific Smart Data use cases, and what additional work is needed. This is supported by a list of standards identified in **Appendix 3: Standards referenced**.

A list of organisations that contributed to this research can be found within **Appendix 4: Participating organisations**.

2.2 Background and policy context

Policy context

The UK's first precursor to a Smart Data scheme was established in 2017, when the Competition and Markets Authority mandated the nine largest payment service providers to participate in the retail banking order. This built upon the EU's Second Payment Services Directive (PSD2) and created a secure system for sharing customer data – with consent – with third-party financial service providers. This became the foundation for Open Banking, an ecosystem valued at £4.1bn,[7] and which by 2024 is regularly used by over 15 million consumers and businesses.[8] Many countries have followed the UK's example and achieved similar benefits in both customer experience, and growth and innovation in the economy (see **Appendix 1: International approaches to Smart Data**). Work is ongoing to expand the impact of Open Banking to new customers and new products, particularly regarding increasing its benefits for small businesses.[9]

[7] Call for Evidence: Data Protection and Digital Information (No.2 Bill (Part 3) (2023)
[8] API performance stats (Accessed November 2025) Open Banking
[9] CFIT-SME-Finance-Taskforce-Smart-Data-Unlock-SME-Lending-Aug-2024.pdf (August 2024) Centre for Finance, Innovation, and Technology

The UK government wishes to support the growth and acceleration of new Smart Data schemes. The Labour manifesto committed to supporting Open Banking and Open Finance[10] and the Data (Use and Access) Act contains powers to create schemes in any sector. The Act sets out a legal framework which will ensure that data sharing is underpinned by robust data standards and privacy protections.[11]

Smart data as a driver for the wider data economy

Data has the potential to support economic growth: it improves efficiency, makes new products and services possible, and in turn can lead to new businesses and job creation. The 'data economy' in the UK is already large, with the OECD estimating that it drives investments contributing between 3% and 6.7% of the UK's Gross Value Added (GVA).[12]

Customers sharing their own data - so long as it is shared safely and with consent - can take our data economy one step further. Smart Data schemes could increase UK GDP through greater productivity and competition benefits enabled by personal data mobility. This potential has been demonstrated in Open Banking, where 82 firms alone have raised over £2bn of private funding since the introduction of Open Banking regulations in 2018.[13]

The UK is already a global leader in Open Banking, which allows the safe sharing of payment account data to benefit over 15 million consumers and businesses, who can use innovative products and services to manage their money and make payments.[14] The government wishes to replicate this success beyond retail banking, by increasing the use of Smart Data within new sectors and across sectors. This will unlock new use cases and enable innovation to enhance customer choice and drive growth.

Understanding data standards

Data standards are a set of rules by which data are described, recorded and shared to ensure common understanding among data users and to maintain data quality.[15] They make it easier to create, share and release data by establishing a common understanding of what the data means, how it is represented and what state and quality it should take.[16] Data standards often fall into one of two categories:

- Standards governing how data is **described and recorded:** the definitions of the data, the hierarchy and relationships between different data items, and how the data is structured, formatted, and stored.
- Standards governing how data is **shared**: i.e. the file schema, API (Application Programming Interface) specifications, and the rules around sharing – such as how security and authentication requirements are met.

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[10] Change Labour Party Manifesto 2024
[11] Data (Use and Access) Bill [HL] - Parliamentary Bills - UK Parliament (2024) UK Parliament
[12] What is the role of data in jobs in the United Kingdom, Canada, and the United States?: A natural language processing approach (2023), Schmidt, J., G. Pilgrim and A. Mourougane, *OECD Statistics Working Papers*, No. 2023/05, OECD Publishing, Paris
[13] The £4bn Open Banking Ecosystem (2023), Startup Coalition,
[14] Recommendations for the next phase of open banking in the UK (2023), JROC
[15] Data Standards Policy - Office for National Statistics (Accessed November 2024), Office for National Statistics
[16] The Open Banking Standard (2017), Open Banking Working Group, HM Treasury

Currently, data sharing for Smart Data is generally enabled through APIs. An API is a set of rules or protocols that enables software applications to communicate with each other to exchange data, features and functionality.[17]

APIs can be either closed, meaning that the design specifications are unique to the data holder and only accessible to authorised parties, or based on open standards. In the case of Smart Data, open APIs enable ATPs to develop digital systems around a standard that is interoperable with multiple platforms, helping to manage costs and increase their viability and attractiveness to users.[18] The development of open APIs is likely to be critical to realising the success of Smart Data use cases; August 2024 saw 51 million successful API calls made by ATPs using the UK's Open Banking APIs.[19]

[17] What Is an API (Application Programming Interface)? | IBM (Accessed November 2024), IBM
[18] Data portability, interoperability and digital platform competition (2021), OECD
[19] Open Banking API Performance stats (2024), Open Banking

3. Enabling Smart Data

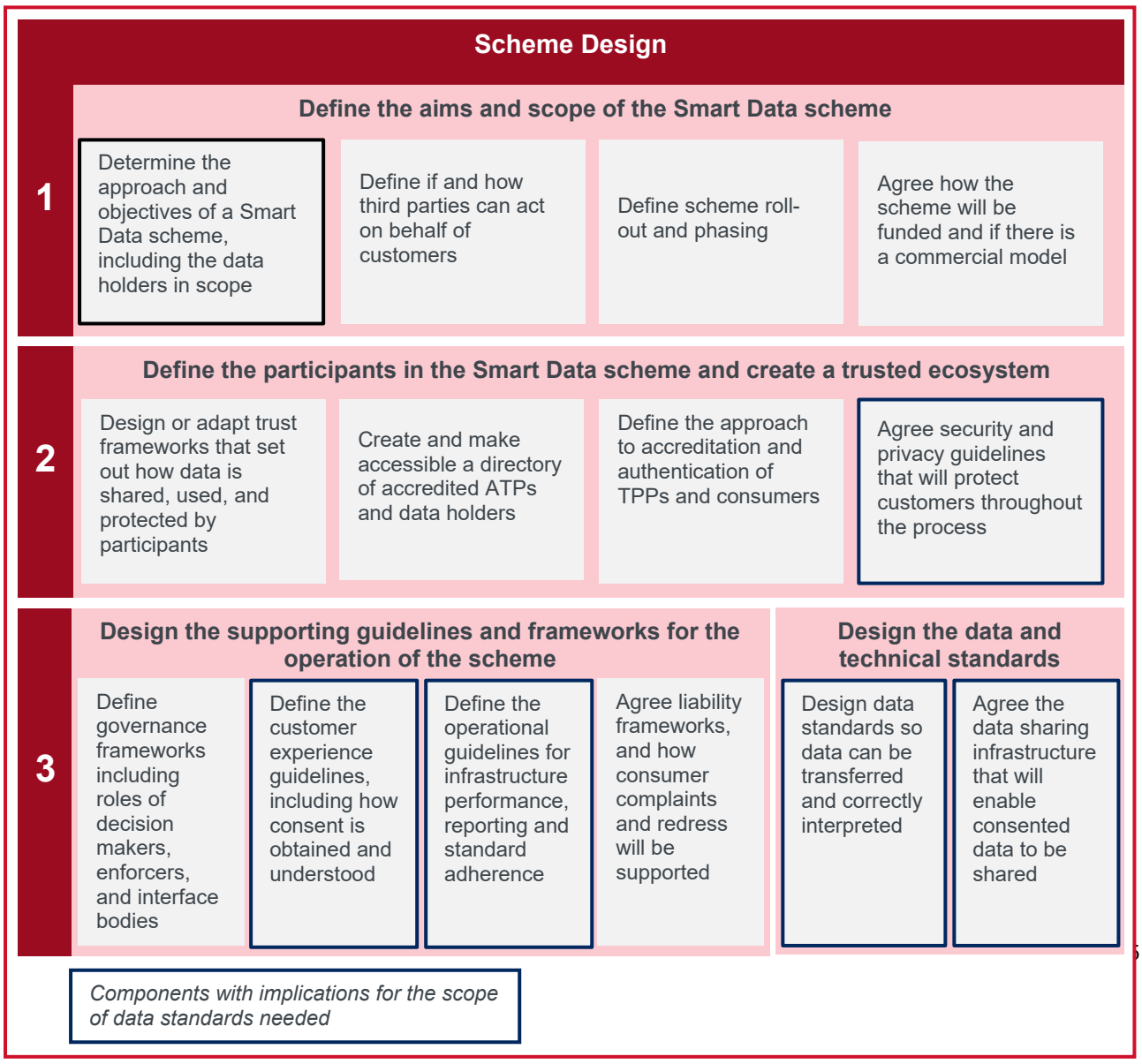
3.1 Creating a Smart Data economy

Establishing Smart Data as a thriving part of the UK economy is dependent on more than data standards. Approaches to consent, governance, accreditation, liability, commercialisation and beyond must be agreed and implemented between participants, and these approaches should complement each other and be interoperable across sectors – if sector-specific approaches are taken. Successfully implementing these enablers is critical to ensuring business and public trust in Smart Data and ensuring data can flow freely and be used for its intended purposes.

Enablers of a Smart Data economy and Smart Data schemes

The creation of formalised 'schemes' is likely to be essential to the success of Smart Data. Schemes define the rules for participation and data sharing and ensure that all participants are actively contributing to a high performing Smart Data ecosystem. A successful scheme is dependent on more than data standards alone. To create a successful Smart Data scheme, all the enablers referred to above are required. They can be grouped under three objectives:

1. Define the aims and scope of the Smart Data scheme.
2. Define the participants in the Smart Data scheme and create a trusted ecosystem.
3. Design the supporting guidelines and frameworks, as well as the data and technical standards.



When creating a new Smart Data scheme, those designing the scheme are likely to need to agree on other enablers - especially those in layers 1 and 2 - before industry can be expected to begin adopting and using data standards. For instance, the design of data standards is influenced by the objectives and approach of the Smart Data scheme, as this will determine what data is in scope, who holds that data, and how much work is needed for that data to be shared.

Work has taken place to understand the best approach to developing these enablers, such as the Department for Business, Energy and Industrial Strategy's (BEIS)[20] previous work on accreditation and customer experience guidelines,[21] and on consent, liability and authentication.[22] At the time of this report's publication, DBT is undertaking research into governance and cross-sector oversight.

Developing a cross-sector Smart Data approach

Currently, the only existing 'formal' Smart Data ecosystem is Open Banking, which is contained to a single sector. There are no requirements for it to support cross-sector or cross-scheme Smart Data interoperability. However, if Smart Data attains broader adoption across the UK economy, and is underpinned by cross-sector use cases, it will be critical that work on Smart Data enablers is done from a cross-sector perspective.

There exists a real risk that the development of disparate Smart Data schemes across various sectors will cause fragmentation, where the various governance, consent, accreditation, and data standardisation approaches do not complement each other and create pain points when sharing data between schemes and sectors – or at worst, a complete lack of interoperability. As far as possible, Smart Data enablers should complement each other and be interoperable.

For instance, accreditation of businesses in a Smart Data ecosystem is an essential way of ensuring and maintaining trust in data sharing. In a Smart Data economy where ATPs and data holders are sharing data across multiple sectors at any one time, it is preferable that a consistent approach, if not a unified approach, to accreditation is taken (i.e., a single cross-sector directory of accredited parties).[23] This ensures that participants can easily participate in multiple sectors at once and that other participants can easily check that they are allowed to do so.

Approaching Smart Data enablers from a cross-sector perspective is crucial to the development of a thriving Smart Data economy and helps identify where potentially bespoke approaches are required.

3.2 Design principles for data standards

Data standards for new Smart Data schemes must be fit for purpose. If data standards are poorly created and maintained, the UK risks difficulties in launching and operating successful Smart Data schemes. Data standards that do not properly reflect the existing data landscape may struggle to gain adoption, may create further issues upon implementation, and will make the transfer of data more burdensome for data holders and third parties.[24] These risks can be minimised if standard setters operate according to a set of common design principles.

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[20] Existed until 2023 when it was split to form the Department for Business and Trade and the Department for Energy Security and Net Zero

[21] Smart Data Research: Third Party Accreditation (2021) Department for Business, Enterprise, and Industrial Strategy

[22] Smart Data: research on consent, liability and authentication (2020) Department for Business, Enterprise, and Industrial Strategy

[23] Smart Data Research: Third Party Accreditation (2021) Department for Business, Enterprise, and Industrial Strategy

[24] Data Standardization (2019) Michal Hal and Daniel Rubinfeld

Why do we need data standards?

Design principle 1: Data standards should meet clearly defined objectives that will unlock value for consumers, businesses and the wider economy

Common data standards should serve a purpose and solve a problem.[25] For Smart Data, this means enabling effective data sharing between data holders and authorised third parties. However, if the objectives of the data sharing itself are not clearly defined, implementing a common data standard among sector participants risks creating unnecessary data transformation burdens.[26] This transformation burden is driven, in part, by the number of data elements within a data standard, which can increase its complexity and reduce the ease of its implementation. Any data transformation should therefore add value, either to consumers, businesses or the wider economy, to justify the costs.

New data standards should therefore only be created if stakeholders are clear on what they want to achieve through a Smart Data scheme/ecosystem, including the expected benefits to customers and the economy, the data holders and third parties in scope, and what the outcomes of implementing the scheme will be. This in turn will inform the selection of data elements that form part of a new standard, prioritising those which are necessary to achieve the scheme's aims.

> *"To make this practical going forward you will start with, what is the total universe of data we could expose? Then you need to have that kind of triage process where you identify which bits are worth doing"*
> ***Data holder***

Who should be involved in creating and maintaining data standards?

Design principle 2: Data standards should be created by a responsible body, with extensive industry and expert involvement

Creating a common data standard for industry is a complex process, requiring extensive cross-industry coordination and expert involvement. Successfully delivering in this environment is best done by a responsible body, whether this is an existing standards body or a newly created implementation entity, that can be responsible for convening industry, developing the standards, and resolving any stakeholder disputes that arise as part of the process.

> *"It would certainly need a body to do it [create a standard] consistently and then get agreement across industry"*
> ***Data holder***

Having a responsible independent body democratises standard development, through creating a forum where relevant parties can be involved whilst also being able to balance and resolve the different motivations of parties. Interviewees were in unanimous agreement that common standards could not be created without industry involvement, particularly given that the successful adoption of a standard will be best achieved if there has been industry buy-in and the standard aligns closely to existing practices.

[25] Getting started | Open Standards for Data Guidebook (Accessed November 2024) The ODI
[26] Exploring the development and impact of open standards for data report (2018) The ODI

"I think our position is that industry should develop standards which are fit for purpose for industry"
Government department

Within the standard setting body, the roles and responsibilities of participants should be clearly laid out, to drive the development of the standard and ensure collaboration between multiple parties can be most effective. The Open Data Institute have identified several of the different roles that are critical to the successful development of a standard:[27]

- **Chair:** Leads the body, manages change, and establishes consensus between parties
- **Authors and editors:** Write the specifications for the standard and gather feedback from the community during drafting stages
- **Testers and implementers:** Test the standard to ensure the standard can be implemented successfully and can be interoperable
- **Reviewers and contributors:** Submit input on the requirements of the standard and contribute editorial comments to a draft standard

For Smart Data, these roles should be populated by independent standards experts and relevant industry representatives.

Design principle 3: Once established, data standards need an owner to ensure their maintenance and adoption

Smart Data schemes and the data that underpins them are dynamic and subject to change, as the requirements and expectations of participants adapt. Data standards will require continual management and iteration to stay relevant in a dynamic environment, and to remain interoperable with standards being developed across the sector and beyond. Ensuring standards are agile and relevant will require clear governance and ownership by a body responsible for their maintenance.[28] This could either be the same body responsible for the initial development or a different organisation.

"Those types of organisations [standards bodies] can be quite critical to ensuring that a standard has a home, that it has proper organisational support. People looking after it and that remain sort of independent of the various industry and government forces that would kind of influence and impact on it"
Expert

How should you create a data standard?

Design principle 4: Data standards should be built based on a clear understanding of the data landscape

Data standards should be applicable to the existing data landscape, and sufficiently adaptable to stay applicable as the data landscape develops. This requires a clear understanding of the existing standards in use, and the data holders and users who would be impacted by the implementation of

[27] Developing standards: scoping and starting | Open Standards for Data Guidebook (Accessed November 2024) The ODI
[28] Response to Formal Consultation on the Form of Long Term Development Statement (2024), Ofgem

new standards. It also requires understanding what data is already being collected and made available in the sector, what data is currently siloed, and the data quality. This report aims to ensure that standard setters and policy makers have an improved understanding of existing standards within key sectors of interest.

Data standards for Smart Data should therefore, as far as possible and relevant, build upon existing standards.[29] Those designing new standards should also have a clear understanding of the existing data holders and how they currently manage their data. This helps ensure new standards are relevant, supports the early identification of potential complications, and ensures that the relevant data holders are brought along the standard development journey.[30] Together, this reduces the burden of implementation by industry and supports an agile and iterative approach that can react to changes in a Smart Data scheme.

> *"We were using ISO standards, so we weren't using any new or different standards"*
> ***Data holder***

Design principle 5: Data standards should be built transparently, tested, and accessible

To ensure trust in a standard and to encourage adoption, the data standard development process should be transparent and accessible to relevant stakeholders.[31] At the point of initial development, industry should be aware of the proposed approach and where they will be able to input on development. Subsequently, the proposed data standard should be tested in collaboration with data holders and users on real data, to ensure the data can be adapted to the standard successfully and that the standard will be fit for purpose in a broader roll-out.[32] Finally, once the standard has been developed, it should be published on an open and accessible platform, with the relevant supporting documentation and change logs.

Design principle 6: Data standards should be built to be flexible and scalable

If Smart Data schemes are to be dynamic, i.e., accommodate the development of new use cases, the inclusion of new organisations, and with the ability to include additional datasets with time, stakeholders made it clear that the underpinning data standards should be flexible and scalable. Standards should be able to include new data fields and types as required and – if necessary – to change existing ones. Non-flexible data standards restrict innovation and place unnecessary burdens on businesses.

> *"The temptation may be to go into having really locked down descriptions and definitions, but the more you do that, the more you're actually going to tighten it and make it harder for many people to achieve"*
> ***Authorised third party***

Flexibility and scalability can be ensured through building on existing standards, through establishing an empowered standard management body, ensuring the standard is not

[29] What is a standard? - Creating and maintaining data standards - Porism (Accessed November 2024) Porism
[30] Getting started | Open Standards for Data Guidebook (Accessed November 2024) The ODI
[31] "The Open Banking Standard" (2017), Open Banking Working Group, HM Treasury
[32] What is a standard? - Creating and maintaining data standards - Porism (Accessed November 2024) Porism

unnecessarily verbose or prescriptive, and by ensuring the standard can easily be adapted within the legal framework that mandates it.[33]

This means that if legislation is required for the standard, it should only be mandated through secondary legislation, or, if direct reference in legislation is not required, flexibility can be ensured through devolving responsibility for setting and enforcing standards to a nominated standard body.[34] Primary legislation should generally be avoided for mandating data standards for Smart Data, as the difficulties of adapting primary legislation makes data standards inflexible to change and at risk of becoming redundant over time.

The UK is increasingly looking to adopt a flexible approach, with HM Treasury's 2023 Call for Evidence on Payment Services Regulations pointing out that placing all requirements in primary legislation runs the risk of failing to keep pace with market changes.[35]

> *"As soon as you get into setting standards in legislation, it's just too inflexible for how standards develop"*
> ***Government department***

What should a fit-for-purpose standard contain?

Design principle 7: Data standards should include a data dictionary, taxonomy, ontology, and ensure consistent messaging and data formatting

Data consistency achieved through a standard is fundamental to Smart Data. In achieving consistency in data fields and how data messages are sent, the same types of data can be shared between data holders and ATPs in an understandable format, reducing the burden on the ATP if they are integrating the same type of dataset from different providers into their service.

A fit-for-purpose data standard that achieves consistency in an entire dataset (as opposed to a single field, like time) will be formed of several essential elements. This could include a data dictionary, a data taxonomy, a data ontology, rules on the data exchange format, and rules on how the data inputs should be formatted. Each of these elements is explained below:

Data ontology: A data ontology acts as a way of linking data within a data standard. It provides a 'semantic framework' that describes the relationships and logical rules between different data elements, concepts, and entities.[36]

Data taxonomy: A data taxonomy is a way of naming and classifying data to make them fit into category groups, which are placed into a structured hierarchy.[37] Data taxonomies are formed of multiple levels, with each level representing a specific category. At the top level, the categories will be broad and get progressively more granular in the lower levels of categorisation.

Data dictionary: A data dictionary is a centralised repository of information about data (including metadata) such as the definition of each data element, the name of each data element, its

[33] Developing standards: scoping and starting | Open Standards for Data Guidebook (Accessed November 2024) The ODI
[34] Exploring the development and impact of open standards for data report (2018) The ODI
[35] Payment Services Regulations: Review and Call for Evidence (2023) GOV.UK
[36] What is an Ontology? (Accessed November 2024) Oxford Semantic Technologies
[37] Data Standards Authority: operational model and processes - GOV.UK (Accessed November 2024) Data Standards Authority

relationship to other data, what type of data it is, the format that the data element should take, and how it should be used.[38]

Format of data inputs: As a sub-section of a data dictionary, the format of data inputs is governed by rules specifying how the data should be returned, to ensure consistency across organisations. These rules may specify whether the data should be returned as text, code or a number response, whether it should be within a specific string length, and whether it should adhere to any specific data field standards, such as ISO 8601 date and time format.[39]

Examples of these elements in practice are contained within **Appendix 5: Required elements of a data standard**. The sum of all these parts can form the data model, which is an abstract description of real-world concepts and objects, and the relationships between them.[40]

"You definitely need to have definitions of data in a consistent format"
Expert

Design principle 8: Data standards should include data exchange standards or be translatable into them – e.g. JSON and API specifications

A data standard for Smart Data can also specify standards for data exchange, such as whether data should be shared using JSON (JavaScript Object Notation) or other formats like XML (Extensible Markup Language), how files in that format should be structured, and what rules they should adhere to.[41] Currently, Open Banking and Pensions Dashboard Programme both use JSON formats as their chosen mechanism for exchange. It can also include standards around the mechanisms for data exchange, such as the API specifications and protocols.

If data exchange standards are not included within a data standard itself, then it is important that the data standard is easily translatable into mechanisms for data exchange – e.g. JSON and Open APIs. Some existing data standards that are particularly focused on describing and recording data are not easily translatable into all data exchange mechanisms, which could complicate their adoption for Smart Data.[42]

An example of where a relevant data standard exists but was not developed to be directly translatable into JSON and API based data sharing mechanisms is ISO 20022. The relevant messaging format for ISO 20022 is XML, as opposed to JSON, and there are currently no ISO-recognised example JSON schemas. Organisations who wish to share ISO 20022 standardised data in JSON format are required to convert XML messages to JSON, which can create errors and fragmentation between different ISO 20022 based JSON formats.[43]

Data standards for Smart Data should therefore consider sharing mechanisms within their design, and it should be possible to easily develop the files and specifications for data exchange based on these standards. For now, it is likely that JSON will be the format that supports Smart Data

[38] Data Dictionary | Data Management (Accessed November 2024) Harvard University
[39] ISO - ISO 8601 — Date and time format (Accessed November 2024) ISO
[40] An introduction to the NUAR Data Model (August 2024) The Geospatial Commission
[41] Standard Data Exchange formats — AIMMS Documentation (Accessed November 2024) AIMMS
[42] For instance, the HL7 V3 Healthcare Standard does not translate easily into JSON – which required the creation of a new standard, FHIR (Fast Healthcare Interoperability Resources): Our API technologies (Accessed January 2025) NHS England Digital
[43] UK national payment API framework standards and best practice | Insights | UK Finance (Accessed November 2024) UK Finance

schemes, as research has shown JSON is the better choice for transmitting data between web applications and servers – particularly in instances where data transmission speed is critical.[44]

Privacy-enhancing technologies and zero-knowledge proofs may also be important supporting features. Privacy-enhancing technologies can help minimise data use, maximise data security, and empower individuals, with zero-knowledge proofs being one of those technologies – allowing individuals to prove a fact (like their age) to a verifier without actually sharing the data itself.[45] Considering how these can support data exchange standards may be important in ensuring privacy and security when sharing data, and in building customer trust in Smart Data.

Design principle 9: Data standards should be built to be interoperable, standardising common attributes and using identifiers where possible

For the purposes of Smart Data, which will increasingly involve the combining of datasets from multiple sources to provide a single service, the standardisation of any single dataset is insufficient. Alongside this standardisation, interoperability must also be achieved between different datasets, even if from different sectors.

Interoperability of unrelated datasets can be achieved through a variety of means. The first of these is for datasets to be underpinned by the same data model, which ensures interoperability between different data messages through adherence to the same data dictionary, taxonomy, and formatting rules. This is the case with ISO 20022, which underpins a wide variety of data messages, all containing different types of data, but all collectively understandable due to conformance with the ISO 20022 Data Dictionary.[46]

However, having data from across sectors all adhere to the same data model is unrealistic. As such, interoperability can be ensured through other means. Principally, this could be achieved through ensuring that the format and definitions of data are consistent across common attributes of unrelated datasets which may be used collectively for the purpose of delivering a Smart Data use case. Common attributes refers to customer information which is likely to appear across nearly all Smart Data datasets, such as personal and company names, address, date of birth, gender, date account opened etc – but that is often represented differently across different datasets and in need of standardisation.[47]

> *"Name, address, date of birth, all those things are going to be common. Regardless of what industry you're in, they should always look the same and be standardised so that there is a common understanding"*
> ***Expert***

Generally, different customer datasets across different sectors will have few common features between them, but the standardisation of common attributes will enable different datasets to be more easily linked to a customer and compared. One important way in which these common attributes could be standardised is using unique identifiers. These unique identifiers, such as Unique Property Reference Numbers (UPRNs), Meter Point Administration Numbers (MPANs),

[44] What is JSON? (Accessed January 2025) Oracle; Comparison of JSON and XML Data Interchange Formats (2009) Montana State University
[45] Privacy-enhancing technologies (September 2022) Information Commissioner's Office
[46] ISO 20022 Payments Interoperability Charter (January 2024) Swift
[47] Representing Peoples Names in Dublin Core (1998) Dublin Core Metadata Initiative

and Legal Entity Identifiers (LEIs), apply a consistent and universal format to locations, businesses, and other real-world items.[48]

In using unique identifiers, datasets can be more easily linked and combined, as the common attributes across them are referred to in a consistent manner – supporting interoperability. This enables shared data to be used to its full potential. If two datasets refer to the same identifier differently (e.g. address) it may not be evident that the two datasets are in fact related to one another in some capacity.[49] To illustrate this, if you had seven datasets and wished to link each to the other – this would create twenty-eight sets of links. If there was a common identifier across all the datasets, this is reduced to seven sets of links.[50] Unique identifiers are therefore crucial in unlocking the benefits of Smart Data – particularly for cross-sector use cases.

Finally, for other data elements which are not directly related to the customer, but will appear in many data messages, such as date and time and country code – standards should build on existing standards for these fields, such as ISO standards, to ensure they are referred to in a consistent manner.

> *"You almost don't need common data standards if you can match the identifying points and link this dataset with that dataset"*
> ***Regulator***

Adopting all the principles listed above when creating and maintaining new data standards will support data standards to be most effective. The principles should also be applied jointly, as they do not act in isolation and are in many cases interrelated to each other.

For instance, the responsible body creating a data standard may also be the subsequent owner of the standard once published. Similarly, the need for standards to be accessible once finished is conditional on the existence of a standard owner who can publish and maintain them. A final example is that the need for data standards to be interoperable is dependent on having a clear understanding of the existing data landscape, including other existing standards.

[48] Creating Value with Identifiers in an Open Data World (May 2016) Thomson Reuters, The ODI
[49] Creating Value with Identifiers in an Open Data World (May 2016) Thomson Reuters, The ODI
[50] Persistent and well-behaved identifiers (September 2018) GeoPlace

4. Expanding Smart Data in the finance sector

4.1 Introduction

In 2022, the UK financial system had assets of around £27 trillion. Of this, around half was held by banks, £1 trillion was held by the Bank of England, and the rest was held by insurance companies, pension funds and other financial institutions (such as investment funds).[51] Open Banking is part of this strength and has achieved notable success since its initial roll-out. The approach has been mirrored, and further developed, by many jurisdictions around the world. This success means that organisations, both government and private sector, are considering how the use of Smart Data in the finance sector could be expanded beyond the current remit of Open Banking, and for what purpose.

Open Finance is the commonly used term to reflect these ambitions to use Smart Data more broadly in the finance sector. Whilst Open Banking covers the sharing of payment account data only, Open Finance aims to enable data sharing for a much broader range of financial services. This could include investments, savings, pensions, debt, credit, mortgages, loans and insurance. The expectation of government is that an expansion of secure data sharing to a broader range of financial products could drive growth, empower customers, and improve competition between firms in the financial sector.

This section identifies existing data standards in the finance sector, including work done for Open Banking and the Pensions Dashboards Programme (PDP), and examines how these, and the corresponding digital infrastructure, could be used to support the development of Open Finance. As the finance sector is unique in its creation of data standards and other enablers to specifically support Smart Data, this section discusses the potential opportunities this presents – particularly considering how the ease of making data accessible, should be considered against the value it will generate.

4.2 Existing data sharing and digitisation within the finance sector

Open Banking is a great data sharing success story. Not only has it resulted in considerable benefits for customers, but it has also made the banking ecosystem familiar with the principles of data sharing and common data standards. This data sharing is enabled through adherence to the Open Banking Standard, which provides the data standards and data sharing standards for a successful Smart Data ecosystem.

Some organisations have gone further than Open Banking for data sharing, using the principles and the standards established to share additional financial data. For instance, while savings data is not shared as part of Open Banking, some banks have independently used the standards to share data from easy access savings accounts with third parties.[52] Another example is customers who can see their mortgages in the Monzo app, as Monzo has established a data sharing agreement with TransUnion.[53]

However, these are isolated examples, and, outside of the requirements of Open Banking, the financial data of customers is usually tightly controlled by data holders, resulting in minimal cross-party data sharing. These businesses have no requirement or need to share customer data and

[51] UK Parliament Commons Library (Accessed November 2024)
[52] The PSC Qualitative Research (October 2024)
[53] Monzo Mortgages (Accessed November 2024), Monzo

may not be in a technical position to be able to do so. Extensive efforts from across the sector will be required to improve this situation and will involve a variety of organisations, listed below:

Government and regulators:

HM Treasury (HMT) is involved in setting the supporting secondary legislation for Open Banking and will be responsible for considering how to support Open Finance.

The Financial Conduct Authority has previously run calls for input on expansion to Open Finance. This includes calls for input on the required regulatory framework, the most appropriate sequencing of expansion, and approaches to developing standards.[54] The FCA are also leading on the expansion of variable recurring payments (VRP), and the development of proposals for the design of a future open banking entity.[55]

The Bank of England is also involved in data sharing and standardisation, although not in relation to Smart Data. It runs, alongside the FCA, the 'Transforming Data Collection' programme, which seeks to define and adopt common data standards for regulatory reporting. The Bank of England expects that requiring standards at the point of reporting will encourage the internal adoption of standards and support data sharing between firms.[56]

The Money and Pensions Service are currently working to establish the central digital architecture for pensions dashboards, and the accompanying governance, through the Pensions Dashboards Programme (PDP). Pensions dashboards will allow consumers to see all their pensions in a single place, and the creation of pensions dashboards will be supported by the central digital architecture, API specifications, data standards, and governance framework established by the Money and Pensions Service.[57] Pensions that are included within the scope of the PDP are personal pensions, occupational pensions, and State Pensions.

Industry bodies:

There are several industry bodies currently supporting Open Banking and looking to support Open Finance. Examples of these include the Centre for Finance, Innovation, and Technology (CFIT) who have developed an Open Finance roadmap and explored potential use cases that could be developed as part of Open Finance.[58] The Investments and Savings Alliance (TISA) have previously developed common standards and APIs for investments and pensions as part of their Open Savings, Investments and Pensions (OSIP) Programme.[59]

Open Banking Ltd

Open Banking is currently operated by Open Banking Ltd, who is responsible for its delivery, including the data standards, API specifications, and customer and operational guidelines. It continues to run the ecosystem, maintaining responsibility for the development of standards as well as ensuring Account Servicing Payment Service Providers (ASPSPs) are meeting API performance requirements. It is also responsible for the Open Banking Directory, which contains information on the identity and authorisation attributes of all accredited participants within Open Banking.[60] The directory is essential for creating trust between ecosystem participants and clarity

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[54] Call for Input: Open Finance (2019), FCA
[55] Recommendations for the next phase of open banking in the UK (2023), FCA
[56] Transforming data collection from the UK financial sector (2020), Bank of England
[57] Homepage | UK Pensions Dashboards Programme (Accessed November 2024)
[58] Embracing the UK's Open Finance Opportunity (2024), CFIT
[59] OSIP (Accessed September 2024), TISA
[60] Smart Data Research: Third Party Accreditation (2021) BEIS

on who can share and receive data. Open Banking Limited was set up following the 2016 CMA investigation into Retail Banking and is therefore only a temporary interface body – it will be replaced by a permanent future entity, using the powers created by the Data (Use and Access) Act.[61] The FCA will set out plans for the establishment of the future entity in due course.

Private sector companies:

The success of Open Finance will depend on the involvement and, to a certain degree, the support of private companies - both data holders and third-party providers. Data holders will be required to provide the data in a machine-readable format and according to a standard, and third parties will be seeking to develop innovative customers services based on this data.

The ability of data holders in the financial sector to do so is highly variable. In discussing the data maturity of firms, stakeholders referred to a spectrum of data readiness, in which banking adjacent products such as savings and mortgages had higher levels of data readiness for Smart Data than products with more complex data, like pensions and investments. This sliding scale is affected by the quality of a firm's data infrastructure and familiarity with data sharing through APIs.

"[Data] readiness is very much on a sliding scale, and I'd say there's a bell curve starting with credit and savings and mortgages at the top. Then further afield you get to pensions and insurance. I would say the pensions and investment side is still incredibility reluctant"
Expert

Data infrastructure:

Some organisations within the financial services sector operate on legacy systems and poor digital infrastructure, and some even experience low levels of digitisation, with research showing that that up to 60% of asset managers still use fax in some capacity.[62] Lower levels of digitisation is a difficulty particularly experienced among smaller firms.[63] Open Banking forced data holders to modernise their digital infrastructure for payment accounts, but research participants made clear that this has not necessarily caused broader improvements for other financial products and firms. Outside of the Open Banking architecture, respondents reported that some firms operate legacy architectures which are not interoperable with one another.

"The challenge that we've seen is that the Open Banking layer is not talking directly to the legacy layer"
Expert

Data holders expressed that this was due to the lack of any data sharing requirements, as operating a single standardised system was unnecessary and could clash with their business approaches. Additionally, research respondents expressed that most firms do not conform to any common standards for customer data when they are not required to share data, pointing out, for instance, that ISO 20022 has limited integration into existing data architectures of smaller financial institutions beyond the ISO 20022 'compliant' messages of Open Banking.[64]

[61] JROC Proposal for Future Entity (April 2024) Joint Regulatory Oversight Committee
[62] Global Automation Research 2023 (Accessed November 2024) Calastone
[63] Impact of Open Finance on mutuals (March 2024) Frontier Economics & Building Societies Association
[64] The PSC Qualitative Research (October 2024)

"Mortgages, for instance, we are still running three or four different mortgage systems in different books because it didn't actually make sense to pull them all together into one. Even within our own institution, it [data architecture] is not the same for some products"
Data holder

API Infrastructure:

Another important determiner of the readiness of financial firms for Smart Data is their familiarity with Open Banking. Data holders who are already required to share their data in a standardised format with third parties via an API will face fewer challenges than those who have never been required to build a technical infrastructure that is compatible with data sharing.

"We already know how the APIs work. We know how they function so in effect it's more of the same if we were to open other products we own. For an insurance company that has never built this kind of API before, it would be a shock"
Data holder

This familiarity will be important to enabling Open Finance, particularly when considering that other financial products outside the scope of Open Banking, such as credit, insurance, loans, savings, and investments, are provided in part by the major high street banks who led the creation of Open Banking. For example, the six major high street banks (also part of the CMA9) held 75.2% of market share for mortgages in 2023 – potentially simplifying the expansion of Smart Data to mortgages.[65]

However, for those financial products, such as investments and insurance, where the high street banks have a lower market share and where there are a greater number of independent players, there will be a higher level of unfamiliarity with the requirements for customer data sharing.[66] Independent firms in these sectors may face substantial challenges in building APIs if they have never had to do so before, and may incur substantial personnel and technical build costs to meet Smart Data requirements.

4.3 Existing data standards in the finance sector

Several data standards which can support Smart Data sharing already exist in the finance sector, and a number of these standards have already been integrated into existing Smart Data schemes and ecosystems. The Open Banking Standard is the core example of this; it builds upon existing data standards and technical standards, including ISO 20022, Legal Entity Identifiers, FAPI 2.0, and Open API specifications.

The Open Banking Standard

The Open Banking Standard governs how data sharing takes place in the Open Banking ecosystem. The Open Banking Standard brings together technical data sharing standards, formed of the API specifications, security profile and customer experience and operations guidelines, and data standards themselves, built upon ISO 20022 principles. Aspects of these standards are

[65] Largest Mortgage Lenders | UK Finance (Accessed November 2024), UK Finance
[66] The PSC Qualitative Research (October 2024)

expected to be used more broadly in enabling Smart Data, both in the finance sector and beyond. The technical data sharing standards are described below:

Open Banking API specifications

Open Banking is supported by industry-agreed Open API specifications that are key to ensuring third parties can access customer data with relative ease. The standard itself provides data holders and ATPs providers with detailed information on what the standardised elements of each specific type of API are (i.e. Payment Initiation APIs) – enabling Open Banking APIs to be built consistently by different organisations .[67] It is likely that elements of the existing API specifications will be used to create new APIs for data beyond payment account data, and that the information on these API specifications will be centralised and standardised as currently done for Open Banking.[68]

Financial Grade API (FAPI)

Another key data sharing enabler of the Open Banking Standard is the Financial Grade API (FAPI). This security profile ensures the security of APIs used in data exchanges and the security of the sensitive data exchanged.[69] FAPI is developed and managed by the OpenID Foundation, who are a non-profit open standards body who develop identity and security specifications.[70]

FAPI 1.0 has been adopted internationally, both for enabling Open Banking and Open Finance.[71] FAPI can be used to support any type of data exchange in the financial sector and can also be used to support data exchange in other sectors, such as insurance or health.

For instance, FAPI will be used as the security profile for Project Perseus, an energy and finance Smart Data use case described later in the report. OpenID are upgrading their standard from FAPI 1.0 to FAPI 2.0, and it is likely that both Open Banking and future Smart Data schemes will use FAPI 2.0.[72]

Customer experience and operational guidelines

The final key data sharing enablers that form part of the Open Banking Standard are customer experience and operational guidelines. Customer experience guidelines govern the customer journey, ensuring a seamless experience and that the customer is clear on the permissions they are providing.[73] The operational guidelines provide account and third-party providers with recommendations for demonstrating compliance with regulatory requirements.

Particularly important in the operational guidelines are the guidelines around the performance and availability of the APIs, which specify a recommended benchmark for API uptime (99.5%) and the time it should take for data exchange to occur after a request. Ensuring this benchmark is met is critical for ATPs to be able to deliver reliable services to customers.[74]

ISO 20022

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[67] Open Banking Read-Write API Profile - v4.0 (Accessed October 2024), Open Banking
[68] FS21/7: Open finance - feedback statement (2021) Financial Conduct Authority, The PSC Qualitative Research (October-November 2024),
[69] API security profiles add an additional security layer to standard authentication protocols (OAuth 2.0 & OpenID Connect), protecting APIs with access to sensitive data from a variety of possible attacks and risks: Final: Financial-grade API Security Profile 1.0 - Part 2: Advanced (2021) OpenID Foundation
[70] Foundation - OpenID Foundation (Accessed November 2024), OpenID Foundation
[71] Open Banking, Open Data, & Financial-grade APIs (2022), OpenID
[72] The PSC Qualitative Research (November 2024)
[73] Customer Experience Guidelines v4.0 (Accessed September 2024), Open Banking
[74] Operational Guidelines v4.0 (Accessed September 2024), Open Banking

ISO 20022 is an open international standard for financial industry messaging. It is managed by the International Organisation for Standardisation (ISO). ISO 20022 provides users with a development methodology and data dictionary from which they can design their own financial messages or use existing ISO 20022 message types. In ensuring that the message elements conform to the data dictionary, users of ISO 20022 can exchange data in a consistent message format and according to agreed terminology, ensuring common understanding and interoperability.[75] Such messages are considered ISO 20022 'compliant'.[76]

ISO 20022 messages are used across financial services, supporting various types of financial messaging, including bank to bank payments, securities, trade finance, and foreign exchange.[77] The Open Banking Standard developed its standard according to the ISO 20022 methodology, with general alignment except for bespoke data items. ISO 20022 has also been deemed a natural companion to Open Finance, as its methodology supports the creation of interoperable data messages that are also capable of meeting sector specific requirements for data sharing.[78] Its adoption is also increasing internationally and domestically: it underpins the Bank of England's Clearing House Automated Payment System (CHAPS) framework. and Real Time Gross Settlement System (RTGS),[79] and is referenced in the National Payments Vision as able to support interoperability between domestic and international systems.[80]

It is also possible to create ISO 20022 'compliant' messages in other sectors, with ISO 20022 potentially providing much of the fundamental framework for exchanging data and ensuring interoperability across sectors and financial services.[81]

"When you're entering a new domain, ISO 20022 is going to be a brilliant starting place. I can't stress enough that it's also a design methodology"
Expert

However, it is important to note that while ISO 20022 standardises message elements, it does not place stringent requirements on how the data in those message elements should be returned – this means that additional work would be required so that data within message elements is agreed and standardised. For example, the Bank for International Settlements has recommended that harmonised cross-border ISO 20022 messages will require agreement on a common time convention.[82]

To further illustrate this point, while ISO 20022 provides a 'Department' message element, defined as the 'identification of a division of a large organisation or building' it does not place any restrictions on how department data should be formatted and inputted, beyond stating it must appear as text and within a certain character limit.[83] In the context of developing an ISO 20022 based data standard for Smart Data, it would be necessary to get more granular in the definition

[75] ISO 20022 - Pay.UK (Accessed November 2024) Pay.UK
[76] Frequently asked questions | ISO20022, (Accessed November 2024), ISO
[77] Bank of England mandates LEI: CHAPS RTGS Payment Messages ISO 20022 (2024), LEI Worldwide
[78] ISO 20022 and Open Banking: Natural bedfellows (Accessed September 2024), XMLdation
[79] ISO 20022: Implementing the global payments messaging standard within CHAPS and RTGS (Accessed December 2024) Bank of England
[80] National Payments Vision (2024) HM Treasury
[81] The PSC Qualitative Research (November 2024)
[82] Harmonised ISO 20022 data requirements (October 2023) Bank for International Settlements
[83] ISO 20022 Message Definitions | ISO20022 (Accessed November 2024), ISO 20022

and allowed values for a message element like Department, to ensure consistency and interoperability across different messages and datasets.

As previously discussed, ISO 20022 is designed for use with XML as a format for exchange, which is distinct in rules and syntax from JSON file formats. As such, ISO do not publish any schema for JSON files based on ISO 20022 or provide rules dictating how XML ISO 20022 messages should be transferred into JSON.[84]

Research participants expressed that Smart Data schemes are likely to use JSON files sent via API as their method of data exchange, just as Open Banking does. This creates a risk of fragmentation if different schemes and APIs take different approaches when converting ISO 20022 XML messages to JSON to enable Smart Data exchange.

Research participants expressed that future Smart Data schemes in the finance sector are likely to develop their standards based upon ISO 20022 compliant messages, but with work required to determine what data is included in the messages, how that data should be formatted, and how to standardise and make compliant types of data not currently in the ISO 20022 data dictionary.

Legal Entity Identifier

The Legal Entity Identifier (LEI) is a globally recognised standard that provides a standardised legal entity identifier for any business entity involved in a financial transaction, formed as a 20-digit alphanumeric code. It was developed by the International Standard Organisation as part of their ISO 17442 standard,[85] and its implementation is now the responsibility of the Global Legal Entity Identifier Foundation (GLEIF).[86] It will also be mandated for use in May 2025 by the Bank of England for all parties to a financial transaction in the CHAPS framework.[87]

Businesses can obtain LEIs by applying to designated LEI issuers and submitting information on their business and their owners. Upon verification, businesses are issued with an LEI that requires yearly renewal.[88] The LEI can be used with the ISO 20022 standard, and forms part of both the ISO 20022 data dictionary and the Open Banking data dictionary. Usage of ISO 20022 and LEIs together have supported the financial sector to become more transparent and robust and supports the sharing of data within and across sectors and borders.[89]

LEIs are important as they provide businesses with assurance on the identity of organisations with whom they are conducting a financial transaction. For Smart Data, having a consistent identifier across datasets and data exchanges is key to ensuring interoperability between datasets, as it allows relevant datasets to be linked without issue. In future, when cross-sector use cases are enabled for Smart Data, it will be critical that ATPs are able to link datasets to a single business without complication, to provide their services effectively.

Corporate identifiers like LEI, which are not necessarily digitally enabled, can also be linked to digital identity, creating a digital corporate identity. For instance, the LEI has been built upon to create a Verifiable LEI (vLEI) which incorporates the identification attributes of the LEI and combines them with digital verification, creating an authentic digital identity for the company.[90]

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[84] UK national payment API framework standards and best practice | Insights | UK Finance (Accessed November 2024) UK Finance
[85] ISO 17442-1:2020 (Accessed November 2024), ISO
[86] This is GLEIF - GLEIF – GLEIF (Accessed November 2024), GLEIF
[87] RTGS Renewal Programme (Accessed December 2024) Bank of England
[88] Get an LEI: Find LEI Issuing Organizations - LEI – GLEIF (Accessed November 2024), GLEIF
[89] Future of Finance: Review on the outlook for the UK financial system (2019), Bank of England
[90] vLEI - Verifiable Legal Entity Identifier (Accessed January 2025) vLEI

Corporate digital identities are expected to drastically simplify customer identification and verification, and enable legal entities to be linked more easily to their relevant information and attributes.[91] This is also likely to support Smart Data – through simplifying the necessary authentication and consent process.

Pensions Dashboards Programme Data Standards

Data standards exist for pensions data that pensions providers and schemes are required by legislation to return to pensions dashboards, developed as part of the Pensions Dashboards Programme. This includes data on accrued pension, data on the pension scheme and administrator, and estimated retirement income (ERI) data. Much like the Open Banking Standard, these standards specify the format and structure of data that is returned to dashboards by pensions providers and schemes. The PDP also includes technical standards, which includes the OpenAPI and JSON schema specifications.

However, these standards are based on a single use case: providing a consumer with ready access to information on their pensions in one place. The Pensions Dashboards Programme operates based on a centralised architecture in which the Money and Pensions Service are responsible for gaining consent and authenticating users. This is distinct from the structure of Open Banking, which operates a decentralised model for consent, authentication and data sharing. This has led some industry experts to express concerns that Open Banking and the PDP are not interoperable, as users would have to go through two different types of consent and authentication journeys for use cases that combined banking and pensions data.[92]

At present, the scope of the PDP means that the Money and Pensions Service are not considering how their standards could be used for use cases beyond dashboards themselves.[93] However, due to the PDP standards, pensions providers are likely to improve their tech stacks, conform more of their data to one common standard, and gain familiarity with data sharing and APIs, putting them in a better position for future Smart Data use cases.[94]

Other initiatives

Outside of the data standards listed above, this research did not identify any other widely adopted common data standards that pertain to customer financial data. As there is no requirement for customer financial data to be shared outside of the Open Banking ecosystem, minimal data sharing does occur and common data standards for customer data are not necessary for businesses to develop and adopt.

However, work has and is taking place across the financial sector to create further common data standards. For instance, part of the remit of the Credit Reporting Governance body, which is a proposed industry body that would oversee arrangements around sharing credit information, is that it will establish the data standards and data sharing rules for sharing credit information.[95]

Another example of similar work is the Open Savings, Investments, and Pensions Programme, led by TISA, which succeeded in creating common standards and API specifications for some investments and pensions data.[96] The programme achieved this through extensive industry collaboration, with organisations coming together to compare and agree how they would

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[91] Corporate digital identity: no silver bullet, but a silver lining (2022) Bank for International Settlements
[92] Open Banking, Open Data, & Financial-grade APIs (2022), OpenID
[93] The PSC Qualitative Research (October 2024)
[94] The PSC Qualitative Research (October 2024)
[95] Report 1: What the credit reporting governance body should do (April 2024) Credit Information Market Interim Working Group
[96] Open Savings, Investments and Pensions Flyer 2023 (2023), TISA

standardise their data. Nonetheless, the standards did not receive industry adoption, due to the costs and perceived lack of benefit around data sharing.[97]

Alignment with design principles

Smart Data in the finance sector is likely to rely on the data sharing standards listed above, and the creation of new data standards through industry collaboration that are ISO 20022 compliant. The importance of ISO 20022 and LEIs for supporting Smart Data can be seen in the use case analysis contained in **Appendix 2: Use Cases** – particularly supporting Mealia, Digital Property Packs, Hexapower, and Ubiquitech.

These standards, and the broader Open Banking and PDP standards, also meet most of the design principles, placing them in a strong position to support Smart Data. For instance, they all meet clearly defined objectives (Principle 1) and are all maintained by independent bodies (Principles 2 & 3), such as the International Organisation for Standardisation. They are also built on a clear understanding of the data landscape (Principle 4), are flexible, with routine improvements and changes (Principle 6), and incorporate most of the elements of a fit-for-purpose standard (Principles 7 & 9).

However, some issues do exist in terms of accessibility and the use of data exchange standards. For instance, while unique identifiers like the LEI will be important for enabling Smart Data, the current approach of yearly renewal and associated cost creates a barrier to broader adoption for Smart Data purposes (Principle 5). Similarly, the lack of available JSON schema for ISO 20022 messages presents risks around creating fragmented data exchange standards (Principle 8).

As Open Finance has multiple standards that could be built upon, the question that remains is where the initial focus of Open Finance should be and how Open Finance can best leverage those existing standards.

4.4 Future adoption of Smart Data

Open Finance has the potential to cover many different types of data held by many different organisations. While existing data standards and technical standards will provide the foundations to support new data sharing, determining how best to build upon these data standards to enable Smart Data will first require the scope of data required for Open Finance to be clearly defined.

Defining the objectives of Open Finance data standards

As described in 3.2, **Design principles for data standards**, data standards should meet clearly defined objectives that will unlock value for consumers, businesses, and the wider economy. This will in turn define the scope of the data that new data standards need to cover.

Stakeholders expressed mixed opinions on exactly what objectives data standards should be developed to meet. Several stakeholders favoured a ‘use case led’ approach, where data is made available to meet the needs of specific use case(s). A use case led approach emphasises the importance of delivering priority use cases at lower cost – for example CFIT’s work on determining the feasibility of Smart Data increasing SME access to loans and finance.[98] Once rolled out, use cases could be iterated and developed with time to incorporate new forms of data.

Data holders often favoured a use case led approach due to the costs that were incurred due to Open Banking. For Open Banking, banks were required to make accessible a broad range of data, beyond just customer data.[99] These requirements caused them to spend substantial amounts of

[97] OSIP (Accessed September 2024), TISA, The PSC Qualitative Research (October 2024)
[98] CFIT-SME-Finance-Taskforce-Smart-Data-Unlock-SME-Lending-Aug-2024.pdf (August 2024) CFIT
[99] The Retail Banking Market Investigation Order 2017 (2017) Competition and Markets Authority

money on upgrading their infrastructure and making data accessible that was then little used. They also expressed that focusing on specific use cases would enable them to more quickly develop the required infrastructure to send high quality data to ATPs.

> *"That's why the use case view is important. Otherwise, you might look at something like mortgages and say, well, that seems like an obvious next place to go. To do what? How would consumers be any better off?"*
> ***Data holder***

Other stakeholders thought that data should be made accessible in a use case agnostic manner (a 'big bang' approach), prioritising quantity of data over the pre-determined value of the data. They felt that it is often difficult to know which innovative services could be provided should data be made accessible, and that adopting a use case led approach is too prescriptive. Authorised third parties expressed that the more data is made available, the more they can innovate or provide novel services, driving broader economic growth. They suggested that a use-case led approach would place restrictions on the services that third parties could offer, disincentivising new market entrants and lowering competition.

> *"Ideally, use case agnostic would be wonderful. Stifling innovation by assuming we can anticipate or try to control on a use case basis is a mistake in my view"*
> ***Authorised third party***

Deciding which of these approaches is adopted, both in the financial sector and in other sectors, forms the basis for developing standards and the next steps for Smart Data. This will dictate the scope of data that should be shared, which in turn will define whether existing data standards (e.g. ISO 20022) already cover the data in question, or whether new data standards need to be developed.

These approaches also have implications for interoperability. Interoperability is ensured through consistency between datasets, using common core attributes. The use case led approach may be accompanied by a higher risk of fragmentation, if different authorities and organisations are responsible for the development of separate data standards to enable individual use cases. Conversely, the challenges of ensuring adherence to a single standard across a broad range of data may create inconsistencies of implementation between participants.

Technical considerations for designing new Data Standards

There are other factors that will impact how data standards are created in the financial services sector and for what types of data: the ease of creating a data standard for different datasets; and the ease of encouraging the adoption of the data standard.

Similarities to Open Banking data

The ease with which certain financial product types can be standardised and shared is partially dependent on the similarity of their data with data already standardised in Open Banking.

It is likely that savings data will be one of the easiest product types to create a new standard for – as it is very similar in format to payment account data.[100] For standard savings accounts provided

[100] FS21/7: Open finance - feedback statement (2021) FCA

by high street banks, limited additional standardisation would be required and the existing APIs would be able to accommodate this information – some organisations are already sharing easy access savings data. Similarly, mortgage data could also be prioritised due to its similarities to payment account data, such as having an account balance/total debt and a steady stream of payments.[101]

"It's probably a combination of where is the most benefit to be derived from which sectors you focus on, but also with which of the ones might be simpler"
Expert

Data far outside the scope of Open Banking, such as investments or insurance data, will require more work to standardise and be made interoperable with existing Open Banking data.[102] The ease of sharing data is also affected by the type of customer the data relates to. Investment products for retail, business or private wealth customers will differ in the exact data that would require standardisation and the difficulties of such standardisation. For example, private wealth products may be more bespoke than ISAs and SIPPs, making the data more difficult to standardise and make interoperable.[103]

"The more you broaden the scope of customers, the more complex delivery becomes"
Data holder

Additionally, the API design principles established as part of Open Banking would provide a guiding framework for creating new API specifications and some of the existing APIs may only have to be repurposed or extended to a marginal extent to share new datasets.

Complexity of action initiation

A core component of Open Banking is the granting of write-access to ATPs. Write access refers to permission that is granted to a third party to modify or execute a file, set of files, and set of data.[104] In the context of Open Banking, write access is granted to ATPs for the purpose of payment initiation, which enables ATPs to initiate payments on behalf of customers with their consent.[105] Payment initiation is enabled via an API provided by the data holder, with the API and relevant data standardised in the Open Banking Standard.[106] Enabling write-access to a dataset is significantly more expensive than just enabling read-access, with one report estimating that the cost of enabling write access for all savings data would be 50% of the cost of Open Banking, while read access would only be 20% of the cost.[107]However, despite the inherent costs, Open Banking payments are now an important factor in driving the growth of Open Banking,[108] with stakeholders now considering where write-access should be a feature of Open Finance, and for which datasets.[109] It is likely that write-access will be a feature of Open Finance, but the complexity of

[101] FS21/7: Open finance - feedback statement (2021) FCA
[102] FS21/7: Open finance - feedback statement (2021) FCA
[103] The PSC Qualitative Research (October 2024)
[104] The Open Banking Standard (2015) Payment Systems Regulator
[105] Open Banking: Guidelines for Read/Write Participants (2018) Open Banking
[106] Payment Initiation API Profile - v4.0 (Accessed January 2025) Open Banking
[107] Open Banking cash savings review (October 2024) UK Finance & Frontier Economics
[108] Impact Report (March 2024) Open Banking
[109] FS21/7: Open finance - feedback statement (2021) FCA

enabling different action-initiation journeys can vary, impacting cost and ease of implementation.[110] As such, when expanding into Open Finance, a key consideration will involve evaluating where enabling write-access will have the most benefit for customers, against the cost of creating and implementing standardised APIs to enable that action initiation.

> *"Most of the cost is back-end data integration to make the service actually work, particularly for write access. Read access is much simpler, you're just exposing data. But if you want to initiate any actions, that's where a lot of the cost sits"*
> ***Data holder***

Achieving consistency across similar datasets

For data related to the same product provided by different firms (i.e. an ISA), there will be varying levels of consistency in the data. Where products are not particularly bespoke, like an easy access savings account, customers now expect a standardised experience across different providers of that product. This results in different providers holding and displaying data in similar ways and conforming to similar internal definitions and taxonomies of that data, even if not by explicit agreement.[111] This will simplify the creation of a common standard, as it should – in theory – be easier to reach agreement on how individual elements should be standardised.

In contrast, where data holders provide more bespoke products, designed to differentiate themselves from the market, it is likely that a consistency across these products is more difficult to achieve – complicating the creation of any data standard.

> *"If you were showing a product [i.e. mortgages] and wanted to define 10 fields, a core consistency could quite easily be obtained. There's a lot of variation in banking products, but there's also a set of core values that should make it easy to compare"*
> ***Data holder***

Ensuring interoperability

Using data standards to ensure consistent data formats and definitions does not automatically ensure interoperability. Should ISO 20022 be the chosen standard for ensuring interoperability between financial datasets, it will have an impact on the ease of making data accessible.

For example, comprehensive ISO 20022 messages currently exist for investments, data which is far outside the scope of Open Banking.[112] However, ISO 20022 messages do not exist for mortgage data. This means that while the data in an investment product may be more complex to standardise, a data standard could be built on an ISO 20022 foundation, which would in turn ensure interoperability. In contrast, mortgage data might be easier to create a data standard for, but additional work would be required to make mortgage messages ISO 20022 compliant, or you risk a lack of interoperability between messages.

[110] Action initiation under Australia Consumer Data Right becomes law (September 2024) Ashurst
[111] The PSC Qualitative Research (November 2024)
[112] Investment Funds - ISO 20022 Messages (Accessed January 2025) Swift

“ISO 20022 has very rich messages for investment funds and equities and fixed income trading. So, it has all the vocabulary for dividend income, yields, stuff like that. There aren’t any ISO 20022 messages for mortgages. ”
Expert

When deciding which data is standardised, and to what extent, there may therefore be a trade-off between releasing benefits quickly through incorporation with the Open Banking Standard or realising long term benefits through more complex work ensuring new standards that are interoperable with other financial datasets.

5. Expanding Smart Data in the energy sector

5.1 Introduction

The UK energy sector is estimated to represent £176bn of economic activity and supports 1 in 50 jobs.[113] Frictionless and routine data sharing in the energy sector is a key government ambition that will support the government to achieve net zero carbon emissions by 2050.[114] There is therefore extensive work across the sector to increase the digitalisation of the UK's energy system, make energy data more accessible, and enable better energy data sharing.

There are two broad types of data shared within the energy sector:

1. Energy 'network and system' data covers physical infrastructure and markets.[115] Although crucial to the operation of the UK energy system, this data is not data that is related to customers and is usually shared between Distribution Network Operators (DNOs).

2. Customer data, which in the energy sector is predominantly consumption or tariff data. This would be the focus of Smart Data; sharing this data can help domestic and business customers to reduce their bills and understand their energy usage and its carbon implications. A limited amount of customer data sharing already happens, but further work is needed if customers and third parties are to have a frictionless experience.

This section explores the current state of customer data sharing in detail, considering the standards that are used to share it, the organisations that are responsible for sharing it, and the additional enablers required for Smart Data. In doing so, this section outlines how data sharing in the energy sector is underpinned by long established standards, enabling some sharing of customer data with consent, but that work is still needed to establish additional standards, make existing standards fit for purpose, and consider how energy data can be most effectively share with authorised third parties while protecting a customer's privacy and data security.

5.2 Existing data sharing and digitisation within the energy sector

Data sharing, of both customer and system data, is fundamental to the operation of the UK energy sector, and the UK retail energy market within that – including to support customer switching, to enable smart meters to send readings to suppliers, and to correctly identify energy supply points.[116] This is predominantly done between authorised market participants (e.g. energy suppliers and Distribution Network Operators), and in accordance with established codes and privacy measures, enabling the retail energy market to operate effectively while ensuring customer trust.

> *"There is a whole host of [energy] data being shared. There has been for decades. Open Banking was dragged into that world. But the energy industry, because it's been regulated in a different way, has developed pillars of data sharing that you could lean on in future."*
> ***Data processor***

[113] Energy UK, (Accessed November 2024)
[114] Digitalising our energy system for net zero (2021), BEIS, Innovate UK and Ofgem
[115] Digitalising our energy system for net zero (2021), BEIS, Innovate UK and Ofgem
[116] Market Message Search (Accessed December 2024) The Retail Energy Code

In addition, while the energy sector does not operate any formal Smart Data ecosystem like Open Banking, it is possible to a certain extent for customers to consent to the sharing of their data with ATPs, who provide useful services back to the customer – examples of these include Loop, which integrates with smart meters to help customers optimise their energy usage,[117] and Hugo, which provides a home energy management solution.[118] The method of this third-party data exchange is usually through APIs providing data in a machine-readable format. Organisations involved, or who support this data sharing, include:

Government and regulators

The government organisations responsible for supporting data sharing in the retail energy market are the Department for Energy Security and Net Zero (DESNZ) and The Office of Gas and Electricity Markets (Ofgem).

DESNZ: Recently published a call for evidence on the potential for introducing a Smart Data scheme in the energy sector, seeking views on the possible scope, opportunities, barriers, and risks to developing an energy Smart Data scheme.[119]

They are also closely involved with the digitisation of the energy sector and in the adoption of common data standards, as part of their work on the Clean Flexibility Roadmap.[120] They now operate several workstreams including the Smart Secure Electricity Systems Programme and Smart Metering Implementation Programme, and run innovation programmes, such as the Smart Meter Data Repository.

The Smart Secure Electricity Systems Programme is creating the technical and regulatory frameworks that will enable customers to flexibly use their energy smart appliances to support demand management across the electricity grid. This includes developing data standards for tariffs and energy smart appliances, as well as standardised APIs to enable data sharing.[121]

The Smart Metering Implementation Programme is an energy-industry led programme which aims to roll-out approximately 53 million smart electricity and gas meters to domestic properties and non-domestic sites in Great Britain.[122]

The Smart Meter Data Repository aims to determine the technical and commercial feasibility of a smart meter energy data repository, centralising smart meter data and better enabling third parties and customers to access this data.[123] To achieve this, DESNZ have so far run competitions to establish feasibility and demonstrate a proof of concept.

DESNZ is also working on implementing a near real-time open data scheme for fuel prices, called Fuel Finder, which aims to increase price transparency and support drivers to easily compare prices and make informed decisions on purchasing fuel.[124]

Ofgem: Involved in improving data sharing and digitisation in the energy market and among Distribution Network Operators (DNOs). For the energy market, they are responsible for improving data sharing through reforming energy industry codes and standards, which govern the way

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[117] Loop App (Accessed January 2025) Loop
[118] Hugo Energy Pro (Accessed January 2025) Hugo
[119] Developing an energy smart data scheme: call for evidence (January 2025) DESNZ
[120] Clean Flexibility Roadmap (July 2025) DESNZ/Ofgem/NESO
[121] Smart Secure Electricity Systems Programme: Energy Smart Appliances (2024), DESNZ
[122] Smart Metering Implementation Programme (Accessed January 2025) SEC
[123] Smart Meter Energy Data Repository Programme, (Accessed November 2024), GOV.UK
[124] Consultation on open data scheme and ongoing monitoring function for road fuel prices: government response (October 2024) DESNZ

market participants share data and provide comprehensive standards for the data messages and data itself.[125]

Among DNOs, Ofgem requires them to adhere to their Data Best Practice Guidance, which is a principles-based approach that seeks to ensure system data is treated as an asset and used for the benefit of customers and the public interest.[126] Underpinng the Data Best Practice Guidance is the idea that Data Assets are 'Presumed Open', meaning that data must be available for all people to use, unless specific evidence is shown that the data should be withheld or have its availability reduced. While currently only applying to DNOs, these principles may in future be expanded to the retail energy market.[127] As part of Data Best Practice Guidance, Ofgem have mandated Dublin Core as a common metadata standard.[128] Dublin Core is a set of fifteen 'core' elements (properties) for describing resources, including elements such as Creator, Language, Format, Contributor.[129] Ofgem have also mandated the Common Information Model as a common data standard for network data exchanges.[130]

Ofgem has appointed the Retail Energy Code Company (RECCo) to design, build and govern a digital consumer consent solution to enable consumers to manage their data sharing consent. Ofgem has appointed the National Energy System Operator (NESO) as the Interim Data Sharing Infrastructure (DSI) Coordinator to lead the delivery of the DSI until the end of 2028. An energy sector DSI will be a secure framework for trusted data sharing across the energy sector.

Energy market organisations

Data exchange in the energy market relies on several centralised data holders/processors and code managers connecting household level customer data with energy suppliers. The energy market, both gas and electricity, is composed of 6 types of organisations. These organisations are either:

1. **Generators:** Responsible for generating the energy itself (i.e. EDF Energy, SSE Renewables).
2. **National Energy System Operator (NESO):** Responsible for taking a whole system view to energy system planning and operations – as an independent public body.
3. **Distribution Network Operators:** Responsible for the distribution of electricity from the national grid to the home or business (i.e. SSEN, UK Power Networks).
4. **Suppliers:** Responsible for supplying the energy to the customer, by buying energy from generators and selling it to customers (i.e. Octopus, OVO).
5. **Market Facilitators:** Responsible for transferring energy data between organisations (i.e. ElectraLink, Smart DCC) and comparing how much generators and suppliers say they will produce or consume with actual volumes, and transferring funds based on the price of this difference (i.e. Elexon).
6. **Code Bodies:** Responsible for the energy codes which govern the obligations of market participants and the transfer of energy data (i.e. RECCo, SECCo).

Further detail on each of these organisations is provided below:

Electricity retail market

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[125] Energy code reform: consultation on code manager selection (Accessed November 2024), Ofgem
[126] Data Best Practice Guidance (November 2021) Ofgem
[127] Open data: A review of our progress so far (2023) RECCo
[128] Decision on updates to Data Best Practice Guidance (August 2023) Ofgem
[129] DCMI: Metadata Basics (Accessed January 2025) Dublin Core Metadata Initiative
[130] The Common Information Model (CIM) regulatory approach (January 2022) Ofgem

Elexon: Responsible for managing the Balancing and Settlement Code (BSC), which contains the rules for the balancing mechanism and imbalance settlement processes of electricity. This means that Elexon compare how much electricity suppliers and generators say they will produce/consume versus their actual volumes and work out a price for the difference and transfer funds.[131]

ElectraLink: Provide the Data Transfer Service (DTS), which has been operational since 1998 and is the data infrastructure that transfers retail electricity data between energy suppliers, Distribution Network Operators, metering agents and other market participants.[132] As part of the DTS, ElectraLink take a copy of every single energy data message that goes through their infrastructure – although they are not able to view detailed consumption data.[133]

ElectraLink provide some of this data to third parties through numerous solution-based APIs, including instant retail energy price quoting, access to historical meter readings from individual meters, and change of energy supplier data.[134]

Retail Energy Code Company (RECCo): Manage the Retail Energy Code (REC), which is the key rules for operating in the Great British retail energy market. The REC contains the data standards for energy data messages, including detail on messages sent between participants, the format of those messages, and the component data items and definitions.[135]

RECCo also provide APIs for customer electricity and gas data through the Electricity Enquiry Service (EES) and Gas Enquiry Service (GES). The EES and GES provides market participants with information needed to facilitate customer switching. Some external organisations can access data through the Enquiry Services, including third party intermediaries, non-domestic customers, local authorities, government departments, and police authorities.[136]

Gas retail market

Xoserve: For the gas retail market, several of the functions split between organisations in the electricity market are provided by Xoserve. Xoserve are responsible for balancing and settlement,[137] and are the Central Data Services Provider (CDSP) of the UK gas market. In this role, they provide the UK Link System, which connects information, communication, and technology systems in the UK Gas Market. The data transferred on the UK Link System includes gas supply register data, consumption data, and settlement and transportation data, with all this data standardised through the Uniform Network Code.[138]

Similarly to ElectraLink, Xoserve, through RECCo, provide several APIs for gas data to authorised parties through the Gas Enquiry Service (GES).[139] These APIs are primarily focused on improving the supplier switching process and are only available to businesses in the gas industry, although the API specifications are openly available.

Electricity and gas retail market (Smart meters)

Smart DCC: Operate the smart meter network which transfers smart meter data (both for gas and electricity) from the household/business level to energy suppliers, DNOs, and Other Users. Smart

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[131] About Elexon, its work and its roles (Accessed November 2024), Elexon
[132] DTS | Energy Data Transfer (Accessed November 2024), ElectraLink
[133] DTS | Energy Data Transfer (Accessed November 2024), ElectraLink
[134] Data Solutions | Energy Data Management (Accessed November 2024) ElectraLink
[135] Building a retail energy market fit for the future (Accessed November 2024), RECCo
[136] Data Access Schedule (Accessed 2024), REC
[137] Our role and customers (Accessed November 2024), Xoserve
[138] Project Trident Business Case (2024) Xoserve
[139] Gas Enquiry Service (GES) (Accessed November 2024) Xoserve

meter data is turned into a packet of data at the point of creation within the home or premises, transferred onto the DCC's servers, and then onwards to suppliers.[140] Smart DCC are responsible for this transfer but do not store the consumption data and are not able to view the smart meter data itself.

DCC can facilitate access to data held on meters, with customer consent, to authorised third parties onboarded onto their network – entitled Other Users. For Other Users, and energy suppliers and DNOs, to be onboarded onto DCC's network, there is a multi-stage process. Firstly, an organisation must become party to the Smart Energy Code.[141] Subsequently, they need a DCC User Gateway Connection and, in order to start sending and receiving messages from smart metering systems, they need to build/buy an XML web service known as the DCC User Interface Specification (DUIS).[142] Finally, they need to make sure their connection is secure and undertake the relevant testing process.[143] It is possible for third parties not on the network to gain access to half hourly consumption profiles through Managed Service Providers, who have onboarded onto DCC's network.[144]

Smart Energy Code Company (SECCo): SECCo is a corporate entity established to support the Smart Energy Code (SEC) Panel to carry out its responsibilities.[145] The SEC Panel is charged with managing the SEC and its subsidiary documents, which define the rights and obligations of energy suppliers, network operators, and other parties involved in the management of smart metering.[146] It is composed of an independent chair, elected industry representatives and representatives from the DCC and consumer groups.[147] Finally, SECCo contract the SEC Administrator and Secretariat (SECAS), undertaken by Gemserv. to provide the day-to-day management of the SEC and its subsidiary documents.[148]

Energy suppliers

Energy suppliers securely receive and send data through the various data networks in the retail energy market. As part of this, they hold considerable customer data, including name, address, Meter Point Administration Number, energy consumption and energy tariffs. Currently, there is no standardised way they share this data with third parties – but to do so they always require consent.

Improving customer access to their data held by suppliers will be necessary for enabling Smart Data. Initiatives to further empower customers through improved data access are being established, such as Octopus Energy's smart tariff data API, which gives customers access to Octopus' pricing data to better automate their smart home energy usage.[149]

Other industry organisations

Some of the work required to enable further frictionless and trusted data sharing has been led by the non-profit organisation Icebreaker One. Icebreaker One run the Open Energy initiative, which creates an ecosystem that allows organisations in the energy sector (i.e. DNOs) to openly share energy system data.[150] While the Open Energy initiative was not established to share customer

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[140] How do smart meters send readings? (Accessed October 2024), Data Communications Company
[141] Becoming a SEC Party (Accessed January 2025)
[142] DCC User Interface Specification (Accessed January 2025) Smart DCC
[143] Partner with the DCC (Accessed January 2025) Smart DCC
[144] Data for good (October 2023) Smart DCC
[145] About Us (Accessed January 2025) SEC
[146] About the Smart Energy Code (Accessed November 2024), SEC
[147] Smart Metering Implementation Programme (2022) CGI
[148] Smart Energy Code Administrator and Secretariat (Accessed January 2025) SEC
[149] Our open API for cheaper, greener, energy (Accessed November 2024), Octopus
[150] Open Energy in the UK (Accessed November 2024) Icebreaker One

data, and there are not currently plans to do so, it does operate under a trust framework, building familiarity among participants with trusted data sharing.[151]

Overall, from a data sharing infrastructure perspective, the energy market is advanced compared to other sectors. Energy data is shared digitally between market participants according to common data standards, and some energy data is available to authorised third parties and customers through APIs. This lays the foundations for overlaying Smart Data schemes on existing energy data sharing.

"Our APIs have been hit about 113,000,000 times this year [2024] alone"
Data processor

5.3 Existing data standards within the energy sector

As sharing energy data between market participants is foundational to the energy sector, there exist numerous standards covering its different datasets, such as data standards for identifying meters, for sharing smart meter data, and for sharing a variety of energy data messages. These standards are laid out in established energy codes for the energy market, which specify the obligations governing energy market participants and must be adhered to. In addition to these, there are also standards under development that will form part of the energy codes, designed to support the customer to operate more flexibly in the energy market.

Meter Point Administration/Registration Number

Electricity and gas meters are provided with unique identifiers, these being the Meter Point Administration Number (MPAN) and the Meter Point Registration Number (MPRN).

An MPAN identifies an electricity supply point through a unique 21-digit reference number. An MPAN is fixed to the supply point on a specific property, and each numerical segment of an MPAN provides information about the property's electricity supply. For instance, parts of the MPAN can show whether the meter is a single rate or time of use meter or can identify the regional distribution company of the premise's electricity supply.[152]

Similarly, an MPRN comprises a unique reference number of between 6 and 10 digits and is unique to the gas supply point on a specific property.

MPANs and MPRNs ensure gas and electricity supplier can accurately identify a supply point, supporting them with billing, energy supply, and switching suppliers. In the context of Smart Data, MPANs and MPRNs are useful as a unique identifier in a dataset, allowing a customer's consumption or tariff information to be mapped back to the original point of supply and allowing datasets using the same MPAN/MPRN to be linked. MPANs and MPRNs only identify the supply point itself, but as unique identifiers they can be linked to other identifiers, such as a Unique Property Reference Number, which is linked to a specific address, creating more granular insights into the behaviour and usage of a specific property or customer. To enable this however would require reference databases where MPANs and MPRNs are linked to specific UPRNs.

[151] Open Energy Technical Documentation (Accessed November 2024) Icebreaker One
[152] What Are MPAN & MPRN? | How To Find Them [2024 Guide] (Accessed November 2024), Utility Saving Expert

"There is an address matching service that maps your MPAN and your MPRN to your address and UPRN"
Data processor

However, use of the MPAN is not without interoperability challenges. An MPAN can be shown in either short-form (last 13 digits) or long-form (full 21 digits).[153] Only the short form is required to identify a supply point, with the long form including supplementary data. The way in which an MPAN is written is context dependent and could create interoperability issues should stakeholders use different versions.

Retail Energy Code

The Retail Energy Code (REC) is a set of obligations governing market participants operating in the retail energy market.[154] Within the REC are numerous code schedules which govern how market participants should operate and undertake various services, including, for instance, how they should transfer customer data, or how they should resolve customer billing issues. The RECCo is the organisation responsible for managing the code, overseeing compliance and making updates and improvements as required.

The REC contains the REC Data Specification, which provides extensive information on the data messages that can be sent between market participants and the data taxonomy underpinning those messages, including the data items, their definitions, and the format in which they should be sent.[155] There are 591 market messages that form the REC, such as a 'Change in Customer Details' notification message.[156]

Part of the REC Data Specification is the Standards Definition Document which comprises metadata standards for Energy Market Data Items, regardless of which retail energy market code they are based upon (SEC, REC, BSC, UNC, IUNC, DCUSA).[157] This creates a common standard for documenting relevant industry data and messaging, with this enabling interoperability between different code messages based on a common understanding of the message content.[158]

Smart Energy Code

The Smart Energy Code (SEC) was created as part of the UK's smart meter rollout and is governed by the Smart Energy Code Company (SECCo). The SEC defines the rights and obligations of energy suppliers, network operators and other involved parties in smart metering. Smart meter data, and the way it is exchanged, is standardised in the SEC.[159]

The data standards for the Smart Energy Code are openly accessible – such as through the Message Mapping Catalogue.[160] The technical standards for data sharing are also accessible, through the DCC User Interface Specification (DUIS), which sets out the mechanisms, formats, protocols, and other technical details for users to send and receive communications to and from

[153] MPANs and MPRNs: What are they and how can you find them? - Uswitch (Accessed November 2024) Uswitch
[154] Retail Energy Code (REC) - Definitions and Governance - REC Portal (Accessed November 2024) Retail Energy Code
[155] Retail Energy Code Data Specification - REC Documents - REC Portal (Accessed November 2024) REC
[156] Market Message Search (Accessed November 2024), Retail Energy Code
[157] For more detail on the different energy codes, Industry codes and standards | Ofgem
[158] Energy Market Data Specification Standards Definition v2.5.doc (2024) REC
[159] Delivering a smart secure electricity system (2023), DESNZ
[160] Message Mapping Catalogue (Accessed January 2025) SEC

the DCC.[161] However, while the data standards are accessible, accessing smart meter data through Smart DCC's network currently has a high barrier to entry as a third party.[162]

Uniform Network Code

The Uniform Network Code (UNC) governs the legal and commercial arrangements of the transportation and supply of natural gas in Great Britain. Part of the Uniform Network Code includes data standards to support the sharing of gas energy data between market participants.[163] Part of the UNC data standards, including data flows and items, are visible on the ElectraLink website, in their UK Link Catalogue.[164]

Energy Smart Appliances standards (proposed)

An energy smart appliance (ESA) is a device which is communications-enabled and capable of responding automatically to price/other signals by shifting or modulating its electricity consumption and/or production.[165] Sharing data from ESAs with third parties could be an important use case within the context of Smart Data schemes and important for enabling Demand Side Response (DSR).

Work has been ongoing by DESNZ to improve the interoperability of energy smart appliances. The specification will include a high-level schema formed of key data items that need to be exchanged, supporting service providers and load controllers to communicate with energy smart appliances in a standardised way.[166] DESNZ intends for a new energy smart appliance specification to be in place later this decade.[167]

While not a data standard that will support Smart Data, improvements in energy smart appliance interoperability and the standardisation of communication may support authorised third parties to access energy smart appliance data in future.

Tariff data standards (proposed)

As part of DESNZ's work on the Smart Secure Electricity Systems Programme, they are working with industry to create data standards for several different types of time of use tariffs (TOUTs). A time of use tariff is a tariff where the unit price for energy varies throughout the day. DESNZ are creating a tariff data standard to support energy smart appliances to switch seamlessly between tariffs from different energy suppliers.[168] This will support customers to operate flexibly in the energy market, lower their energy bills, and support broader decarbonisation.[169]

For TOUT data standards, DESNZ proposes that they should be governed and standardised by the Retail Energy Code, which would additionally ensure interoperability with other existing energy data messages.[170] The Retail Energy Code would require energy suppliers to comply with the

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[161] DCC User Interface Specification (Accessed January 2025) Smart DCC
[162] Data for good (October 2023) Smart DCC
[163] UNC Summary AUGUST 2024.pdf (2024), Joint Office of Gas Transporters
[164] Energy Data Management: UK Link Catalogue (Accessed December 2024) ElectraLink
[165] Delivering a smart secure electricity system (2023), DESNZ
[166] The PSC Qualitative Research (December 2024)
[167] Delivering a smart secure electricity system (2023), DESNZ
[168] Smart Secure Electricity Systems Programme: tariff data accessibility for flexibility services (2024), DESNZ
[169] Smart Secure Electricity Systems Programme: tariff data accessibility for flexibility services (2024), DESNZ
[170] Delivering a smart secure electricity system (2023), DESNZ

TOUT data standards. DESNZ also propose that the sharing of this tariff data should be done according to standardised APIs adopted by all energy suppliers.[171]

DESNZ are also consulting on whether to expand the tariff data standards to include all domestic scale electricity and gas tariffs, including fixed rate tariffs.[172] In the immediate term, DESNZ are focused on delivering an MVP for tariff data standards, solely for the purpose of supporting the optimisation of energy smart appliances. Utilising these data standards, when complete, to support third parties to access tariff data with a customer's consent will require additional work and consultation.

> *"So at the moment tariff information is not standardised and it varies from supplier to supplier"*
> ***Government department***

Smart meter system data (currently unstandardised)

Smart meter system data is data related to a household's smart meter but ancillary to the consumption and usage messages sent by Smart DCC to energy suppliers.[173] Smart DCC refer to smart meter system data as the 'envelope' in which the smart meter data is sent, including information on where it was sent, to which device it was sent, at what time it was sent. An example of an item of smart meter system data is a low credit alert sent out by a prepaid meter.[174] There is currently no mechanism for external access and it is current unstandardised, but stakeholders have suggested that it may be made accessible and shareable by customers in future.[175]

Alignment with design principles

The role of these standards in supporting Smart Data can be seen for the energy use cases (Project Perseus & Hexapower) in **Appendix 2: Use Cases**. For these use cases, which require consumption and tariff data, the REC and SEC would be able to support the sharing of consumption data in a standardised form. However, the current lack of tariff data standard would create issues for enabling these use cases.

Existing standards that could enable these use cases currently meet some of the data standard design principles. They all meet clearly defined objectives (Principle 1) and currently have owners (code bodies) who are responsible for their maintenance/adoption (Principles 2 & 3). The standards have been built based on industry collaboration and are designed for the existing energy data landscape (Principle 4). They are also fully accessible (Principle 5) and contain some of the elements of fit-for-purpose standards, such as data dictionaries and taxonomies (Principle 7).

However, the complex nature of the codes make them less flexible and scalable than necessary (Principle 6). The complexities also make them less interoperable than may be required for Smart Data – although they do use unique identifiers frequently, such as MPANs and MPRNs, as well as the use of Unique Property Reference Numbers in the REC (Principle 9). The following section

[171] Smart Secure Electricity Systems Programme: tariff data accessibility for flexibility services (2024), DESNZ
[172] Smart Secure Electricity Systems Programme: tariff data accessibility for flexibility services (2024), DESNZ
[173] Data for good (October 2023) Smart DCC
[174] The PSC Qualitative Research (November 2024)
[175] Data for good (October 2023) Smart DCC

provides more detail on work that is needed for Smart Data to be used in the energy sector, including how to ensure energy data standards meet the design principles

5.4 Future adoption of Smart Data

While the energy sector has been independently working towards more frictionless customer data sharing and already enables customers to do so to an extent, there is still further work required to ensure that customers can easily share their data, and third parties can utilise that data – all while adhering to essential privacy standards.

This work revolves around making improvements to existing standards, enabling cross-sector interoperability, the development of new required standards, making all relevant standards open and accessible, and implementing some of the required enablers for Smart Data sharing.

Data Access and Privacy Framework

The government's view is that energy customers should be able to easily share their own energy data with authorised third parties to access innovative products and services.[176] Access to smart meter data is governed through the Data Access and Privacy Framework. This framework establishes the rights and restrictions of various parties in accessing customer smart meter data. The parties governed by this include customers, suppliers, network operators, third parties, and non-domestic microbusinesses.[177] The Data Access and Privacy Framework does enable third parties to access customer data, but subject to some requirements. These requirements include:

1. Having to be a signatory of the Smart Energy Code, or go through an intermediary who has done so.
2. Only being able to request customer data with customer consent.
3. Having to obtain verification of a customer's identify before accessing their data.
4. Requirements to remind customers that they are consenting to their smart meter data being accessed.

Currently, the Data Access and Privacy Framework, and its accompanying requirements, is essential to ensuring customer trust in Smart Metering – due to the perceived risk that smart meter data could be used to identify household behaviours.[178] These requirements are not dissimilar to the consent requirements and directory within Open Banking, both of which are used to maintain customer trust in data sharing, and are likely to be critical to any potential energy Smart Data scheme.

However, there are still some sources of friction within the data sharing process and the requirements themselves (e.g. on consent). Some work is ongoing to minimise these frictions, but potentially further work may be needed if a fully effective energy smart data scheme is to be established.

DCC Other User

The most substantial barrier to authorised third party access to smart meter data is in onboarding to DCC's network. While it is possible for any organisation or natural person to become an SEC party, under the **Other SEC Party** category,[179] the costs and requirements for subsequently

[176] Smart Metering Implementation Programme: Review of the Data Access and Privacy Framework (2018) GOV.UK
[177] Smart Metering Implementation Programme: Review of the Data Access and Privacy Framework (2018) GOV.UK
[178] Data Privacy Plan for Access to Smart Meter Consumption Data (December 2019) UK Power Networks
[179] SECAS Guidance Notes: Accession Process (Accessed November 2024), SECCo

accessing the smart meter data and becoming a DCC Other User are substantial and act as a high barrier to entry.[180]

> *"If you're looking to go through the onboarding and integrate with DCC directly, then you're looking at 6 months plus and quite a bit of technology development capability"*
> ***Data processor***

This high barrier to entry is necessary due to the importance of maintaining a safe and secure Smart Metering infrastructure, and in ensuring customer privacy. However, it does preclude many potential authorised third parties from connecting to DCC's network. As such, it may be that any future Smart Data scheme in the energy sector has ATPs accessing data through Managed Service Providers already on DCC's network, with trust and customer privacy ensured through a directory or trust framework – or accessing data directly from suppliers themselves.

> *"So, it's not a cheap thing to do [connect to DCC's network], because the standards are high. Rightly so, because you are connected to a critical national infrastructure asset"*
> ***Data processor***

Consent

Outside of onboarding onto the DCC network, the process around acquiring customer consent and identity verification lacks standardisation, in terms of acquiring it and in its management – both of which are requirements of the Data Access and Privacy Framework.[181] This lack of standardisation makes it more difficult for customers to grant consent and revoke consent, complicating the ability of ATPs to access data and provide services.

> *"You can go through the DCC's Other User system and consent in various ways, but it's quite ad hoc. It's inconsistent and you end up having to repeat the process multiple times"*
> ***Regulator***

To resolve this lack of standardisation, Ofgem has appointed RECCo to design, build and govern a digital consumer consent solution to enable consumers to manage their data sharing consent. This would support customers in the sharing of their data while also reducing barriers to entry for innovators that use energy data for their customer services.

The expectation is that this consent solution would have the capacity to provide standardised access to consumption data, tariff data, and energy smart appliance data, supporting third parties to provide innovative solutions to customers. Improvements to the approach for customers' consent to their data being shared in the energy sector will support the adoption of Smart Data.

However, there is a risk that customers may experience consent fatigue if they have to deal with multiple/complex approaches to consent across different sectors, or if they have to provide consent multiple times to enable a single ATP to access multiple different datasets. The previous 90-day Strong Customer Authentication for Open Banking is an example of a complex consent approach

[180] The PSC Qualitative Research (November 2024)
[181] Data Sharing in a Digital Future: Consumer Consent (2023) Ofgem

causing customer consent fatigue.[182] As far as possible, the burden of providing consent should be minimised, with this potentially requiring a cross-sector consent solution.[183]

Energy code reform & cross-sector interoperability

The various retail energy market codes which establish the data standards for energy data are currently undergoing reforms. In 2019, Ofgem and the Department for Business, Energy, and Industrial Strategy consulted on making substantial reforms to the energy codes, due to the view that the energy codes at that point were fragmented and complex, and that improvements could unlock innovation and significant benefits for customers.[184] The complexity of the codes, as they stood then, stretched to over 10,000 pages and required on average 200/250 days to make changes to – with such complexity a substantial barrier to authorised third parties accessing customer data.

This consultation sought to ensure that the energy codes were easier to understand for new market participants, developed in a way that benefits energy customers, able to accommodate increased numbers of market participants, and agile and responsive to change. This work resulted in the consolidation of several codes, such as the Master Registration Agreement (MRA) & Supply Point Administration Agreement (SPAA), into a single code, the REC. It is likely that further codes will be consolidated as part of this work.[185]

This simplification of the codes and their governance has also been supported by improvements in the accessibility, with RECCo doing substantial work to make its data standards more openly available and comprehensible.[186] This has included the creation of an openly accessible Meta Data Catalogue, a Data Item Classification model, and a Data Domain model.

Some energy code reform is still required to ensure that third parties can easily access and properly understand the data they are receiving. The different codes are not fully interoperable and some lack the required transparency in terms of openly accessible standards to enable third parties to view them.[187] Additionally, the codes have not been developed with cross-sector interoperability in mind and so are not necessarily interoperable with other common standards in use, such as ISO 20022. Enabling cross-sector Smart Data would likely require some reform to the standards within the codes to ensure they can properly be interoperable with datasets from other sectors.

> *"There isn't the ease of interoperability you would hope for. It's not even perfect within the standards. You do need a bit of a degree in standards to understand the standards"*
> ***Data processor***

Creation of new standards

While the energy codes provide much of the foundations for sharing standardised data, more work is needed to create standards for several other relevant datasets. These datasets have already been identified, including tariff data, energy smart appliance data, and smart meter system data. Work is currently ongoing to create standards for tariff data and energy smart appliances.

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[182] Strong Customer Authentication (2023) FCA
[183] Smart Data Research Report: Consent (2020) Department for Business, Energy & Industrial Strategy
[184] Reforming energy industry codes: consultation (2019) GOV.UK
[185] Consultation on the implementation of energy code reform (2024) GOV.UK
[186] Open data: A review of our progress so far (2023) RECCo
[187] The PSC Stakeholder Interview (November 2024)

For all the proposed standards which are to be developed, interoperability with other standards should be a central consideration. These standards should adhere to the same data dictionary, principles around taxonomy, and message items as existing energy data standards. The standards should also be able to link to datasets outside the energy sector. While the bulk of the data in energy datasets is likely to be distinct from non-energy datasets, the use of identifiers (such as UPRNs) to link datasets, and adhering to standards for common attributes (like name, date, time) would support that interoperability.

Centralised or de-centralised approach

Currently, third party data sharing in the energy sector is often done by the centralised data processors and holders. However, customer data is also held by energy suppliers as well, with these suppliers being decentralised, just as the banks are in the context of Open Banking.

As Smart Data develops further in the energy market, a decision will need to be taken as to whether the energy market should adopt a centralised or de-centralised approach, with the burden of data sharing either on centralised data processors or decentralised energy suppliers.[188]

Adopting a decentralised approach would replicate the Open Banking model and likely replicate the approach of other sectors as well. Customers may also be more trusting of their data being shared by their energy supplier as opposed to a centralised intermediary. However, increasing the number of organisations responsible for data sharing may impact the performance of the Smart Data ecosystem, and levels of adherence to required standards. It may also increase the amount of regulatory oversight needed. In either case, the success of the ecosystem would require several additional enablers, such as Open API standards, security standards, and operational guidelines.

> *"It's not completely decentralised in energy, so the challenge is different [to Open Banking]. There is already centralisation, which could advance [Smart Data] quicker"*
> ***Data processor***

[188] Making Smart Data Happen (February 2025) Startup Coalition, The Tony Blair Institute

6. Expanding Smart Data in the property sector

6.1 Introduction

The property ecosystem is a cornerstone of the UK economy, employing 1.2 million people and contributing over £100 billion a year.[189] It is broad in scope, including services from construction, planning, and building to sales and purchases, registration of ownership, and maintenance.

Many of these services require the generation, storage and sharing of data across the lifecycle of a property, from planning, construction and management, to buying and selling, to demolition. Data standards are used across these services and often play essential roles in their operation.[190] The scope and quantity of data shared in the property sector means that the possible scope of Smart Data is very broad, necessitating a clear vision on where Smart Data schemes can bring the most benefit to most customers.

In this context, Smart Data could be most effective in supporting the buying and selling of property, both commercial and residential, particularly given the difficulties and delays that customers face during property transactions. A major factor behind these difficulties are the complications that customers face when trying to find, access, and reuse data required for a property transaction – complications that Smart Data could help resolve. These complications also impact the ability for customers to access, hold, and share data on a property they already own/live in – another core Smart Data use case.

In light of the above, this report section chooses to focus on the potential for Smart Data to improve the efficiency of property transactions and customer experience – particularly in the residential property market. However, it is important to note that many of the data sharing inefficiencies and standards in the residential property market also apply to the commercial market, underlining the importance of a joined-up approach to improvements in data sharing.

The exception to this section's focus on the residential property market is when discussing existing data standards, with both data standards for both home-buying and broader use cases considered. This broader perspective is essential, as the frequent reuse of property data for different purposes creates the risk of fragmented data standards which are not interoperable.

6.2 Existing data sharing and digitisation within the property sector

Data sharing is integral to property transactions and yet extensive difficulties exist which have a detrimental impact on customer experience. In particular, the home-buying process in England and Wales is one of the most stressful life experiences that some people will go through, characterised by delays, fall-throughs, and information asymmetry.[191] A successful property transaction requires multiple parties to source, verify, and share data – with this being an important cause of delays.[192] Conveyancing, for example, takes an average of 150 days to complete, requiring a review of 163 different data sets.[193]

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[189] Building better decision making (2023), Geospatial Commission
[190] Examples include: ISO 19650, ISO 16739 (Industry Foundation Classes), International Land Measurement Standard, BS7666
[191] Improving the home buying and selling process in England - House of Commons Library (2022) House of Commons Library
[192] The Open Property Data Association – streamlining the home-buying process (2024), Open Banking
[193] Building Better Decision Making (2023), Geospatial Commission

These datasets are often of low quality and requires manual data sharing processes; less than one percent of property data is digitised.[194] Even the data that is available digitally is rarely in a form that can support Smart Data (i.e. not machine-readable or adhering to a common standard), and for certain types of data (e.g. utilities), it can be unclear who holds the necessary data and how to access it. These issues can result in a home-buying process that is overly complicated and susceptible to failure, with customers often not having a full understanding of a property's rights, restrictions and physical condition at the point of making an offer, necessitating further enquiries that delay the purchase and risk its failure.[195] Many of these difficulties are also present for commercial property transactions.

"Digital platforms have been built, but not according to FAIR standards and not in a way that's useful for the consumer or useful for making the data trusted and shareable"
Expert

Industry is taking steps to address these issues however, led by groups such as the Home Buying and Selling Council (HBSC), and the Digital Property Market Steering Group (DPMSG). The DPMSG is chaired by the Ministry of Housing, Communities, and Local Government (MHCLG), as the department responsible for home-buying and selling, and is attended by HM Land Registry and the Department for Science, Innovation, and Technology, as well as various industry groups.

They seek to make improvements to digitisation among organisations that generate, hold and share property data - spanning central government, local government, the private sector, and private individuals. The following section outlines these organisations, with a focus on home-buying, but many of the data sharing requirements and difficulties are also relevant for commercial property. These include:

Government data providers:

HM Land Registry (HMLR)

HMLR plays a central role in the home-buying process and is involved in all property transactions. HMLR hold a register of all land and property in England and Wales, including information about property titles and deeds, boundaries, ownership rights, mortgages, local land charges, transaction and price data, and restrictive covenants.[196] Data from HMLR is required as part of conveyancing, and following a property purchase HMLR's data must be updated by registering the new owner's details and mortgages.

Certain services supplied by HMLR are supplied digitally through APIs and data published in bulk is accessible online, but the majority of that information is not machine interpretable, meaning that the data cannot be read, understood, and linked to other data. There is ongoing work at HMLR to upgrade outdated formats into modern, machine interpretable information, embrace open standards and change the way data is received, stored, supplied and visualised. This would provide the property market with near real-time property data and would be beneficial to HMLR's data users (e.g. PropTech companies) – with the data linking more readily to other geographic information and supporting the efficient data sharing as part of a smarter, more efficient property ecosystem.[197]

[194] The Open Property Data Association – streamlining the home-buying process (2024), Open Banking
[195] Enabling a world leading property market – Strategy 2022+ (2022), HM Land Registry
[196] HM Land Registry - GOV.UK (Accessed November 2024), HMLR
[197] Enabling a world leading property market – Strategy 2022+ (2022), HM Land Registry

HMLR is actively engaging with government departments and the property sector to ensure that it takes an optimal approach towards interoperability and reusability in its data, including options for data standardisation. It is continuing with a review of its fees and charging model to determine whether all fees are aligned to its strategic plans, how they can be made less complex and fair for customers, and how to make information services as accessible as possible, while enabling the investment the market wants to see in more useful and useable data.

For a Smart Data Scheme in Homebuying and selling, the DUA Act could unlock data sets within those use cases, but there is a chance that not all data sets will be unlocked using the DUA Act and other steps would likely also need to be considered.

Local Authorities

Local Authorities hold data for searches needed during conveyancing. These include:

1. The Local Land Charges search (LLC1 Form), which includes information on any legal restrictions affecting the property.
2. The CON29 Enquiries of a Local Authority (CON29 Form) which focuses on any potential future developments that might affect the property.[198]

There are over 300 local authorities in England and Wales and the digital availability of their data is variable. Some provide data in electronic format online, whilst others only share data in physical paper form, placing a requirement on the conveyancer to attend an office in person.

> *"I would say we've probably got about 25% of information held by local authorities pushed to the web"*
> ***Expert***

There is ongoing work to digitise Local Land Charges data. Historically held by local authorities, this data is being migrated digitally to HMLR as part of the Local Land Charges Programme.[199] This programme alone is not sufficient to enable Smart Data, however, as not all local authorities have yet moved their data over.

> *"At the moment, none of that [primary] data is digitised at source at all, apart from the stuff the Local Land Charges Programme has done"*
> ***Expert***

Many of the stakeholders that we spoke to felt that digitising data held by HMLR and Local Authorities would offer significant benefits in reducing delays and inaccuracies in the Home Buying process, and that this in turn would encourage private sector organisations to do the same.

> *"The things that would really make a difference would be Land Registry data and local authority data because that's the biggest reason things go wrong, and that's the data that*

[198] CON29 forms | The Law Society (Accessed November 2024) The Law Society
[199] Local Land Charges Programme - GOV.UK (Accessed November 2024) GOV.UK

has the biggest impact"
Expert

Ministry of Housing, Communities and Local Government (MHCLG)

MHCLG continues to work closely with industry stakeholders and HMLR to consider options for furthering digitalisation of the home buying and selling process. It is their vision that customers will be at the heart of a reformed buying and selling process that is faster, more certain and less stressful – resulting in significant savings to consumers and industry. As a custodian, MHCLG also holds data on Energy Performance Certificates (EPCs) which are required to be provided up-front as part of the home-buying process. EPCs held by MHCLG are available digitally, in a machine-readable format accessible via API.[200]

In February 2025, MHCLG announced property data pilots[201] to open up and digitalise locally held property data that is vital to the home buying and selling process, and a commitment to support the implementation of common data standards. These projects will inform government's future policy approach to support the digitalisation of the home buying and selling sector.

Other government agencies (i.e. Coal Authority, Environment Agency)

Additional searches performed during conveyancing can include:

- An environmental search, using data from the Environment Agency to provide information on contaminated land, nearby landfill sites, flooding predictions, and ground stability issues.
- Dependent on location, a mining search to see if a property is affected by coal or tin mining using data generally provided by the Coal Authority.[202] The Coal Authority provide various mining reports that are relevant to homebuyers, such as CON29M mining report or the Ground Stability report. These reports require payment to get access to and are not machine readable or accessible via API.[203]

Private data providers:

Property buyer and seller

Buyers must provide information proving their identity, address, source of funds, and information regarding any mortgage they have or deposit they intend to put down as part of the home-buying process.

Sellers must also provide proof of identity and address. They must also provide information to complete The Law Society's Transaction (TA) forms, including information on a property's fittings and contents, the leasehold, the boundaries, building works, and disputes with neighbours.[204]

Utility companies and other private companies

Private companies hold utilities data that may be needed as part of a water search (requiring data from water companies that confirms if the property is connected to the main and public drainage system, and whether there are any drains running underneath the property). Alternatively, this

[200] Domestic Energy Performance Certificates API (Accessed December 2024) MHCLG
[201] MHCLG (February 2025): Home buying and selling to become quicker and cheaper
[202] Product pages Archives : Coal Authority (Accessed November 2024) The Coal Authority
[203] Product pages Archives : Coal Authority (Accessed November 2024) The Coal Authority
[204] Transaction (TA) forms | The Law Society (Accessed November 2024) The Law Society

utility data might be needed for searches requiring information on existing connections for electricity, gas, and broadband/telecom services.

> *"In terms of access and getting that report back [from a water company], you normally get access either same day or within the same working week. Gas is the same. Telecommunications tend to lag behind."*
> ***Expert***

This situation may be improved if access to the National Underground Asset Register (NUAR) is expanded. The National Underground Asset Register is a digital map of underground pipes and cables in England, Wales and Northern Ireland, currently in development by The Geospatial Commission.[205] Data in the NUAR is standardised by the NUAR Harmonised Data Model.[206] If accessible to conveyancers and other relevant parties, it would enable instant access to information on underground assets.[207]

> *"The Geospatial Commission have developed the NUAR. It's fantastic. It would revolutionise conveyancing"*
> ***Expert***

Transaction intermediaries:

The data that is required as part of the home-buying and selling process is acquired and passed between a variety of transaction intermediaries, all of whom vary in their adoption of the digital infrastructure necessary to store and share data. This lack of interoperability between transaction intermediaries, as well as a lack of trust in the provenance of data shared, results in intermediaries sometimes not reusing data they receive, but rather sourcing it again – creating inefficiencies. Adoption of common standards and digitisation among these participants, and their software providers, will be crucial to enabling Smart Data.

Estate agents

Estate agents play a crucial initial role in gathering the data required to support the home-buying process. Estate agents must collect essential property information prior to listing a property and must make this information available at the point of listing. National Trading Standards have issued guidance suggesting material information includes an EPC, Council Tax band, asking price, property tenure, freehold or leasehold, physical characteristics of the property, number of rooms, and more.[208]

Conveyancers and solicitors

While estate agents gather essential information prior to the transaction, conveyancers conduct more in-depth searches into the relevant legal, financial and environmental information needed at the point of transaction. Conveyancers share this information between themselves and with the buyer/seller, to help all parties make an informed decision.

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[205] National Underground Asset Register (NUAR) (November 2024) GOV.UK
[206] An introduction to the NUAR Data Model – Geospatial Commission (2024) GOV.UK
[207] National Underground Asset Register (NUAR) (November 2024) GOV.UK
[208] Material Information Guidance for Property Sales (2023) National Trading Standards

Some larger estate agents and conveyancers operate their own proprietary data management systems and would be required to adopt common standards and APIs to fully enable Smart Data. There are already some trials underway among these organisations to implement the Property Data Trust Framework and streamline home-buying.[209]

Mortgage lenders

Mortgage lenders require data from both the prospective buyer of the property and information on the property itself. From the prospective buyer, they might require proof of identity, proof of address, credit history, bank statements, income and employment, savings and expenditures.

For information on a property, they might require the property's value and condition, title deeds, tenure, and the security of the property (i.e. from floods).

Transaction solution providers:

To support the highly complex nature of the home buying and selling process, there are several different solution providers who look to support data acquisition, data sharing, and data management.

Property Technology (PropTech) companies

There is a vibrant PropTech ecosystem around the home-buying and selling process that seeks to streamline the process and improve outcomes for customers. These services include:

1. Digital property packs containing all the information required to support a successful property transaction.[210]
2. Residential Logbooks that contain all the information homeowners would want to have accessible while they occupy a property.[211]
3. Secure digital networks through which the relevant participants in a property transaction can share information digitally between themselves.[212]

These PropTech solutions support data sharing between market participants and rely on the data held by data providers to provide their solutions.

Investment in PropTech has grown considerably over the past decade due to demand - in 2023 alone, the sector raised £1+ billion in funding (compared to £106 million in 2016). Many PropTech companies operate in the home buying and selling space, providing either a 'one-stop-shop' service to customers, or focusing on one main service to solve a particular problem (e.g AI lease reporting tools). The more Findable, Accessible, Interoperable and Reusable (FAIR) property data is and the lower any licensing or cost barriers, the more empowered PropTech companies are to innovate and create added value for the clients, including in academia, the public sector and industry.

Software suppliers

Conveyancers, estate agents, and other participants in a property transaction can be supported by a variety of Customer Relationship Management (CRM) systems and Case Management Systems (CMS) to store the data they collect during the information gathering phases of a property

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[209] LMS announces first-of-its-kind pilot to speed up house buying and selling (August 2024) The Financial Times
[210] Moverly (Accessed November 2024) Moverly
[211] About (Accessed November 2024) Residential Logbook Association
[212] Home - Coadjute (Accessed November 2024) Coadjute

transaction. These systems also support the digital exchange of data between relevant stakeholders in a property transaction.

As most smaller transaction intermediaries rely on these software providers to store and share the data they collect as part of a property purchase, these software providers have a central role in enabling Smart Data. Currently these systems do not conform to any common data standards or common approaches to sharing data. Successful implementation of Smart Data would require these software providers to align their internal systems and software products with the relevant standards and specifications. This would allow them to collect data more easily (i.e. through a portal where a seller could provide relevant information), store information according to a common data standard, and then share it onwards according to a common standard via API.

Search providers

Buyers and conveyancers can be supported in the information gathering phase through search companies, who conduct the required local authority, government, and private company searches on their behalf. These companies have established relationships with local authorities and other data providers and may have independent databases of relevant information that they can provide to buyers.

6.3 Existing data standards within the property sector

Despite digitisation challenges, data standards exist that can support the property sector. This includes unique location identifiers, data standards specifically designed to improve the home-buying process and data standards/models which are broader in scope, designed to enable a variety of use cases. The list below is non-exhaustive but does list the core data standards that could potentially support Smart Data identified in the desk and qualitative research.

Data standards that support home-buying

Property Data Trust Framework (PDTF)

Most of our research participants from the property sector were members of the Open Property Data Association and the Home Buying and Selling Council, and all referred to the work of these organisations in developing a data standard that could support the entire home-buying process, from required material information, to legal information, information for local searches, and information provided by the seller.

The **Buying and Selling Property Information (BASPI)** is a dataset designed to act as the 'one source of truth' for providing upfront information about a property. It includes information required under the Consumer Protection from Unfair Trading Regulations, and information required for Conveyancing Due Diligence.[213] The BASPI was created by the Home Buying and Selling Council (HBSC) – an industry body formed by organisations across the home-buying process, including professional bodies and government organisations. While the BASPI does not in itself reduce the burden of collecting information, it does simplify the identification of data required and provides a way to hold that data in one place and share it onwards.[214]

A data standard, JSON schema and API specification for the BASPI have been developed as part of the Open Property Data Association's (OPDA) **Property Data Trust Framework (PDTF)** .[215]

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[213] The BASPI (Accessed November 2024) Home Buying & Selling Council
[214] Buyer and Seller's Property Information (Accessed November 2024) Home Buying and Selling Council
[215] Open Property Data Association (Accessed October 2024)

The standards and schema are designed to map to and be interoperable with the Royal Institute of Chartered Surveyors Data Standard.

The PDTF data standard covers required information for property transactions, both prior to the point of listing (material information) and during a transaction (local searches). This includes the address, titles and deeds, ownership history, ground rent, local authority searches, and Energy Performance Certificate for a property. The PDTF specifies the required data format, data taxonomy, and data definitions for this information. The PDTF also includes technical standards for data exchange, i.e. the format of the JSON schema and API specifications.

> *"They've [The OPDA] developed a taxonomy that I think we should all follow and that's one of those key bits of infrastructure that's got to be jointly owned"*
> ***Data processor***

Research participants felt that the PDTF was now the only data standard that could be applied to the whole home-buying ecosystem, with the RICS standard being too high-level, and the OSCRE (Open Standards Consortium for Real Estate) Industry Data Model not being used for home-buying in the UK. Participants were keen to stress that the PDTF should and could be adopted by all participants in the home-buying process, which, if implemented correctly, would significantly improve the process for customers.

> *"The intention for the data suppliers is to encourage them to move to this standard [PDTF]"*
> ***Data processor***

Whilst the PDTF has some industry support, the adoption of the standard is limited to some transaction intermediaries and transaction solution providers – such as PropTech companies and large estate agencies.[216] Should the PDTF be the preferred industry solution, it would require widespread adoption by both private and public sector data providers, to ensure authorised third parties do not have to transform the data upon receipt.

ISO 20022

The ISO 20022 standard has been recommended for use in the property sector by the Bank of England. As ISO 20022 can provide detailed information as part of its messages, it could be used to add further specific information to required payment transfers in the homebuying process. For instance, it could provide additional detail about the purchaser and the property, as well as the purpose of the payment, through ISO 20022 Purpose Codes.[217]

The current home-buying process involves multiple transactions to a range of involved parties, with transactions often not reaching recipients immediately. By integrating additional information into one single payment message sent as part of the homebuying process, data sharing inefficiencies would be reduced.[218]

Data standards that support broader property use cases

[216] The PSC Qualitative Research (November 2024)
[217] ISO 20022 Market Guidance Guide for the property market sector (2021), Bank of England
[218] *Ibid*

Unique Property Reference Number (UPRN) & Unique Street Reference Number (USRN)

A UPRN is a unique numeric identifier, up to 12 digits long, that is provided for every addressable location in Great Britain, throughout the entirety of the property lifecycle.[219] A USRN is an 8-digit unique identifier for every street in Great Britain.[220] UPRNs and USRNs are the recommended standard way for government to share and reference address information.[221] UPRNs & USRNs are created by Ordnance Survey and allocated to addresses by local authorities and Ordnance Survey, with guidance from GeoPlace,[222] which is a limited liability partnership owned equally by the Local Government Association (LGA) and Ordnance Survey.[223] UPRNs and USRNs have been made openly available to public sector organisations under the Public Sector Geospatial Agreement.[224]

These unique identifiers facilitate property identification within property data exchanges and are crucial in ensuring that different property datasets can be accurately linked.[225] Properties accumulate large amounts of data throughout the duration of their lifecycle, and a UPRN enables these different data sets to be linked for different use cases.[226] The UPRN/ USRN can also be linked to non-property datasets, facilitating interoperability across sectors – and for Smart Data, they enable customers be linked directly to addressable locations.[227] For example, UPRNs are included on Energy Performance Certificates and can be linked to MPANs & MPRNs.[228]

However, UPRNs/USRNs do present some challenges. UPRNs become historic if the addressable location associated with them is changed – i.e. a house that has recently been converted into flats – and ensuring accurate data sharing would require all organisations using URPNs to keep them updated.[229] From a Land Registry perspective, property titles do not always map onto addressable locations, and therefore UPRNs – for instance, a single property title may cover multiple UPRNs.[230]

In addition, whilst UPRNs/USRNs are freely available to government under the Public Sector Geospatial Agreement, access is more limited for the private sector market.[231] Ordnance Survey provide data products which provide private sector organisations with access to UPRNs/USRNs, but to access full datasets requires organisations to establish commercial licenses with Ordnance Survey[232] – placing barriers on the seamlessly syncing of address databases with UPRNs.[233] Together, these present complications in the use of unique identifiers for Smart Data. For unique identifiers to be fully effective, they must be used wholesale in their relevant sector, and falling short of this will make providing reliable services more difficult and complicate the seamless exchange of data.

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[219] Building better decision making (2023), Geospatial Commission
[220] What is a Unique Street Reference Number (USRN) | GeoPlace LLP (Accessed November 2024) Geoplace
[221] Geospatial Commission to release core identifiers under Open Government Licence (Accessed November 2024) GOV.UK
[222] UPRNs and the property lifecycle (November 2021) Ordnance Survey
[223] GeoPlace (Accessed January 2025) GeoPlace
[224] New freedoms to share UPRNs and USRNs (Accessed January 2025) GeoPlace
[225] How FAIR as the UK's national geospatial data assets? (2022), Geospatial Commission
[226] UPRNs and the property lifecycle (November 2021) Ordnance Survey
[227] Persistent and well-behaved identifiers (September 2018) GeoPlace
[228] Energy performance certificates now include the Unique Property Reference Number (UPRN) (Accessed December 2024) MHCLG
[229] Limitations (Accessed January 2025) UPRNs
[230] Land Registry admits limits of property reference numbers (May 2022) The Law Society
[231] AddressBase | Data Products | OS (Accessed November 2024) Ordnance Survey
[232] AddressBase Premium | Data Products (Accessed January 2025) Ordnance Survey
[233] The PSC Qualitative Research (November 2024)

Royal Institute of Chartered Surveyors (RICS) Data Standard

The RICS Data Standard (RDS) provides a schema that allows users to capture, share, and exchange data on property, real estate, land, and infrastructure assets. The RDS does not seek to replace other detailed standards but rather provide a common interface between many existing schemas across the property sector and to provide common APIs for exchanging data.[234] The RDS also supports physical entities such as land and buildings being mapped to and reconciled with legal concepts such as ownership, tenure, loans, occupation, rights etc. The RDS is available in JSON & XML format.

The RDS supports and is the basis for development of more granular RICS and industry data standards, such as the PDTF. The standard does not necessarily have the detail to enable specific use cases and rather provides a foundational model on which data standards which have a purpose can be built.[235] To illustrate this, it avoids terminology specific to any individual jurisdiction which enables it to be used internationally.

> *"RICS is a data standard that is acceptable across 34 countries and has real legs behind it. So having created the BASPI, we said right, let's make sure that it is programmable to the RICS data standard"*
> ***Expert***

OSCRE

OSCRE are a global non-profit consortium who develop real estate data standards and support their implementation. They have developed an Industry Data Model that provides standards, technical schema, and data definitions for over 130+ use cases and is openly accessible on their website. This model could support various elements of the home-buying and selling process,[236] but levels of adoption in the UK are unclear.[237] It has, however, been used as the data model for other property data sharing use cases in the UK, such as for the Housing Associations' Charitable Trust's UK Housing Data Standards.

UK Housing Data Standards

The UK Housing Data Standards are based on the OSCRE Data Model, designed to support data management and exchange in the UK social housing sector. They are owned by the Housing Associations' Charitable Trust (HACT) and includes standards on managing and exchanging customer data, environmental data, regulatory data, and maintenance data. The UK Housing Data Standards is formed of 10 modules designed to meet different functions, and each module provides the standards, the reference data models, and examples of use cases where they have been used.[238]

Alignment with design principles

More detail on how these standards can support the Smart Data property use cases (Digital Property Pack & Hexapower) can be found in **Appendix 2: Use Cases**, where the data requirements for two property related use cases are discussed – much of the data required for

[234] RICS Data Standard Release Notes (2022), RICS
[235] Releases · RICS-Data-Standard/RDS (Accessed November 2024) RICS
[236] Introducing the Data Model (Accessed November 2024) OSCRE
[237] The PSC Qualitative Research (November 2024)
[238] UK Housing Data Standards | HACT (Accessed November 2024) HACT

these use cases could be conformed to an existing common data standard, although there are issues with adoption.

Regarding how these data standards align with the design principles – they all meet clearly defined objectives (Principle 1) and have owners who created them through industry consultation and buy-in (Principles 2 & 3). Broadly, they are built on a clear understanding of the data landscape and are scalable/flexible due to not being prescribed in legislation (Principle 4 & 6). They also contain some of the relevant elements of a fit-for-purpose standard, such as data dictionaries, taxonomies, and formatting rules (Principle 7). Most of the standards also contain data exchange standards, such as the PDTF and OSCRE Industry Data Model also having JSON schema to support data exchange (Principle 8).

However, not all the standards are openly accessible, with restrictions in access for UPRNs/USRNs and for the OSCRE Industry Data Model (Principle 5). Additionally, while there is some interoperability between standards, such as between the PDTF and RDS, or between the Housing Data Standards and OSCRE Industry Data Model – they are not all collectively interoperable and do not define or format the same data items and messages consistently (Principle 9). Improving this interoperability, as well as the accessibility and adoption of the chosen standards will be important for enabling Smart Data schemes.

6.4 Future adoption of Smart Data

Currently, despite the sizeable amounts of data sharing taking place in the property sector, it is a long away from being able to implement successful Smart Data schemes – both for property transactions and otherwise. While customers can share their data with third parties, this is almost never machine-readable data, as data providers do not make it accessible in such a format. Instead, participants share data in either physical or electronic form (via emails, PDFs, or other electronic documents). Until this is resolved, it will not be possible to implement or create data standards in such a way as to enable Smart Data.

Improvements in digitisation

A key barrier to adopting data standards and implementing Smart Data schemes in the property sector is the lack of existing data digitisation. The current level of digitisation among many participants, particularly with respect to data providers, prevents the adoption of common standards and digital data sharing. Ensuring data is easily findable, accessible, and available in an electronic, timely and machine-readable format will be crucial for ATPs to provide timely and accurate services to customers.

Smart Data schemes therefore require digitisation of data, by data holders, to reduce the current burden of data collection on third parties and other participants in the home-buying process. Schemes will also require improvements in digitisation among transaction intermediaries and other participants, if the data is to be exchanged seamlessly once initially collected between relevant parties.

The scale of the digitisation problem is substantial. Private and public sector organisations are likely to incur substantial costs to upgrade their systems, digitise and standardise their data, and create APIs.[239] While improvements can and are being made, wide scale digital transformation is likely beyond short or medium-term reach.

[239] The PSC Qualitative Research (November 2024)

"We've got 400 case management suppliers to estate agents who would have to redevelop their portal, but once they do that, hopefully if they've done it to the PDTF, those could all be interoperable at that point."
Expert

Additionally, independent of the costs involved, several stakeholders reported a reluctance amongst some private sector players to invest in digitisation. Given the extent of the challenges in the property sector, companies have created business models based on reducing the burden of the challenges on the homebuyer and seller. For instance, some conveyancing search companies hold private databases of information necessary for property searches and sell access to this data for a fee. If this data is made more accessible at source, the value of such a service would be diminished.

"Many of the systems in place are there because there is commercial interest in maintaining friction, rather than removing it"
Authorised third party

Research participants suggested other reasons for a reluctance to digitise included concerns around liability and risk and entrenched organisational resistance to change.[240] These difficulties in encouraging digitisation in the private sector meant that research participants felt improvements to digitisation should start with key government-held datasets such as Land Registry and Local Authority data, which would release benefits to customers and - potentially - encourage private sector organisations to do the same.

"Whenever there's change, you've got 10% in the vanguard chomping at the bit and 10% kicking and screaming. Then you've got the vast majority in the middle waiting to see which way to jump, and they need convincing"
Expert

TA6 forms

Within home-buying, research participants pointed out that the mandated use of the Law Society's TA6 (Transaction) form creates a pain point for machine-readable data exchange. The TA6 form contains legal details on a property, provided by the seller, and is currently completed and exchanged through either paper-based or electronic means. TA6 forms are required for almost all property purchases.[241]

Whilst the Buying and Selling Property Information (BASPI) and the PDTF can store and share the data required in the TA6 form in a machine-readable format, participants nonetheless must manually complete a TA6 form when completing a property transaction. The requirement creates a non-digital step in what could otherwise be – in theory - a frictionless digital exchange.

[240] Challenges and opportunities of digital innovation for the UK property market (June 2024) Open Access Government
[241] Transaction (TA) forms | The Law Society (Accessed November 2024) The Law Society

Meanwhile the Law Society considers the TA6 form to be intellectual property, and gains fees from licensing the form to solicitors. Resolving this lack of interoperability will be necessary to ensure Smart Data schemes that aim to promote a frictionless home-buying process.

> *"The Law Society were concerned that their IP for the TA6 would be impacted by its pre-population [using the BASPI]. They wanted to have a form, so even if you get the BASPI dataset complete, you need to take the data out of there and put it into the TA6"*
> ***Data processor***

Requirements for data standards to support Smart Data schemes

Supporting data standard adoption

For Smart Data schemes to be established in the property sector, digitisation needs to be complemented by broader adoption of data standards. While existing standards, whether this is the PDTF for home-buying, or other standards for broader use cases, could go some way to supporting Smart Data, adoption of these standards is limited, and organisations are unfamiliar with the process of standardisation. For instance, while some interviewees expressed that the PDTF was an appropriate data standard for supporting Smart Data in home-buying, they reflected that its limited adoption precluded it from underpinning Smart Data schemes in the immediate term. Currently, adoption is limited to only some transaction intermediaries and solution providers and to use the standard they must transform the data that they receive from data holders to adhere to this standard themselves.[242]

Given the scale of the challenges facing the property sector, many interviewees expressed that they would like to see further government support to promote both digitisation and adoption of data standards within the sector – viewing this as the best way to increase adoption among sector participants. For Smart Data, this would align with the Open Banking approach. As HMLR progress with their plans to create machine interpretable data and move towards a geospatially enabled register, they will need to identify and implement data standards that meet user needs and interface with existing industry work, which could lead to broader adoption of standards.

> *"Land Registry have more power than they are willing to use in this process. If they chose to dictate data standards as a prerequisite for providing a title, people would adopt the data standards"*
> ***Data processor***

The DPMSG, formed in the summer of 2023 to drive crucial change in the land and property market, has also prioritised the digitisation of key property system data sets and the sharing of information using an open protocol – allowing transparency and supporting innovative new consumer-friendly digital services as part of its work programme roadmap. As a coalition of key industry partners across the property market, the DPMSG could act as a vehicle to accelerate the adoption of common standards, by bringing disparate stakeholders together under a shared vision.

[242] The PSC Qualitative Research (November 2024)

"It [adoption of standards] would be a lot easier if we have government's support…There are just so many disparate stakeholders."
Authorised third party

Enabling broader Smart Data use cases within the property sector

The variety and complexity of data in the property sector means that seeking to apply a single standard for the capturing and sharing of property data is unlikely to be feasible.[243] There are already many different standards in place across the sector; ensuring visibility and working toward interoperability (for example ensuring a common data dictionary so that values can be correctly interpreted by ATPs) between standards will be crucial to enable complex use cases.

A use-case agnostic data model would ensure that data maintains the same definition, format, message structure and place within the data taxonomy, ensuring it can be reliably interpreted, and combined with other sector data, by ATPs to benefit customers.

"The long-term vision for the property market is that there should be a single data model owned by the market that everyone works to. Then there are use cases where industry experts define what should be used [from the data model] for the use case"
Expert

To an extent, the PDTF is underpinned by a use case agnostic model with its alignment to the RDS. However, the purposefully high-level nature of the RDS means that use case standards, like the PDTF, that are based on it may still require bespoke tailoring to achieve their objectives and therefore may not be fully interoperable.

This presents a challenge. There are already diverging standards emerging, for example, the HACT Housing Data Standards and the PDTF. While the PDTF is based on RDS, the HACT Housing Data Standards are based on the OSCRE Industry Data Model, resulting in different data definitions.

For instance, for data defining property type, the HACT standards breaks the data down into a primary code (related to its sector – i.e. agriculture) and then a sub code (related to the type of building – i.e. terraced house). In contrast, the PDTF breaks the data down into 1 of 550 different options, such as Option 1) Terraced house, or Option 184) Serviced Office. Data elements that are common between both standards, such as property type, are therefore defined and inputted differently. This makes it more difficult to combine datasets based on these different standards, although still possible – using AI, manual data cleaning, or other means.

"If you look at something like the length of a lease that's left on a building, then it's useful for building safety information, for home-buying, for letting and for local authorities to regulate landlords. Either all four of those are driven by the same data model or they are

[243] The role of standards in enabling a data driven UK real estate market (2020), The RED Foundation

completely separate, and completely separate just adds costs into the system"
Expert

Longer term, a common data model supporting the property sector, that accounted for the variety of use cases for property data, would be an important enabler of broader Smart Data schemes.

Standards to support cross-sector interoperability

Several of the existing standards across the property sector will help enable cross-sector smart data schemes. The UPRN will allow any property that is involved in the sharing of data through a Smart Data scheme to be easily identified by the third party. Single identifiers such as the UPRN are not only adoptable by participants in the sector, but also interoperable across sectors, as they can be combined with other unique identifiers to link broader datasets together.

Similar interoperability can be achieved through use of ISO 20022 for information transfers completed as part of the home-buying process. It will ensure that structured data is shared in property transactions and allows this data to be aggregated and shared with data associated with Open Finance schemes.

7. Expanding Smart Data in the retail sector

7.1 Introduction

The UK retail sector contributed £110.4 bn (or 4.7%) to the UK's total economic output in 2023. For every pound spent in 2023, 40 pence was spent on food; 11 pence in clothing shops; and 7 pence on household goods.[244] For this research we have primarily focused on retailers who sell consumable goods, for example leading UK supermarkets.

Retail is viewed as a priority sector for Smart Data due to the quantity of data that customers produce on a regular basis through their retail transactions. Retailers routinely collect, store, and analyse this customer data, with this including names, addresses, purchasing behaviour, spending patterns, and product preferences.[245] For online shoppers, this can include their browsing behaviour, click-through rates, and time spent on individual pages. Martin et al (2020) has forecast customer data collected by retailers to increase 142 zettabytes, from 33 zettabytes in 2018 to 175 zettabytes by 2025.[246] Retailers use this information for various organisational benefits, for example using spending patterns to better target sales and marketing strategies.

Enabling customers to access the data that they produce via their interactions with retailers is anticipated to provide broader benefits to individuals and society. In aggregated form this data has already proven powerful – for example researchers have used loyalty card data from two UK high street retailers to identify potential early indications of the onset of ovarian cancer.[247]

This section explores how the current state of supermarket data sharing may be able to enable these benefits on a wider scale and what additional work is required for this to be achieved. The current state of the grocery retail market does provide opportunities for Smart Data, as large supermarkets have high levels of digitisation and use numerous existing product data standards to support their business operations. However, standards that could support customer data sharing are lacking, and incentives for retailers to standardise and share commercially important customer data would be required for successful Smart Data schemes.

7.2 Existing data sharing and digitisation within the retail sector

Product data

The retail sector has widespread data sharing for information on products and supply chains. Up until the point where products arrive on shelves, product data has been generated, stored and shared throughout its entire journey, starting at the point of initial production. Much of this data is shared electronically. Organisations generating, storing and sharing information include supermarkets, logistics and shipping companies, government organisations, and the producers of the product itself.

Customer data

Whilst product data sharing is widespread, customer data sharing within the retail sector is limited. While retailers do share customer loyalty card data with partnered data analytics companies, who analyse it on their behalf and sell anonymised data insights to other brands, there is more limited

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[244] UK Parliament Commons Library (Accessed November 2024)
[245] Loyalty pricing in the groceries sector (November 2024) Competition and Markets Authority
[246]

data sharing on behalf of the customer.[248] Retailers view customer data as their own intellectual property, given it is key to their data analytics and business operations. These commercial sensitivities mean that accessing this data, either by academics or individual customers, can be challenging.[249]

With regards to Smart Data style sharing, our research participants told us that while some retailers are open to allowing screen-scraping on their websites, there is limited engagement with third parties on allowing them to have more granular and seamless access to consented customer data. This includes retailers declining to participate in this research.

> *"They are extremely protective of what they see as their IP [intellectual property], the data they have on each user, which they believe is something they should not have to share ."*
> ***Authorised third party***

Despite this reluctance, interviewees explained that retailers are aware of the likely direction of travel towards increasing levels of customer empowerment and customer access to their data. Whilst not improving the access of third parties to customer data in the immediate term, retailers are nonetheless engaging in conversation with third parties, to remain competitive should customer expectations further shift.

7.3 Existing data standards within the retail sector

While data standards do not exist to enable retailers to share customer data on the customer's behalf, numerous data standards do exist to support the identification of products and the standardised sharing of product data. The primary organisation developing these standards is GS1, who provide standards for identifying products, capturing information, and sharing information. These standards provide an essential foundation to Smart Data, but further work will be required to repurpose existing standards and develop new ones.

GS1

GS1 is an international organisation that sets standards to support the identification of products and the sharing of product data throughout the supply chain in a standardised form. GS1 standards are widely adopted across the supply chain, used to distinguish products, logistics units, assets and relationships from the manufacturer to the customer. An example of these standards is the Global Trade Item Number (GTIN) (the number underneath a product barcode) – used by over 2 million retailers worldwide.[250] GS1 separate their standards into standards that identify products and places, standards for capturing information, and standards for sharing information.

> *"GS1 is the common standard for industry to use and has been for many years"*
> ***Expert***

GS1 standards that identify products and places

[248] Loyalty pricing in the groceries sector (November 2024) Competition and Markets Authority
[249] Dietary Patterns Derived from UK Supermarket Transaction Data with Nutrient and Socioeconomic Profiles (2021) Nutrients
[250] GS1 UK | Get a barcode for Retail (Accessed December 2024) GS1

GS1 provide 12 different identifiers for the retail, healthcare, and other industries – predominantly to support identification across the supply chain and to enable trading partners to share data between themselves.[251] Some examples of identifiers that support the retail industry include:

1. The GTIN, which identifies types of products – such as a can of soup or chocolate bar
2. The Global Location Number (GLN), which identifies locations to improve the efficiency of the supply chain – such as companies, warehouses, factories, stores.
3. Global Shipment Identification Number, which identifies logistics units delivered to a customer together.

These standards all build familiarity among retailers for adopting standardised identifiers to their products, locations, and cargo, and enable trading partners and organisations to know they are speaking of the same type of thing. However, they are not sufficient to support Smart Data.

To illustrate this, GTINs are formed of two parts. The first is a company prefix, allocated by GS1. The second part is an item reference number, which is chosen by the retailer.[252] As the item reference number part of the GTIN therefore has no meaning outside of the retailer or manufacturer's internal system, it cannot be used consistently by third parties to identify a specific type of product. Using just the number, third parties would be able to identify the company related to the product, but not the product itself – unless they knew what the item reference number corresponds to.

The same combination of a company prefix and an internally allocated reference number applies for the Global Location Number[253] and the Global Shipment Identification Number.[254]

While the identifiers themselves do not support the linking of datasets from different organisations, the company prefix element that underpins the GS1 standards is standardised and logic based. Upon joining GS1, companies are licensed with a unique GS1 Company Prefix. This company prefix remains consistent across all 12 GS1 identifiers and is unique to the company itself. This is done to support interoperability and traceability worldwide.[255]

As a unique identifier, the Company Prefix of a GTIN could be linked to an LEI and business financial data, should the retailer also possess an LEI. However, it would not currently be possible to always do the reverse, as companies that do not sell or manufacture physical goods are unlikely to be a member of GS1.

GS1 standards for capturing information

GS1 standards for capturing information include barcodes which allow organisations to encode product information, shipment identifiers, and batch numbers – supporting industry to track products through the supply chain. GS1 provide different barcodes for supporting product identification at retail point-of-sale (EAN/UPC barcodes and GS1 Data Bar) and barcodes for use in distribution and logistics, but prior to retail point-of-sale (ITF-14 and GS1-128. All these barcodes contain the product's GTIN, but can also contain information on expiry date, product weight, batch number and others.[256]

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[251] GS1 UK | Standards that identify (Accessed December 2024) GS1 UK
[252] Global Trade Item Number GTIN (Accessed December 2024) GS1 Australia
[253] An Introduction to the Global Location Number (GLN) (April 2024) GS1 US
[254] An Introduction to the GSIN (2013) GS1 US
[255] GS1 UK | What is a GS1 Company Prefix? (Accessed December 2024) GS1 UK
[256] GS1 UK | Standards that capture (Accessed November 2024) GS1 UK

As barcodes are a visual, machine-readable representation of data, they allow GTINs and other product information to be transferred, upon being scanned, from product to computer system.[257] However, this does not resolve the third party identification issues of a GTIN, or the fact a machine-readable barcode does not support Smart Data, as the information held in the computer system on the product would need to be able to be sent in machine-readable form.

GS1 standards for sharing information

GS1's standards for sharing information are their category of data standards that are most relevant to Smart Data. Within GS1's standards for sharing information, they provide standards for sharing master data, transaction data, event data, and product data as well as the data exchange standards themselves.[258] Some of GS1's standards for sharing information include:

1. Global Data Model: Designed to harmonise the exchange of product information between organisations.
2. Global Product Classification: Enables products to be grouped into categories, based on their relationship to other products and their properties.
3. Electronic Data Interchange: Standards for electronic business messaging, ensuring the accurate transmission of relevant data between partners.

Among these, the Global Data Model is of particular importance to enabling Smart Data. Sharing standardised product information, based on a customer's purchase history, will be key to enabling a variety of Smart Data use cases. The Global Data Model seeks to define a globally consistent set of foundation product attributes and improve data accuracy throughout a customer's omnichannel purchasing experience – and so aligns closely with Smart Data requirements.[259]

The Global Data Model is a recent innovation by GS1, with work initiating in 2018, and so does not have global adoption.[260] Until it attains broader adoption, the standard could not easily be leveraged for Smart Data, although the expected benefits of a standard data model for product information may support uptake.[261]

Alignment with design principles

GS1 provides a range of standards that underpin the UK retail sector and global supply chains, and the importance of these standards can be seen in the Ubiquitech and Mealia use cases in **Appendix 2: Use Cases**.

These standards meet many of the design principles suggested in this work: they have been developed specifically to meet industry data requirements (Principle 1), they have an established owner (Principles 2 & 3), have been developed with a clear understanding of data landscape (Principle 4), are accessible (Principle 5), flexible (Principle 6), and contain most of the necessary elements of a fit-for-purpose standard (Principle 7). GS1 standards also have associated data exchange standards, including associated JSON schema files (Principle 8).[262]

However, these standards do still have limitations for supporting Smart Data. The standards use unique identifiers which are not universally interpretable and additional granularity may be required to enable Smart Data (Principle 9). The following section provides more detail on the need to

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[257] GS1 UK | How does a barcode work? (Accessed December 2024) GS1 UK
[258] GS1 UK | Standards that share (Accessed December 2024) GS1 UK
[259] Global Data Model | GS1 (Accessed December 2024) GS1
[260] Data excellence call for action (2018) GS1
[261] Consumer companies can improve the omnichannel experience by standardizing product data (2020) McKinsey & Company
[262] GS1 Standards enabling the EU digital product passport (September 2024) GS1 Europe

create explicit Smart Data standards as well as the need to further encourage retailers to share customer data.

7.4 Future adoption of Smart Data

Aside from the reluctance of retailers to share customer data, interviewees reported that the retail sector is well placed to adopt Smart Data schemes. There is already widespread data sharing to support supply chain logistics, standardisation of product information, and customer data is widely digitised and used for analytical purposes to support business operations.

Encouraging data sharing

Stakeholders we spoke to felt that big retailers have relatively good digital infrastructures, as part of the digital sharing of logistics information and the need to provide online stores to customers. Shifting customer expectations toward online shopping have required retailers to move away from legacy systems and modernise their processes. The UK is particularly advanced with regards to online shopping, with 27% of all retail sales taking place online,[263] which is forcing legacy retailers to build e-commerce practices and improve their digital infrastructures.[264] This digitisation provides some of the technical foundations to enabling standardised approaches to data sharing.

Building on this technical foundation will require retailers to increase their willingness to share data related to a customer's habits. This could be achieved through a government mandate or due to further changing customer expectations, with retailers increasing access to data to stay competitive.

> *"I think the reason why all the big supermarkets have had conversations with us and shown some interest is because it's pretty clear to them that there's going to be the involvement of third parties in that process"*
> ***Authorised third party***

Creation of Smart Data standards

Stakeholders reported that retailers already operate a degree of standardisation 'by default' for their product data.

Much of the data displayed for products, such as nutritional information, is required by law.[265] Despite no common data standard, there is therefore consistency in the data fields, and definitions, used across different retailers. For both mandatory and optional information, the format of the data is also standardised (at least in how it appears to customers), as customers expect to see it displayed in a consistent manner. For example, the UK traffic light system for nutrition is not required but has been adopted for many products across major retailers.[266] One stakeholder told us how this general consistency of product data across supermarkets made the screen scraping required for their service easier to do effectively.

This consistency of product information displayed on the front-end of online shopping likely reflects a degree of consistency in how product data is stored by retailers. Even if internal data structures and formats differ, the data fields and definitions are likely to be very similar, if not the same.

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[263] Retail sector in the UK (December 2024) House of Commons Library
[264] Rebooting retail: How technology will shape the future of retail (June 2020) McKinsey & Company
[265] Nutrition labelling (Accessed December 2024) Food Standards Agency
[266] Check the label | Food Standards Agency (2020), Food Standards Agency

"I think the only thing that standardises things are required by law, so things like nutrition information… The market means that most consumers want a consistent shopping experience regardless of which supermarket they shop from. We end up with very similar ways of structuring [the data], even though I don't think it is done in a connected way"
Authorised third party

Existing standardisation of product information for display will support the creation of data standards for product information, as retailers will be able to coalesce around shared definitions and information required. However, stakeholders pointed out that other required data, such as stock levels and local availability, may be more difficult to create into a consistent standard as non-product information may be defined and used differently across retailers. Our third-party stakeholder told us that this lack of consistency in defining and displaying local availability forces them to do extensive computational work that would otherwise be avoided through an API.

Enabling the creation of Smart Data standards and encouraging data sharing will require government leadership. Currently, no organisation is directly responsible for governing or supporting the sharing of customer data in the retail sector. Possible departments and regulators who could be involved in some form include the Department for Business and Trade, Department for Environment, Food & Rural Affairs, Office for Product Safety and Standards, Groceries Code Adjudicator, Competition and Markets Authority, and the Food Standards Agency. Establishing the governance and responsibilities of these organisations within the context of retail Smart Data will be an essential enabler.

Appendix 1: International approaches to Smart Data

Whilst the UK has led the way in implementing open banking, other countries are developing increasingly innovative approaches to sharing consumer data. Countries such as Australia and Brazil are following the UK and EU's regulation-led approach, whilst the US and Japan have followed alternative approaches to developing Smart Data ecosystems.

1. Australia's Consumer Data Right (CDR) framework

In Australia, the concept of Smart Data, or the authorized sharing of customer data with third parties upon the customer's request, is primarily governed by the Consumer Data Right (CDR) framework. This framework, first introduced in 2019, empowers consumers to share their data with accredited third parties, to access better deals on everyday products and services[267].

The Australian government plans to roll out CDR on a sector-by-sector basis. Currently active in banking and energy, it will next be expanded to non-bank financial services.[268] The vision for CDR expands beyond open banking, and coverage is wider – whilst the UK CMA order only applied to the nine largest institutions, CDR requires small institutions licensed as Authorised Deposit Takers to comply.[269] However, it is worth noting that the expansion of CDR has faced delays due to high costs of implementation and low uptake.[270]

CDR relies on robust data standards maintained by the Data Standards Body (DSB) within the Australian Treasury. These standards are developed in consultation with the Australian Competition and Consumer Commission (ACCC) and the Office of the Australian Information Commissioner (OAIC) who are co-regulators of the CDR.[271] These open standards set out both the high-level principles that the CDR standards should meet, alongside the detailed API specifications, security profile and consumer experience standard requirements for both Data Recipients and Data Holders. CDR standards can be separated into cross-sector standards that all participants need to meet, such as customer experience standards, security standards, common definitions and API standards, which underpin the sector specific standards for more bespoke data.[272]

2. Open Finance in Brazil

Brazil has made strides in the implementation of Smart Data schemes. Its instant payment system Pix is used by 143 million citizens, over 70% of the country's adult population, and had 13 million companies (79%) registered by April 2024.[273] Brazil has gone beyond the scope of Open Banking within the UK, with implementation of Open Finance, including data from current accounts, payments, savings, investments, insurance, pensions, and foreign exchange,[274] making it a global leader in the development of Open Finance ecosystems.[275]

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[267] What is CDR? (accessed October 2024), CDR.GOV.AU
[268] Consumer Data Right (CDR) legislation and compliance (2024), KPMG
[269] Open data for SME finance (2020), Bank of England
[270] Albanese Government to reset Consumer Data Right | Treasury Ministers (August 2024) Ministers Australian Treasury
[271] Consumer Data Standards Australia (accessed October 2024)
[272] Introduction – Consumer Data Standards (Accessed November 2024) Data Standards Body
[273] Brazil's Digital Transformation: Paving the Way for Inclusive Prosperity (2024), Connected by Data
[274] Open Finance in Brazil completes two years with 15 million customers and defined evolutionary agenda (2023) Banco Central Do Brasil
[275] Industry experts predict Brazil will be a global leader in Open Banking (2022), Intelligent CIO

A key element driving Brazil's progress is the Lei Geral de Proteção de Dados (LGPD), which sets legal standards for personal data protection and privacy.[276] With similarities to GDPR, the LGPD mandates data portability as a principle, giving users the right to obtain their personal data in a structured and commonly used format, such that they can transfer data between service providers easily. Meanwhile the Brazilian Civil Rights Framework for Internet Use (commonly known as Marco Civil da Internet) promotes compliance with open technology standards that allow for communication, accessibility and interoperability between applications and databases.[277]

As per the UK's Open Banking system, the development of Open Banking Standards introduced by the Brazilian Central Bank has enabled new use cases. These standards ensure interoperability through enabling financial institutions to share customer data (with consent) through defined APIs and according to common data formats that facilitate data portability. Adoption has surpassed that of the UK, in June 2023 Brazil saw 4.8 billion successful API calls, quadruple that of the UK's 1.1 billion.[278] The system has been designed in phases, gradually expanding the scope of the data made available and the organisations involved.[279]

3. The US' market driven approach

Unlike the UK, Australia and Brazil's regulation-driven approach, which mandates banks to share customer data with ATPs, the US model for Open Banking has historically been driven by the market. In this context, customers are increasingly aware of the ability to control their data, and demand transparency into how their data is being used.[280]

However, the US may be shifting towards a more regulatory-led approach for the roll-out of Open Banking. In 2021, The Consumer Financial Protection Bureau (CFPB) was requested by the White House to intervene in the banking market to improve competition.[281] A consequence of this was CFPB's proposal for a Personal Financial Data Rights rule, with this outlining the ability of ATPs to access a consumer's data on their behalf. This rule also requires data providers to establish a developer interface, capable of receiving requests for consumer data and making that data available in electronic form to any authorised third parties.[282]

The rule also supports developing industry standards to support data standardisation. However, in contrast to other regulatory led approaches, much of this standard-setting is expected to take place outside of regulatory frameworks and be led by an independent standard setting bodies[283].

Despite the Personal Financial Data Rights rule, regulatory intervention remains limited. Section 1033 of the Dodd-Frank Act, which enables the data-access rights rule, is not clear on whether the CFPB is legislatively empowered to promote Open Banking and sector interoperability, with this leading to the market driven approach that characterises US Open Banking.[284]

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[276] Brazil - Data Protection Overview (2024), OneTrust DataGuidance
[277] Data Portability, Interoperability and Competition – Note by Brazil (2021), OECD
[278] Open Banking in Latin America (2024), Mastercard Services
[279] *Ibid*.
[280] FinTech and Bank Partnerships will boost open banking in the US (2024), PYMNTS
[281] GC-Open-Banking-Lessons-from-EU.pdf (laweconcenter.org) (2024) International Center for Law and Economics
[282] Notice of Final Rulemaking - Required Rulemaking on Personal Financial Data Rights (2024) Consumer Financial Protection Bureau
[283] Laying the foundation for open banking in the United States (2023), CFPB
[284] Open Banking Goes to Washington: Lessons from the EU on Data-Sharing regimes (2024), International Centre for Law and Economics

In this market driven context, there are nonetheless the hallmarks of the Open Banking approach found in regulatory-driven markets. While still prevalent, screen-scraping has declined by a third since 2019, replaced instead by APIs, with some degree of standardisation.[285] The broad strength of Open Banking in the US, independent of serious regulatory intervention, prompt some stakeholders to question the merit of additional government involvement.

4. Japan's Data Free Flow with Trust (DFFT)

While Smart Data adoption in Japan is more limited, Japan has developed an overarching concept called the 'Data Free Flow with Trust' (DFFT), which aims to ensure the cross-border flow of data to solve business and social issues, where borders may be organizational, institutional, regional, as well as national and international.[286] DFFT aims to reconcile two related policy objectives: promoting free data flows to foster economic growth, whilst protecting individual privacy, national security, and intellectual property through trusted regulations.[287] Whilst not restricted to Smart Data, it therefore shares similar aims and could include Smart Data within its remit. In Japan, the government has a key role in defining and 'guaranteeing' what Trust means; but individuals and companies also have a lot of choice in what and how they want to share.

After its debut in Davos in 2019, where DFFT was endorsed by members of the G20, countries around the world have been working to establish rules that align with the DFFT concept. The Japanese government has identified two tracks to operationalise DFFT; through trade and regulation. The former is progressing through e.g. hi-standard e-commerce rules in the Japan-US Digital Trade Agreement[288], whilst the latter faces more challenges. Different countries have different approaches to data protection and data trust and agreeing global consensus on e.g. standards that involve security and privacy will take time as international viewpoints differ.[289]

Despite these challenges, DFFT has the potential to complement existing efforts to make national privacy standards interoperable. There are already international guidelines and initiatives – for example the OECD privacy guidelines,[290] and the Asia-Pacific Economic Cooperation (APEC) Cross-border Privacy Enforcement Arrangement (CPEA), which aims to facilitate information sharing in APEC economies.[291] APEC economies including Japan and the United States are championing a Global Cross-Border Payments and Reporting (CBPR) system to globalise the APEC model – all efforts that align with the DFFT concept.[292] There will remain challenges to navigating divergent transatlantic digital privacy standards – in particular compliance with EU GDPR – but as DFFT gains further traction it offers an opportunity to promote international data-sharing opportunities.[293]

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[285] Open Banking Goes to Washington: Lessons from the EU on Data-Sharing regimes (2024), International Centre for Law and Economics
[286] Overview of DFFT (Accessed October 2024), Digital Agency
[287] Operationalising Data Free Flow with Trust (DFFT) (2023), CSIS
[288] Every country has its own digital laws. How can we get data flowing freely between them? (2022), World Economic Forum
[289] *Ibid*.
[290] Privacy and data protection (accessed October 2024), OECD
[291] APEC Cross-border Privacy Enforcement Arrangement (CPEA) (2024), APEC
[292] Global Cross-Border Privacy Rules Declaration (Accessed October 2024), US Department of Commerce
[293] Operationalising Data Free Flow with Trust (DFFT) (2023), CSIS

Appendix 2: Use Cases

The following use cases have been included to test the applicability of the methodology used for assessing data standards; and to illustrate the diversity of data that could be used in Smart Data schemes. These five use cases were chosen through a workshop with the Department for Business and Trade. The workshop selected use cases that were likely to have a high impact across sectors and that would require a variety of different data standards – some existing and some to be developed. The use cases initially formed part of the Smart Data Discovery Challenge and are a mix of existing initiatives which would be improved using Smart Data and initiatives that would be enabled using Smart Data.

1. Mealia

What is the goal of the use case?

Mealia is a retail focused use case which seeks to integrate supermarket data and user's purchasing data to unlock benefits to customers. Currently, customers get very minimal benefit from any of their loyalty card or shopping history data, with supermarkets utilising their data for their own purposes, but being reluctant to share it with them or any third parties.

Mealia would seek to resolve this imbalance and increase data transparency by providing customers with an app that they can connect to their shopping history and loyalty card data – allowing the app to generate insights for them based on their retail data. There are five key areas where Mealia seeks to make improvements for customers:

1. **Health improvements:** Using purchasing data to recommend healthier food options
2. **Cost savings:** Comparing prices in stores and customer spending habits to suggest more cost-effective spending strategies
3. **Increased choices:** Using purchasing data to suggest recipes which match users' preferences and dietary requirements
4. **Waste reduction:** Using product data to encourage users to utilise near-expiry food
5. **Eco-conscious purchasing:** Utilising purchasing data to calculate carbon-footprint and suggest greener alternatives

What data is required for this use case?

- **Customer data:** Purchase history, points and promotions, vouchers and reward usage, payment preferences
- **Retailer stock and product data:** Stock Keeping Unit (SKU), price, ingredients, nutritional value, allergen information, date labelling, preparation instructions

Current state of digitisation and standard adoption

The digital maturity of major retailers, particularly those offering e-commerce and loyalty card services, is relatively high. Retailers already hold much of the data for this use case in digital formats and real-time databases of product information and availability. This data supports their stock management systems, online shopping operations, and customer data analytics, underpinned by robust technical infrastructure. However, retailers are reluctant to share their data with authorised third parties, particularly customer data, which they view as their intellectual property.

Standards that could support this use case are provided by GS1. GS1 provide several standards which are used to identify products and share product information throughout the supply chain, in stores, and at point of sale. GS1 are working to create more product data standards.

What is the current state of the data required?

Data required to enable use case	Sector	Is the data currently available in a digital, machine-readable form?	What appropriate data standards exist?	What is needed to support successful data sharing?
Purchase history	Retail	**No** Online shopping history available, but not in machine-readable form	Requires development	Creation of a data standard and data sharing infrastructure
Points and promotions	Retail	**No**	Requires development	Creation of a data standard and data sharing infrastructure
Vouchers and reward usage	Retail	**No**	Requires development	Creation of a data standard and data sharing infrastructure
Payment preference	Retail/Finance	**Partial**	Open Banking Standard and ISO 20022	Ensure ISO 20022 is applied to payment data in the retail sector
Stock Keeping Unit	Retail	**Partial** Retailers all use SKUs internally, but these are not standardised	Requires development	Creation of a data standard and data sharing infrastructure
Price	Retail/Finance	**Partial** Payment data standardised in Open Banking	The Open Banking Standard and ISO 20022	Ensure ISO 20022 is applied to payment data in the retail sector
Ingredients	Retail	**Partial** Standardised by default, available online but not machine-readable	GS1 Global Data Model	Adapting the Global Data Model to support Smart Data sharing & encouraging adoption
Nutritional value	Retail	**Partial** Standardised by default, available online but not machine-readable	GS1 Global Data Model	Adapting the Global Data Model to support Smart Data sharing & encouraging adoption
Allergen information	Retail	**Partial** Standardised by default, available online but not machine-readable	GS1 Global Data Model	Adapting the Global Data Model to support Smart Data sharing & encouraging adoption
Date labelling	Retail	**Partial** Available online but not machine-readable	GS1 Global Data Model	Adapting the Global Data Model to support Smart Data sharing & encouraging adoption
Preparation instructions	Retail	**Partial** Available online but	GS1 Global Data Model	Adapting the Global Data Model to

		not machine-readable		support Smart Data sharing & encouraging adoption

2. Digital Property Pack (OPDA)

What is the goal of the use case?

The Open Property Data Association aims to significantly improve the current state of property transactions. This would be done through providing homeowners with a digital property pack containing the key information relating to their property.

This digital property pack would be created and updated by Authorised Third Parties and could be used by the homeowner to store and easily share relevant data with the prospective homebuyer as well as legal and financial parties involved in the transaction (conveyancers, lenders, surveyors etc) – significantly reducing the burden of data acquisition and the friction of data sharing on involved parties.

The digital property pack would bring together all the key data needed for a property transaction. This data would be taken from data holders from across the property, energy and utilities, banking and finance sector.

What data is required for this use case?

- **From government:** Titles and deeds, history of ownership, leasehold and ground rent, EPC data
- **Local authorities:** Search data (planning, environmental searches, conservation data), Building safety regulations
- **Private companies:** Utilities, water and sewage, installation and servicing certificates, home insurance, mortgage offers
- **Public companies (e.g. Ordnance Survey):** Property address, UPRN

Current state of digitisation and standard adoption

Currently, digital property packs are provided for customers by several different property technology providers. However, the lack of digitisation and data maturity among property data providers prevents this from operating as needed for a Smart Data scheme. The third-party providers are forced to manually collect the necessary data from data holders, as it is rarely provided in a machine-readable digital format.

The providers of relevant datasets do not work to any common data standards between them, except for those who adopt the UPRN in some capacity. They adopt different structures, formats, and definitions for the data they provide, and this results in data inconsistencies and issues of quality across datasets. This prevents interoperability between datasets.

Common data standards that could support this use case have been developed by industry. In particular, the PDTF provides schema and standards for most of the required data for a property pack. However, these standards require adoption among data providers and organisations collecting and processing the data if they are to reduce inefficiencies.

What is the current state of the data required?

Data required to enable use case	Sector	Is the data currently available in a digital, machine-readable form?	What appropriate data standards exist?	What is needed to support successful data sharing?
UPRN	Property	**Yes**	UPRN	Easier access of third parties to UPRN data
Titles and deeds	Property	**No**	The PDTF provides a data standard for this data, but adoption is limited	Creation of a machine-readable data sharing infrastructure and adoption of common standards
History of ownership	Property	**No**	The PDTF provides a data standard for this data, but adoption is limited	Creation of a machine-readable data sharing infrastructure and adoption of common standards
Leasehold and ground rent	Property	**No**	The PDTF provides a data standard for this data, but adoption is limited	Creation of a machine-readable data sharing infrastructure and adoption of common standards
Local Authority search data	Property	**Partial** Local Land Charges data is digital, although not machine-readable	The PDTF provides a data standard for this data, but adoption is limited	Creation of a machine-readable data sharing infrastructure and adoption of common standards
Utilities	Energy	**Partial** Some private companies may provide it in a digital format	The PDTF provides a data standard for this data, but adoption is limited	Creation of a machine-readable data sharing infrastructure and adoption of common standards
Water & Sewage	Water	**Partial** Some private companies may provide it in a digital format	The PDTF provides a data standard for this data, but adoption is limited	Creation of a machine-readable data sharing infrastructure and adoption of common standards
Energy Performance Certificates (EPC)	Energy	**Yes**	MHCLG EPC Standard	-
Building safety regulations	Property	**No**	Requires development	Creation of a common standard
Installation and servicing certificates	Property	**No**	Requires development	Creation of a common standard
Home insurance	Finance	**No**	Requires development, but could build on ISO 20022 principles	Creation of a common standard
Mortgage offers	Finance	**No**	Requires development, but could build on ISO 20022 principles	Creation of a common standard

3. Hexapower

What is the goal of the use case?

More people and businesses are transitioning from being electricity customers, to “prosumers” who may generate, store and consume their own energy and participate in flexibility or energy efficiency schemes. However, this shift could prove costly and take time. Using energy, financial and building data, Hexapower is developing AI systems that would help customers to find the best way to become “prosumers”.[294]

Hexapower would support customers to choose the best decarbonisation technology for their financial and property circumstances by providing information on decarbonisation assets which form part of the broader local network. This would support customers to reduce their carbon footprint in cheaper, faster, and more efficient ways.

What data is required for this use case?

- **Energy data:** Consumption data (area & household level), DNO connection costs, tariff data
- **Property data:** HMLR data, Geospatial roof spaces data, EPC data
- **Finance data:** Financial profiles/credit scores, banking data, mortgage data, insurance data

Current state of digitisation and standard adoption

Energy sector: In the retail energy sector, data readiness for this use case is high. Consumption data at both the area level and household level is currently standardised through the REC and SEC and accessible for some third parties via API. Tariff data still requires a standard, but the centralised data holders/processors and energy suppliers are in a good position to adopt it should it be implemented. Among Distribution Network Operators, as they have only more recently been required by Ofgem to adhere to common standards and make their data more openly available. Only some Distribution Network Operators have met Ofgem’s deadlines for ‘presumed open’ and data standardisation, while others have not - and so cost connection data is not completely openly available

Property sector: Land Registry data is at varying levels of data maturity, and with the exception of Local Land Charges data, it is not digitally accessible. Geospatial roof data is not openly accessible in most cases. Energy performance certificates (EPC) are provided by MHCLG through their EPC open data service. This data is provided via Open API in a machine-readable format. The only data that adheres to a common standard is EPC data.

Finance sector: Some banking data would be automatically accessible as it could be shared through the current Open Banking framework. Credit scores can be automatically generated by credit reference agencies, but standards would be required if they are to be shared through a Smart Data framework. Mortgage data and insurance data are outside the Open Banking Framework, and apart from a small amount of mortgage data, is not shared in any Smart Data capacity. Insurance companies also lack sufficient digital maturity. The Open Banking Standard and ISO 20022 could be leveraged to support the sharing of this data.

[294] Smart Data Discovery Challenge winners pave the way for new £750,000 prize launch this summer (Accessed November 2024), Department for Business and Trade

What is the current state of the data required?

Data required to enable use case	Sector	Is the data currently available in a digital, machine-readable form?	What appropriate data standards exist?	What is needed to support successful data sharing?
Consumption data (area level)	Energy	**Yes**	Retail Energy Code	Easier access of third parties to consumption data
Consumption data (household level)	Energy	**Yes**	Retail Energy Code	Easier access of third parties to consumption data
Distribution Network Operator (DNO) connection costs	Energy	**Partial** Ofgem have made this a requirement, not all DNOs have yet met this requirement	Data Best Practice Guidance Common Information Model	Remaining DNOs to make relevant data openly available
Tariff data	Energy	**No**	Likely to be standardised through developments to the Retail Energy Code	A standard currently does not exist, but will be created by DESNZ
Land Registry data	Property	**Partial** No data is machine-readable, but some Local Land Charges Data is digitised	Common standards exist, such as the PDTF, but have not been adopted	Land Registry data would need to be further digitised, machine-readable and accessible via API.
Geospatial roof spaces data	Property	**No** Limited accessibility to certain datasets via Ordnance Survey or private providers, but this is not usually in a machine-readable format	Requires development	Creation of a centralised database of roof spaces data and API access
Energy Performance Certificates	Property	**Yes** Provided by MHCLG through their EPC open data service	MHCLG EPC Standard	-
Financial profiles/credit scores	Finance	**Yes** Available digitally through credit reference agencies	Requires development: data standards may be developed by the Credit Reporting Governance Body	Development of standards and data sharing infrastructure
Banking data	Finance	**Yes**	Open Banking standard	-
Mortgage data	Finance	**No**	Requires development, but could build on ISO 20022 principles	Creation of a common standard, building on the Open Banking Standard
Insurance data	Finance	**No**	Requires development, but could build on ISO 20022 principles	Creation of a common standard, building on the Open Banking Standard

4. Ubiquitech

What is the goal of the use case?

Ubiquitech seeks to seeks to streamline the transfer of information through the global supply chain by integrating the electronic tracking of vessel contents and goods ownership into trade finance and banking applications.

The relevant data, such as bills of lading, could be sent digitally in real-time between participants in the supply chain – allowing organisations to react to the data immediately, with benefits such as minimising delays at docks and customs and reducing food wastage. Additionally, this greater transparency will increase the confidence of organisations in the financial sector, releasing liquidity into global finance markets – as the goods in transit can be borrowed against. The transparency would also support the identification of illegal activities and organised crime.

What data is required to enable the use case?

- Shipping and transport data including vessel tracking, containers & manifests, bills of lading, customs declaration data, purchase orders and legal entity identifiers
- Finance data including banking, investment, payment flow credit, insurance, and trade finance data

Current state of digitisation and standard adoption

Shipping data: The legal framework required for this use case has recently been put in place, with the passing of the Electronic Trade Documents Act in 2023.[295] This gives electronic bills of lading the same legal status as paper documents – which will support the electronic tracking of vessels & their containers, as well as integrate with finance data. Furthermore, the Act is based on English Common Law, the legal framework that underpins 80% of trade volume and 60% of trade value in global shipping.[296] This basis would allow most global trade to adopt electronic bills of lading, supporting supply chain participants to participate in the efficiency improvements of this use case.

However, Electronic Trade Documents Act has no requirements for adoption. Additionally, despite the basis in English Common Law, for the data exchange to occur seamlessly between international companies and organisations, it would require agreement on the laws around the exchange and handling of data, with it being likely that some countries would have to amend their data protection and exchange provisions.[297] Finally, the Electronic Trade Documents Act places no requirements that the documents should be sent in a machine-readable format, meaning not only are there inefficiencies in sharing data in PDF, or Word, or other electronic form, but also issues of interoperability between documents and data corruption risks.

Finance data: The current ability to seamlessly exchange finance data is only possible for current accounts and payments data. As such, the use case could only access banking and payment flow data in a frictionless machine-readable format. The other sources of finance data would require the creation of common standards and improves in digital infrastructure to be shared.

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[295] UK economy to receive £1 billion boost through innovative trade digitalisation act (July 2023) GOV.UK
[296] Seizing the moment — Unleashing the potential of trade digitalisation (2024) ICC United Kingdom
[297] The PSC Qualitative Research (October 2024)

What is the current state of the data required?

Data required to enable use case	Sector	Is the data currently available in a digital, machine-readable form?	What appropriate data standards exist?	What is needed to support successful data sharing?
Vessel tracking	Shipping and transport	**Partial**	Requires development	Further work by ICC on global trade data standards
Containers & manifests	Shipping and transport	**Partial**	Requires development	Further work by ICC on global trade data standards
Bills of lading	Shipping and transport	**Partial.** Electronic Trade Documents Act developed but no requirements for adoption or machine-readability	Requires development	Further work by ICC on global trade data standards
Customs declaration data	Shipping and transport	**Partial**	Requires development	Further work by ICC on global trade data standards
Purchase orders	Shipping and transport	**Partial**	Requires development	Further work by ICC on global trade data standards
Legal entity identifiers	Shipping and transport	**Yes**	ISO 17442-2020	Full adoption of LEI among trade participants
Banking	Finance	**Yes**	Open Banking standard ISO 20022	-
Investment	Finance	**No**	Requires development, but could build on ISO 20022 principles	Creation of data standards for investment data
Payment flow credit	Finance	**Yes**	Open Banking standard ISO 20022	Full adoption of ISO 20022 in payment systems
Trade finance	Finance	**Yes**	ISO 20022	Full adoption of ISO 20022 in trade finance systems

5. Project Perseus

What is the goal of the use case?

Project Perseus is a use case which seeks to improve the ability of small & medium sized enterprises (SMEs) to accurately measure and report their carbon emissions.

Currently, SMEs account for around half of the country's greenhouse gas emissions from businesses but are hampered by a lack of a common process and approach to emissions reporting. This causes difficulties down the chain, with banks and other corporations receiving low quality data and inaccurate estimates from SMEs, preventing them from meeting their regulatory requirements around financed emissions and in providing green finance to SMEs to help them, in turn, reduce their carbon emissions.

Project Perseus will reduce these challenges and inefficiencies through automating the access of third parties to SME electricity data, particularly in the form of Smart Meter electricity consumption.

This will remove the burden of reporting and assure the quality of emissions data, supporting banks and lenders to meet their sustainability regulatory requirements around investments and financial services to SMEs. It will also support SMEs to access green finance.

What data is required to enable the use case?

For the greenhouse gas emissions of SMEs to be accurately reported, there are a few key datasets that are required. For electricity data, these are as follows:

- Consumption data
- Tariff data
- Consumption metadata
- Tariff metadata

Current state of digitisation and standard adoption

In terms of implementing the use case, significant progress has been made by Icebreaker One and their coalition, made possible due to the strong state of data readiness and substantial data sharing already taking place in the energy sector.

This strength is seen when sharing data between customers and energy suppliers, with this occurring entirely digitally and according to common standards. The transfer of electricity consumption data is done by either ElectraLink, through their Data Transfer Service, or through Smart DCC's network. This processing of data enables both organisations to provide the data to third parties via API. Much of the relevant information is already shared digitally between participants in the energy sector, as well as external third parties. The quality of data is assured in this process, with it adhering to a common standard and able to be shared in a machine-readable format.

What is the current state of data required to enable the use case?

Data required to enable use case	Sector	Is the data currently available in a digital, machine-readable form?	What appropriate data standards exist?	What is needed to support successful data sharing?
Electricity consumption data	Energy	**Yes**	Standardised through either the REC or the SEC	Easier access of third parties to this data
Electricity consumption metadata	Energy	**Partial**	The REC for non-smart meter metadata. No existing standard for smart meter metadata Elements of this metadata, i.e. MPAN, are already standardised	Creation of a data standard for smart meter metadata/system data. Also, easier access of third parties to this data
Tariff data	Energy	**No**	Requires development	A standard currently does not exist, but will be created by DESNZ
Tariff metadata	Energy	**No**	Requires development Elements of this metadata, i.e. MPAN, are already standardised	A standard currently does not exist, but will be created by DESNZ

Appendix 3: Standards referenced

Sector	Data standard	Data covered	Link to standard
Cross-sector	ISO 20022	Standard for creating interoperable financial messages, with cross-sector potential	ISO 20022 | ISO20022
Finance	The Open Banking Standard	Outlines the data standards and technical standards for Open Banking	Standards Home - Open Banking Standards
Finance	Legal Entity Identifier	Business identifier for use in financial transactions	Home – GLEIF
Finance	Pensions Dashboards Programme Data Standards	For standardising pensions data sent to a pension dashboard	Data standards | Standards | UK Pensions Dashboards Programme
Energy	Meter Point Administration Number	Identifier for electricity meters	What Are MPAN & MPRN?
Energy	Meter Point Reference Number	Identifier for gas meters	What Are MPAN & MPRN?
Energy	Retail Energy Code	Standard for electricity data messages	The REC Codes - REC Portal
Energy	Smart Energy Code	Standard for smart meter data	DCC User Interface Specification Message Mapping Catalogue
Energy	Uniform Network Code	Standard for gas data messages	UNC Document | Joint Office of Gas Transporters - Gas Governance
Energy	Energy smart appliances standard (proposed)	Proposed standard for energy smart appliances	Delivering a smart secure electricity system
Energy	Tariff data standards (proposed)	Proposed standards for time of use tariff	Smart Secure Electricity Systems Programme: tariff data

		and standard electricity and gas tariffs	accessibility for flexibility services
Property	Property Data Trust Framework	Standard for data related to home-buying	Property Data Trust Framework · GitHub
Property	Royal Institute of Chartered Surveyors Data Standard	High level JSON schema that can support data transfer for different property use cases	RICS Data Standard Release Notes
Property	Unique Property Reference Number	Unique identifier for addressable locations	AddressBase | Data Products | OS
Property	Unique Street Reference Number	Unique identifier for streets	OS Open USRN | Data Products | OS
Property	Open Standards Consortium for Real Estate Data: Industry Data Model	Data model for different property use cases	Introducing the Data Model
Property	UK Housing Data Standards	Standards for data collected in the UK social housing sector, based on OSCRE	UK Housing Data Standards | HACT
Retail	GS1 Standards	Assortment of industry standards that help identify products and standardise product information	GS1 UK | Standards

Appendix 4: Participating organisations

With thanks to stakeholders from the following organisations who participated in the qualitative research and made contributions.

Organisation	Sector
Bank of England	Cross-sector
CILEX	Property
Coadjute	Property
Conveyancing Association	Property
Council of Licensed Conveyancers	Property
Council of Property Search Organisations	Property
Ctrl-Shift	Cross-sector
Data for London	Cross-sector
Department for Energy Security and Net Zero	Energy
Department for Science, Innovation, and Technology	Cross-sector
ElectraLink	Energy
FDATA	Finance
Financial Conduct Authority	Finance
Friday Initiatives	Cross-sector
GS1	Retail
HM Land Registry	Property
HM Treasury	Finance
Horizon Zero	Finance
HSBC	Finance
Icebreaker One	Energy
Innovate Finance	Finance
Law Society	Property
Mastercard	Finance
Mealia	Retail
Money and Pensions Service	Finance
Moverly	Property
NatWest	Finance

OBConnect	Cross-sector
Ofgem	Energy
Open Banking Ltd	Finance
Open Data Institute	Cross-sector
Open Property Data Association	Property
Open Standards Consortium for Real Estate	Property
Ozone API	Finance
Propertymark	Property
Raidiam	Cross-sector
Real Estate Data Foundation	Property
Residential Logbook Association	Property
Santander	Finance
Smart DCC	Energy
SSE	Energy
The Investments and Savings Alliance	Finance
Ubiquitech	Cross-sector
UK Energy Research Council	Energy
UK Fin+ Network	Finance
UK PropTech	Property

Appendix 5: Required elements of a data standard

The below table illustrates different elements of data standards. We have gathered this list to support those involved in the creation of new standards to find good practice examples.

Elements of a standard	Example	Example description
Data dictionary	Account and Transaction API Profile - v4.0	The Open Banking Standard provides data dictionaries for each of its API specifications, providing definitions for each of its data items
Data taxonomy	ISO 20022 Message Definitions | ISO20022	The downloadable Message Definition Reports on the ISO 20022 visually shows the hierarchical relationship between different message items. For instance, the message element <Account> is formed of numerous sub-message items, such as account name, type of account, account status.
Data ontology	Business Model | ISO20022	The ISO 20022 Business model outlines the relationships between different business concepts.
Format of data inputs	Energy Market Data Specification MPAN Core - Retail Energy Code	The Energy Market Specification places rules on how data items should be returned and formatted. For each datatype, it gives a definition of the datatype and the data that should be returned, and in what format it should be returned (i.e. string, number, Boolean). The result of these rules is visible on the REC website. For the data item MPAN Core, the REC specifies it should be a max length of 13 digits and in number format. You are required to create an account to view the Retail Energy Code.
Data exchange format (JSON schema)	GitHub - Property-Data-Trust-Framework/schemas: Open data schema for digital residential property data exchange	The PDTF provide open access JSON schemas for all relevant property forms and data messages sent between participants. Once the schemas have been populated with data, they can be sent via API between participants.
API specifications	Technical standards | Standards | UK Pensions Dashboards Programme	The Pensions Dashboards Programme and Open Banking provide Open API specifications, which describe the format

	API Specifications - Open Banking Standards Describing RESTful APIs with OpenAPI 3 - GOV.UK OpenAPI Specification - Version 3.1.0 | Swagger	of the API and how to get responses from the API. These API specifications are built based on the OpenAPI 3 Specification.
Unique Identifiers	ISO 17442-1:2020 - Financial services — Legal entity identifier (LEI) — Part 1: Assignment Payment Initiation API Profile - v4.0	Unique identifiers, like the LEI, are important for representing a single data item consistently across datasets, which can be used to link the datasets. The Open Banking Standard uses the LEI as a unique identifier, and it is referenced in the standard.
Standardised common attributes	ISO - ISO 8601 — Date and time format ISO - ISO 4217 — Currency codes ISO - ISO 3166 — Country Codes Meter Reading Date - Retail Energy Code	For attributes that will be common across shared data, such as consumer name or date & time, a standardised approach should be taken. Examples of standards that do this are the ISO 8601 standard (standardises date and time), ISO 4127 (standardises Currency Codes) & ISO 3166 (standardises Country Codes). Date and time are referred to using ISO 8601 in the Retail Energy Code.

Appendix 6: Literature review – key word search terms

Key words	
Overarching key words: Data standards	
Combined with (by terminology):	**Combined with (by sector)**
Smart Data	(Open) Finance
Data portability	(Open) Energy
Consumer Data Right	(Open) Property
	(Open) Retail