DIGITAL REGULATORY REPORTING

# Digital Regulatory Reporting

## Phase 2 Viability Assessment

BANK OF ENGLAND

BARCLAYS

FCA FINANCIAL CONDUCT AUTHORITY

CREDIT SUISSE

LLOYDS BANK

HSBC UK

Nationwide Building Society

NatWest

Santander

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**Disclaimer**

The views expressed in the following paper are not representative of the views of the Financial Conduct Authority and Bank of England. They represent the individual views of the DRR team and so should not be taken as an indication of future regulatory direction. The numbers were generated for this report through limited industry surveys and therefore only act as an indication of industry cost rather than a complete picture.

# 1 Executive summary

Regulatory reporting has become an increasingly complex and consequently expensive part of a financial service firm's operations. Regulatory reporting can also create difficulties for regulators, in particular where inconsistent data affects their ability to efficiently and effectively regulate, supervise and monitor firms and markets. In 2018, the Financial Conduct Authority (FCA) and Bank of England (the Bank) established the Digital Regulatory Reporting (DRR) project. The overall aim of this work is to explore how technology could make it easier for firms to meet their regulatory reporting requirements and improve the quality of information they provide to the regulator. Two subsequent pilots have been completed (Pilot Phase 1 & 2). The pilots represent a collaboration between the two UK regulators and Barclays, Credit Suisse, HSBC, Lloyds, Nationwide, Natwest and Santander.

This Viability Assessment reflects the work undertaken in this second phase of the pilot, but also draws on the learnings and insights from Phase 1. The focus of Phase 2 of the DRR pilot was partly to gather information and conduct analysis to provide decision makers with information to determine whether continued investment in DRR is warranted and to identify any gaps that need closing before any potential implementation, while also exploring potential technical solutions for DRR. A series of high-level primary and secondary objectives were agreed between participants (the DRR team) to guide the outcome of Phase 2:

## Priority Objectives

**1** Assess economic viability of DRR from a participant organisation, industry and economy-wide perspective

**2** Explore possible third-party solutions for the generation of machine executable regulation and the definition of data and how they may fit into the DRR vision

**3** Further develop and test processes for definition of data and creation of machine executable regulation developed in phase 1.

## Secondary Objectives

**1** Understand what regulatory reporting processes and reports could be implemented using a DRR solution, including:

**a.** which regulation is suitable for the creation of machine executable regulation

**b.** what data could be included in the standardised interface between a firm and a DRR system

**2** Understand the extensibility and relationship of data models defined for different domains

## 3 Understand challenges and possible paths for implementation and adoption of the DRR vision.

The DRR team gathered information from a variety of firms to understand not only the burdens of regulatory reporting but also the processes and costs involved in meeting regulatory reporting requirements. Firms were found to generally understand these costs through the lenses of run and change costs. From this survey information, the cost of regulatory reporting in the mortgage domain for a large regulated firm was estimated at an annual average of £450,000 for run and a further £700,000 on change related costs in addition to technology costs which were excluded, because it was too difficult to attribute a specific amount to regulatory reporting. Depending on the firm, mortgage reporting may represent a small proportion of its overall regulatory reporting obligations and so the annual cost of meeting all reporting requirements will be substantially higher.

This phase of DRR also showed the biggest cost drivers for the current approach were inconsistent interpretation of regulations (and its disambiguation), the time needed to prepare and create reports (particularly in response to ad-hoc reporting queries) and the time spent on communication and query management. Whilst there were other costs that were not gathered (such as the costs of developing new regulation), the information provided a base from which the costs and benefits to firms of implementing DRR under different scenarios could be estimated. The analysis showed a significantly reduced period for firms to make a return on investment if DRR were to reuse pre-existing third-party data standards and technical solutions and if the implementation were aligned with regulatory change initiatives.

A DRR approach would require the regulator to publish a digital (machine-executable) version of their regulatory rules. Ideally, the production of these digital rules from the current natural language version of the rules would be automated, making the subsequent component of the approach (standardising the description and identification of data) easier. To further this approach, a set of requirements any solution (an existing product already available, or one newly built for the purpose) would need to be able to perform to realise the DRR vision needed developing. These meant the solution had to work for all firms, be built on open standards and agnostic of technology, capable of being scaled and extended robustly and, finally, be transparent to both firms and regulators.

The research undertaken revealed there was no current solution that met all requirements. However, the market is evolving and solutions may well be developed in the future. Some solutions met some of the requirements. Others failed because they were built on proprietary standards or required an unproven, nascent technology.

The option of developing a purpose-built solution was also explored. However, as there are several different approaches, all of which potentially change the business case for DRR, as well as the potential path to implementation, there was no one preferred approach. Further work is required in subsequent phases of DRR to recommend an preferred approach.

To develop this Viability Assessment, 5 key areas which are significant in determining the savings and costs from setting up and then adopting DRR were explored. These included which aspects of the DRR vision should be delivered, and in what order; which reporting areas (or domains of data) should be implemented, and again, in what order. The differences between the current process and a potential DRR process were analysed. The DRR team concluded after analysing the cost data that DRR showed sufficient promise to warrant continued investment and exploration.

This paper does not make a single recommendation as to how DRR should be implemented, but instead have developed a series of implementation scenarios which model what the impact could be in the UK mortgage reporting domain. This area was selected because significant work had already been done on the mortgage domain in Phase 1 and previous techsprints, there were a number of subject matter experts in the DRR team and both the FCA and BoE have a shared interest in mortgage data. These scenarios are presented in this Viability Assessment, along with the participants' assessment of the efficiencies firms would gain for both run and change costs based on the surveys undertaken. This analysis shows that the standalone viability of DRR (limited to just mortgage reporting) is likely to be low. However, when modelling its extension to two other reporting domains, benefit realisation was expected to be faster for firms. Since it would depend on the precise reporting areas selected, this assumption would need to be validated as part of next steps, once the extension domains are agreed.

It is proposed that further investment in analysing the business case for DRR would be worthwhile. In order to increase understanding of the costs of DRR, testing some of the ideas in more realistic environments (such as using live data) would be useful. Doing so would start to uncover the inevitable issues with setting up and running DRR for live regulatory reporting. It would also allow the regulators and industry to keep developing the ideas and solutions.

Although the work to date does not come to an overall conclusion on the best implementation option for DRR, from the work conducted some key conclusions have been developed. These are:

- Digitising regulatory reporting rules may lead to other benefits, such as increased transparency of regulation, which is a priority for firms.
- The lack of standardisation of the definitions and descriptions of data by firms is a significant barrier to improving both firm processes and exploitation of new analytical techniques.
- Open standards, that are technology agnostic, may increase competition and reduce the cost of implementing DRR, however they also increase the complexity of implementation and (potentially) the cost of setting up DRR.
- Although the team did not find a current solution in the market that met all articulated needs, they note the market place is evolving quickly, suggesting that this may change in the future.
- There remains a degree of uncertainty over the best technical solution, and the team suggest further investigation in warranted in the next phase of DRR.
- The decision on which reporting domains to select for further work in the next phase will impact the overall business case.
- The business case for DRR is strongest when implemented for multiple domains and aligned to change initiatives already occurring at firms.
- Re-using industry data and technical standards could significantly reduce the cost of implementation for DRR.

# 2 Context and background

## 2.1 The challenges in regulatory reporting

The volume of regulatory reporting has increased significantly in the decade since the global financial crisis. Many regulated firms have found that reporting has become more complex and time consuming. Much reporting takes the form of firms submitting structured regular reports, while the number of ad-hoc data requests have also grown. These intermittent requests can be particularly challenging and time consuming, since compliance with them can be very difficult for firms to automate.

The aggregate cost of providing data is significant. The Summary Report of the Public Consultation on the Fitness Check on Supervisory Reporting[1] estimated most firms' regulatory reporting costs are around 1% of total operating costs. Industry feedback suggests that the cost of building or changing reports tends to be higher than ongoing run costs. The total burden on industry is therefore likely even higher than that quoted in the European Commission's report.

The report cites several reasons why supplying regulatory reports is increasingly expensive (see figure 1). The process of populating a regulatory report with the correct data can be challenging for a firm. The full set of instructions for compiling a report can be spread across different pieces of interlinking regulation. The wording of a rule might be unclear or difficult for firms to understand. Sometimes this reflects the challenge of writing a set of instructions that must be understood and implemented by approximately 60,000 firms in the UK alone. In other cases, firms need to make judgements, which mean it is difficult to provide definitive, unambiguous requirements. For international firms, subject to multiple regulatory regimes, the process is yet more complex. They may have to submit differing reports to each regulator even when the regulatory reports contain similar underlying data.

1 European Commission (2018). Summary Report of the Public Consultation on the Fitness Check on Supervisory Reporting having taken place from 1 December 2017 to 14 March 2018. https://ec.europa.eu/info/sites/info/files/2017-supervisory-reporting-requirements-summary-report_en.pdf

***Figure 1 - An analysis of the key areas causing regulatory reporting cost***

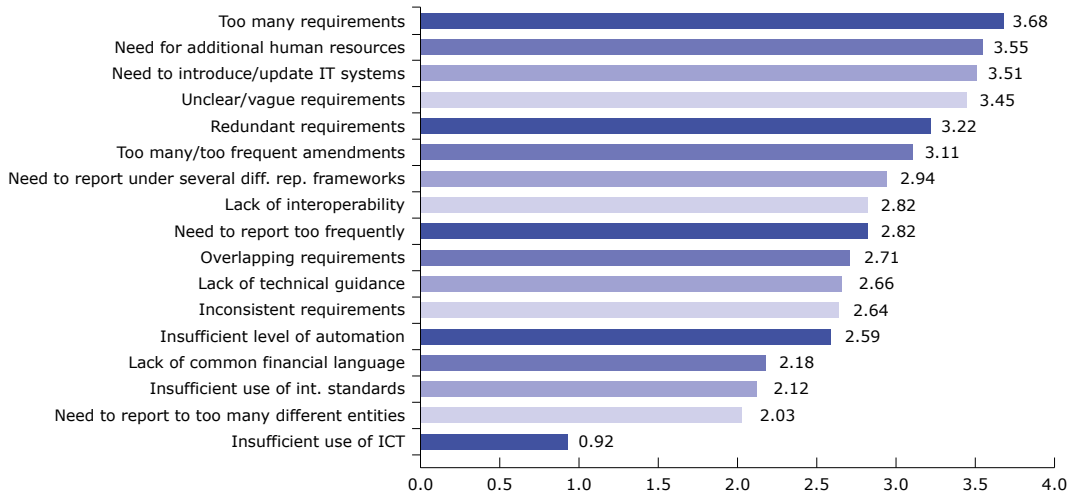



Figure 1: The European Commission's research asked almost 400 firms to rank the factors that contribute to compliance cost in terms of supervisory reporting on a scale of 0 (not at all a source of costs) to 4 (very significant source of costs).

Interpreting the instructions incorrectly can have serious legal, operational and financial consequences. To reduce this risk, many small or mid-sized regulated firms buy external professional services to help them interpret the requirements correctly. Larger firms are more likely to have in-house compliance teams dedicated to these tasks.

Where possible, firms seek to meet their reporting obligations by building or buying reporting systems. Doing so reduces the costs of providing regulatory reports. However, some critical regulatory reports still involve many manual processes – making these reports particularly expensive to produce.

Poor regulatory reporting process also can create difficulty for regulators. Inconsistent or poor quality regulatory data can affect their ability to effectively supervise and monitor financial markets, identify harm and detect financial crime.

Addressing these challenges has been a recent focus for industry and regulators alike. In Europe, initiatives like the Banks Integrated Reporting Dictionary (BIRD)[2], Integrated Reporting Framework (IReF)[3] and the European Banking Authority's Data (DPM)[4] are examples of industry attempts to improve and standardise the reporting process. Several other authorities around the world have announced initiatives along similar lines.[5] One of the most developed initiatives today exists in Austria, where industry and the Austrian Central Bank have worked together to build a central reporting utility called "AUREP"[6].

2 https://www.ecb.europa.eu/stats/ecb_statistics/co-operation_and_standards/reporting/html/index.en.html
3 https://www.ecb.europa.eu/stats/ecb_statistics/co-operation_and_standards/reporting/html/index.en.html
4 https://eba.europa.eu/regulation-and-policy/supervisory-reporting/data-point-model-dpm-
5 For instance, the US Consumer Financial Protection Bureau (CFPB) and Commodity Futures Trading Commission (CFTC), the Monetary Authority of Singapore (MAS), the Hong Kong Monetary Authority (HKMA) the Japan Financial Services Agency (JFSA) and the Philippines Central Bank (BSP).
6 https://www.oenb.at/dam/jcr:d9cdbe0a-a6d4-409a-8ac5-670cad2619b0/05_Kienecker_Statistiken_3_18.pdf

## 2.2 Unlocking regulatory reporting in the UK

The work that led to DRR began with an FCA TechSprint (hackathon) in November 2016 that explored the idea of digitising reporting instructions, with reference to an agreed data model. This idea was further explored in a November 2017 TechSprint on 'Model Driven Machine Executable Regulatory Reporting' – run jointly by the Bank and FCA. At that TechSprint, a proof of concept was developed which demonstrated that a small set of reporting instructions could be converted into machine executable code. Machines then used the code to automatically carry out (execute) the instructions, pulling the required information directly from a simulated version of a firm's systems. While the high-level process developed at the TechSprint demonstrated the approach had merit, further investigation was required to develop the concept.

During 2018, specialists from the financial regulators collaborated with members from across the innovation, data, technology and reporting functions of six large financial firms[7] on a 6-month pilot on 'Digital Regulatory Reporting'[8] (DRR Pilot Phase 1). The participants researched how firms and regulators could use technology to make the current process of regulatory reporting more accurate, efficient and consistent. This included exploring the broader implications of potential technological solutions and developing a vision for what regulatory reporting might look like in the future.

The DRR Phase 1 Pilot showcased how to automate the reporting process by making changes in three areas:

- Standardising the description and identification of data
- Digitising reporting instructions
- Improving the efficiency of report generation

### *Standardising the description and identification of data*

Currently some firms use multiple terms or identifiers to describe the same data. The metadata firms hold about their data was not designed to meet the needs of regulatory reporting. Firms often rely on subject matter experts or key individuals to understand the data they have. In the DRR vision, firm data are digitally tagged and identified according to agreed data standards. This means the same data can be identified easily across firms and systems.

### *Digitising reporting instructions*

Currently, reporting instructions are primarily published in natural language. Firms and reporting software vendors convert those instructions, where possible, into code. This process can be difficult since the instructions may be hard to interpret to the legally untrained. Where data standards exist, regulators do not always reference them in their reporting instructions, partly because the standards do not necessarily cover the full range of data required in a report and in some cases due to limitations in the EU legal framework. In the DRR vision, a coded version of reporting instructions are published by the regulator. The instructions reference the data standards agreed with the firms. Depending on the form of implementation, the natural language version may also be published or may be replaced by a structured, machine executable version.

7 Barclays, Credit Suisse, Lloyds, Nationwide, NatWest and Santander

8 FCA (2018). *Digital Regulatory Reporting Pilot - Phase 1 Report.* https://www.fca.org.uk/publication/discussion/digital-regulatory-reporting-pilot-phase-1-report.pdf

***Improving the efficiency of report generation***

Currently, reports are compiled by firms using their own systems or systems purchased from software vendors. These reports are submitted to the regulator. In the DRR vision, reporting systems are designed so they can consume the digital regulation published by the regulator, identify and collate the data required and provide it to regulators. It may be possible for these activities to occur in a fully automated "straight through process" or for additional control or governance procedures to be instigated to enable appropriate human oversight.

## 2.3 DRR Pilot Phase 2

The work of DRR has been focussed on building prototypes and exploring at a high level how they may work in practice. However, the path from prototype to production is a long one. To take the next step along that path, broader engagement from firms and regulators is needed, not just pockets of interested individuals and departments. Furthermore, putting any of the ideas of DRR into practice would involve strategic investment decisions and business change.

During Phase 2, the business case for DRR began to be analysed.

This analysis started with a discussion of costs. Data were collected and analysed about the current costs of reporting. The findings on costs are presented in Section 3. It should be noted that the cost-benefit analysis will depend materially on choices about how DRR is delivered. The key decision areas for implementing DRR and key factors to consider when making those decisions were identified. These options are presented in Section 4. A key decision area would be what technical solutions are chosen to implement DRR. Understanding if DRR was technically feasible was a focus area for DRR Pilot Phase 1 and continued to be so for DRR Pilot Phase 2. However, this Viability Assessment also summarises the exploration of the technical feasibility of DRR in Section 5. To analyse the costs and benefits of DRR, a number of assumptions about how DRR may be delivered were made. These assumptions and the initial analysis of the possible costs and benefits of DRR are presented in Section 6. Finally, several assumptions were made to design alternative implementation scenarios. This allowed the impact of major delivery decisions on the business case to be analysed. These scenarios and the accompanying analysis are presented in Section 6.

Much of the analysis presented here is focussed on mortgage and derivatives reporting. This is not because DRR would only be relevant to those reporting domains. Mortgage and derivative reporting were good use cases to help focus and guide analysis: both are areas where there is a lot of regulatory reporting; both are areas of interest to the Bank and FCA; and either mortgages, derivatives or both were of interest to every participant in the pilot.

# 3 Developing a baseline for reporting costs

## 3.1 Approach to collecting cost data

Initial activity related to understanding current costs. This provided a baseline to understand the key activities influencing costs and allowed the participants to identify significant expenditure items which may be appropriate priorities for targeting cost-efficiencies.

Following this, several data gathering exercises were undertaken. These were specifically aimed at collecting information on ongoing operational costs, as well as understanding the effort required for and impact of delivering regulatory changes.

Data were collected from two broad regulated groups: (a) large banks, specialist lenders and challenger banks (eleven in all) and (b) small to medium-sized firms (126 respondents).

The most detailed data were compiled by the large firms, and these focussed on the costs of different domains of reporting, the overall costs of regulatory reporting, mortgage reporting and/or derivatives. Not all the respondent firms submitted costs for each of these subsets.

Respondents were asked to estimate overall average annual resource costs related to technology (servers, storage and software), as well as staff costs standardised as FTEs (Full-Time Equivalents) per year. The FTE values were converted to monetary values using an agreed scale.

These data were used to identify which aspects of the reporting process were relatively more expensive. Respondents were asked to provide information to estimate the costs that arise during each stage of the reporting process:

- Interpretation - reviewing and establishing what the regulation means for the firm, translating the regulatory requirements into IT requirements, any associated staff training and validation processes
- Data Preparation - sourcing and integrating data from different systems and reviewing for completeness and accuracy
- Report Production - transforming data by applying the appropriate calculations, checking for and resolving errors, and signing off the report for submission
- Communication - transforming reports into the format required for submission and sending the output to regulators
- Queries –handling both internal queries prior to submission as well as queries received from regulators after submission.

The assumptions made when completing the data templates were also identified.

A less detailed[9] online survey was prepared for smaller firms, which was sent to the FCA's regular news update 'RegRoundup' (approximately 100 responses received), with a modified version sent to members of UK Finance[10], an industry association (which generated additional responses). To reduce the time firms needed to spend on compiling figures, the data were requested in cost bands, rather than exact values. This constraint, together with the relatively low number of responses, therefore limits the interpretation of the data received from these surveys.

## 3.2 Survey results

To preserve confidentiality, average costs are presented. Estimating and isolating components of costs is difficult: firms are structured in different ways and may choose to centralise or outsource certain activities. This should be considered when interpreting the data, where averaging masks some of the variability that exists between individual firms.

### *Mortgage reporting by large firms*

The data were used to estimate that large retail firms, which collectively account for 60% of the mortgage market[11], spend an annual average of £450k on meeting their ongoing mortgage reporting obligations and a further £700k[12] on responding to new obligations and requests for additional mortgage data. Two-thirds of these costs are related to data preparation and report production. These estimates cover human resource costs and do not include the costs of associated technology infrastructure, which proved difficult to cost for regulatory functions alone. To this end, further analysis needs to be done on specific technology costs of regulatory reporting as these will impact the business case.

A subset of firms completed detailed surveys for both mortgages and overall regulatory reporting[13]. Comparing the results between the surveys showed that mortgage reporting accounted for around 5-10% of total regulatory reporting costs.

***Table 1 – Estimated mortgage reporting costs for large firms***

**Estimated mortgage reporting costs £'000k by large firms (values rounded to nearest £50k or nearest 5%)**

| | Estimated operational costs | % of operational costs | Estimated change costs | % of change costs | Estimated total costs | % of total costs |
|---|---|---|---|---|---|---|
| Interpretation | <£50 | 5% | £150 | 20% | £200 | 15% |
| Preparation | £150 | 30% | £200 | 25% | £300 | 30% |
| Production | £200 | 40% | £250 | 40% | £450 | 40% |
| Communication | <£50 | 5% | <£50 | 5% | £50 | 5% |
| Queries | £100 | 20% | £50 | 10% | £150 | 10% |
| **Total** | **£450.00** | | **£700** | | **£1,150** | |

9 A shorter version of the reporting steps used for large firms, which included: interpretation, production, communication and queries. There were slightly different questions asked in the UK Finance version.

10 Asked for information about outsourced activities, and costs associated with recent regulatory changes.

11 UK Finance (2017). Largest mortgage lenders 2017 – challengers and specialists lead the way. https://www.ukfinance.org.uk/blogs/largest-mortgage-lenders-2017-%E2%80%93-challengers-and-specialists-lead-way

12 There was significant variability in cost estimates for change, such that the larger estimates were around three times those of the smaller estimates.

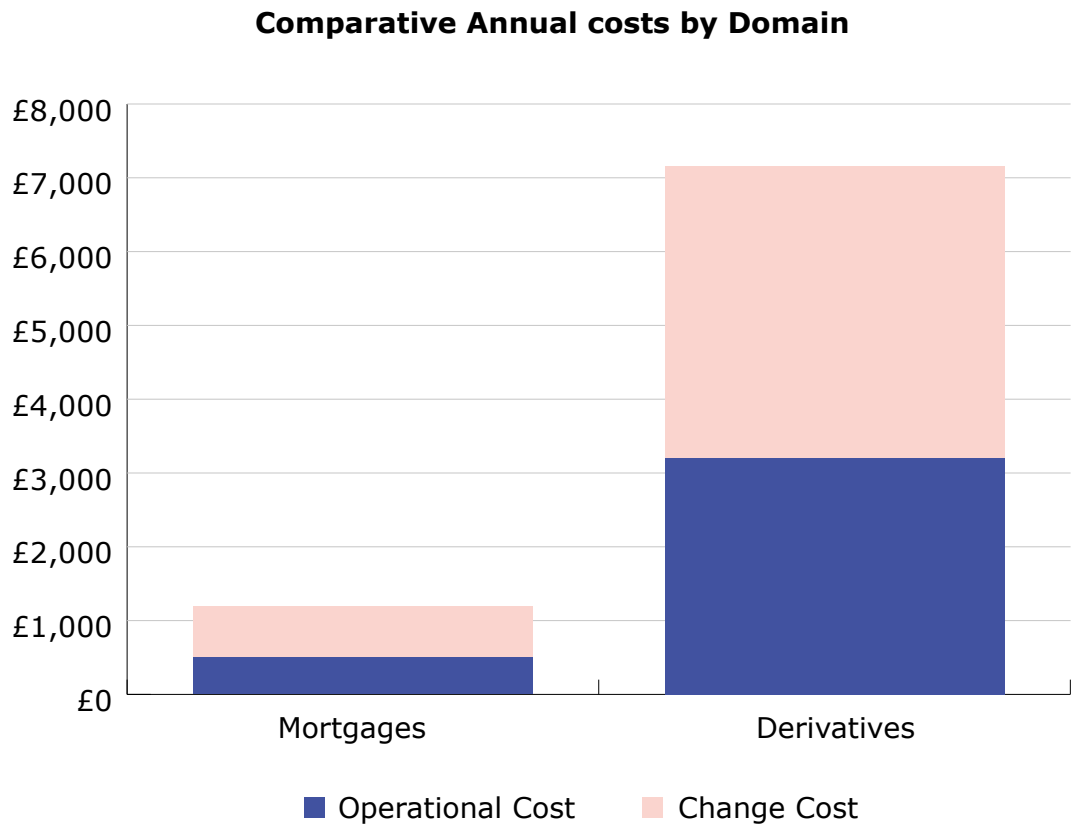
13 There were insufficient responses for particular firm types for us to publish average costs for all regulatory reporting.

### *Derivatives reporting by large firms*

Four firms were also surveyed about the cost of reporting transactional derivative data. The results showed an average annual spend of £3.25 million on regulatory reporting run costs and £3.85 million on reporting-based change. These costs relate to FTE cost in this domain, and do not include the full range of technology costs.

Based on this limited sample, average derivative reporting costs are around six times higher than those for mortgage reporting. There are several reasons why this may be the case. The international nature of derivatives trade means firms may submit reports to more regulators – UK firms surveyed submitted reports to an average of seven jurisdictions, whereas mortgage costs are estimated for reporting to the Bank and FCA only. Submitting similar reports to many regulators also increases the cost of regression testing, as a change for one regulator requires the system to be tested for submissions to all regulators. Differences in cost may also arise due to differences in the core systems, reporting mechanisms and processes and the level of detail in the information provided. On the other hand existing, widely adopted, standards for operational derivative data help simplify derivative reporting.

***Figure 2 – A comparison of mortgage reporting costs within large UK based firms vs associated costs of derivatives reporting***



### *Small and medium-sized firms*

Data were collected about the ongoing costs of meeting reporting requirements from small and medium-sized firms via online surveys. Firms responding to these surveys[14] were grouped into the following asset value bandings:

| Firm SME Type | Asset Size Up To |
|---|---|
| Micro Firm | £1m |
| Small Firm | £100 m |
| Medium Firm | £15 b |

The limited number of survey responses for this group[15] reduced the amount of analysis that could be performed. In summary:

- Most medium-sized firms have an annual regulatory reporting costs of more than £1m (run and change costs)
- Most small firms have run and change costs between £50k to £250k
- All micro-sized firms have annual regulatory reporting costs below £50k

With a single exception, all the micro and small firms have fewer than 10 FTE staff in a regulatory reporting function, with associated costs that do not exceed £250k.

## 3.3 Other insights

Follow up conversations with both medium and large firms who submitted the surveys also resulted in several qualitative insights.

When regulatory changes are required, the complexity of internal data sources largely determines how quickly firms can respond. 'Industry-wide' regulations are interpreted and applied individually within each firm, and the speed of response also depends on the extent to which reporting is outsourced and the size of internal compliance teams.

Respondents suggested a key cost driver for reporting is the use of manual processes where reporting steps cannot be automated. Operational staff were thought to spend most of their time on Data Preparation (assembling the underlying data required to create the report), and Output Production (applying the calculations to create the report's data and signing of that the data are correct).

The Data Preparation step was also cited as expensive due to the presence of multiple legacy systems that are the ultimate source of data.

The reasons why change costs are notably higher than operational costs were explored. Firms responded that this is partly because regulatory change has a knock-on impact on normal operations as expertise and resources is diverted to meet the requirements.

14 Of the firms that responded, 126 sets of data were useable, and included in this analysis

15 The two versions of the survey were slightly different, and total response rates low

It was found that different firms included different activities within "change" costs – there was not consistency across the respondent firms. Big, infrequent changes resulted in substantial project costs that were generally clearly defined, tightly constrained and consistently categorised as "change". However, firms also need to make smaller changes, which introduce incremental costs that may be included as "operational" costs.

There was an initial aim to take the two sets of current costs derived from the mortgage and derivatives responses and extrapolate these to form a baseline cost for all reporting domains. However, by the end of the pilot, it became apparent that it would not be possible to extrapolate our quantitative findings to other types of reporting. This was mainly due to variation in the costs of different types of reporting across domains.

Nonetheless a key insight from these discussions suggests that, like mortgage reporting, the majority of time and effort is spent on Data Preparation and Report Production regardless of which report is being produced.

# 4 Options for delivering DRR

Analysis was undertaken on the key decision-making areas for implementing DRR. The hypothesis was that decisions made in these areas would materially change the business case for DRR. The options for implementing DRR were broken into six high-level decision-making areas:

1. Which reports and domains of data would be included and when;
2. which firms, regulators and other parties would participate;
3. which aspects of the reporting process would firms, regulators and other parties be accountable and responsible for;
4. how compatible would the new DRR process for data collection be with existing reporting processes;
5. which aspects of the DRR vision would be delivered and in what order, and;
6. whether participants in DRR need to invest in new solutions or whether there are existing third-party solutions that could meet their needs.

The results of the analysis of the first five questions are presented in this section. The last question was explored in more depth as part of evaluating whether DRR would be technically feasible. A summary of findings in that area is presented in Section 5.

## 4.1 Reports and data domains

The Bank and FCA collect varied data across a range of report types. These data are varied in nature, its purpose, and the level of aggregation or granularity. Therefore, the type of reports and domains of data included in an implementation of DRR would impact the business case.

The analysis suggests the benefits of DRR may be wider the more domains of reporting DRR it is applied to (see Section 7). This is partly because the DRR vision depends on standards being developed for data and digital regulation; while the benefits of standardisation may increase the more widely they are applied. Finally, the benefits of DRR may disproportionately come only when all reporting for a specific domain transitions to the new DRR approach.

Some reports and areas of data may be easier to roll out than others. The pilots were focussed on UK mortgage reporting since the Bank and the FCA receive several reports of structured mortgage data from sizeable populations of firms. As part of DRR Phase 2, the ease of rolling out DRR for financial accounting data was explored. The analysis suggested it may be harder to deliver savings in this area, though anecdotal evidence from the work on costs suggested financial accounting was a relatively costly reporting domain. The reasons for both the potential and limitations of creating machine executable versions of accounting reports are outlined below:

Positives for accounting data:

- It is possible to implement some of the accounting definitions found in Capital Requirements Regulation (CRR) Annex V in MER

- Around half of the definitions that are provided in the Financial Reporting regulation (FINREP) can be traced directly back to definitions in accounting standards
- Where terms are defined in the reporting instructions, these often ultimately depend on other accounting definitions.

Limitations for accounting data:

- The data points defined in FINREP in the reporting instructions cannot be broken down to a contract level
- Sometimes the rules that may map a term to another term cannot be coded unambiguously
- Data often contains manual adjustments applied at an aggregate level that DRR cannot code centrally.

This suggests choosing the right area to roll out reporting would have an impact on the business case for rolling out DRR.

## 4.2 Participants in DRR

There are a large number of UK-regulated institutions that report financial data to the Bank and the FCA. A wide range of institutions report data – from global insurance firms to smaller, one person, independent financial advisors. The FCA and the Bank are not the only authorities that UK financial firms report data to. Some are subject to reporting requirements from authorities around the world. As the analysis of the cost of derivative reporting shows (see Section 3), meeting one set of regulator's reporting requirements can also have a knock-on effect on the cost of meeting another regulator's requirements.

Differences in firm structure may mean including some firms and not others; which in turn may change the business case. The firms involved in DRR are relatively similar in size and structure. However, some firms may find reporting more burdensome than others – for instance, not all firms submit all 10 of the mortgage reports included in the DRR cost surveys. Newer firms may not experience some of the legacy issues that can increase costs and complexity for older firms (see Section 3). This may mean the benefits of DRR would be lower, however it may also mean that setting up DRR would be less onerous.

## 4.3 Operating model

For UK financial reporting, the Bank and FCA are accountable for writing reporting requirements. Firms are accountable for supplying the correct data to the FCA and Bank. This process often includes converting the reporting instructions into executable code. Both the UK financial regulators and firms also rely on third party vendors to carry out parts of the reporting process.

Decision makers would need to decide whether the implementation of DRR would require a central body and if so what form that central body should take. Rolling out DRR would require developing and maintaining common standards and potentially also common technology platforms. These common activities could in theory be carried out by the regulators. However, firm involvement in the process of developing and maintaining these common elements would likely be required to deliver more value and greater efficiency

than if firms were not involved. To coordinate and carry out joint activities between firms and regulators, a central body may need to be set up. However, doing so may also result in an additional cost to setup and run that body.

Responsibility and accountability for aspects of the reporting process would need to be decided if DRR was implemented. These decisions would impact the cost and benefits of a DRR implementation. For instance, due to the rules that govern reporting, it may be harder for firms or a third parties to gain the full benefits of writing digital regulation. The regulators may be best placed to carry out this function[16].

## 4.4 Backward compatibility

The Bank, the FCA and other authorities already collect large volumes of regulatory data. They have invested in systems and processes to collect and analyse that data. Firms have already invested money in systems and processes to deliver that data. Changing those systems and processes will add cost, while the benefits of a new method for collecting those data which regulators already receive may be lower.

A key decision area would be whether an implementation of DRR only applied to new reports or also replaced existing reports. Using the DRR process to create existing reports may reduce the costs to firms and regulators of setting up DRR. However, it may also decrease the benefits DRR may bring. If DRR replaces existing reports, it would need to be decided if DRR runs in parallel with existing reporting processes for a period or a direct switchover from one process to the other is implemented. Whilst a likely scenario could be for DRR to run in a parallel "test phase", running dual processes to submit the same information is more costly and might create additional risks, complexity and compliance issues.

The analysis undertaken suggests the business case for DRR may be stronger if it is delivered as part of a major change or new set of reporting rules (see Section 7). Firms and regulators would already be investing in reporting change, so the viability threshold for DRR could be based on a direct comparison between delivering change in the established current process or under DRR – with no need to account for the costs of reforming existing reporting.

On a related issue, decision makers would need to decide if reports should be compatible with existing systems for collecting data (such as the FCA's GABRIEL system or the BoE's BEEDS system), or whether changes to data collection systems would be needed. For instance, changes would be needed if DRR included some of the technical options that were explored during DRR Pilot Phase 1 - such as moving to an API-based pull model of reporting or using a DLT-based mechanism to exchange data.

16 Once a regulation is published, there are strict rules about the process for changing or amending a regulation. These rules mean that process can be long and difficult. By writing the digital regulation at the same time as the natural language regulation, issues in converting the natural language into its digital form can be corrected at source. However, only regulators have the ability to change or amend the regulation before it is published.

## 4.5 The components of DRR

The DRR vision aims to transform reporting by changing three components of the current process:

- Digitising reporting instructions
- Standardising the description and identification of data
- Improving the efficiency of report generation

The components of the DRR Vision are related and somewhat interdependent, however they could be implemented separately. They could also be sequentially implemented, with the delivery of one component triggering the delivery of another.

The full DRR Vision involves all three components interacting seamlessly, with minimal human interaction where possible. However, within each component there is the option to consider less-than-full automation and to adjust the scope of the component's application. Decisions in these areas may impact the business case for DRR.

### *Sequencing the implementation*

A single component could be delivered on its own. Analysis of benefits (see Section 6) indicates that the implementation and consistent use of common data standards may have benefits beyond reporting. This suggests the business case for DRR implementation which include standardising data may have higher benefits than for those implementations that exclude this component.

Decision makers could decide that setting up one component could be the basis for the subsequent implementation of a further component or components. In the DRR Vision, digital reporting instructions that reference common data standards were explored. This suggests that the implementation of digital reporting instructions may work best after common data standards have been agreed.

### *Approaches to digitising reporting instructions*

The DRR vision proposes regulators publish a digital version of their reporting instructions. For the prototype model built for Phase 1, regulators published instructions in a scripting language.17 The distribution of the digital instructions and the resultant automatic execution that would occur within firms was then simulated. This allowed firms and regulators to demonstrate how compliance reports could be automated.

However, regulators could publish a digital version of their instructions without those being part of a fully automated process. This may not result in full automation but may make those instructions clearer and easier to translate into executable code. For instance, as part of the work on DRR, the team have looked at ways of standardising how reporting instructions are drafted and how domain specific languages could improve the transparency of instructions (see Section 5 for more details).

Digitising reporting instructions may lead to the digitisation of regulation more broadly. This may drive other benefits such as improved transparency – a priority area for regulated firms according to a recent FCA survey[18].

17 A general purpose programming language commonly used in web browsers and web applications.

18 A 2018 survey carried out across regulated firms (over 3,000 responses) carried out by the FCA and FCA Practitioner Panel identified increased transparency of regulation as a priority area for improvement.

### *Options to standardise the description and identification of data*

The DRR vision relies on firms standardising how their data is described and regulators referencing that description in their reporting instructions.

A decision maker would need to decide whether DRR implementation only includes firms standardising the description of their data, without digitising instructions. This could make data between reports easier to compare. It could also make future reports easier to create by helping firms' source and integrate the data required. In a recent CBI Financial Services Survey, "Common Data Standards" came out as the most important digital innovation respondents felt regulators should adopt in the short term.[19]

Firms and third-party vendors would need to decide whether to reuse those data standards beyond regulatory reporting. Developing data standards that can be used beyond regulatory reporting may have wider benefits for firms and regulators.

### *Solutions to improve the efficiency of report generation*

As part of DRR the team also looked at alternative ways of generating reports. Some of the changes would involve changes in technology and would entail limited change to the operating model of the reporting process.

A decision maker would need to decide whether DRR requires the use of a specific technology to generate reports and if so, which one. As part of DRR Phase 1 the team looked at pulling data from an API, rather than submitting it via a report. They also looked at using Distributed Ledger Technology (DLT) as part of the reporting process. These experiments suggested the choice of technology would have implications for firms and regulators.

19 https://www.pwc.co.uk/financial-services/assets/image/pwc-cbi-financial-services-survey-q4-2018.pdf

# 5 Technical solutions

A key decision-making area for DRR implementation would be what technical solutions are used to deliver DRR. How to technically deliver DRR was a key area of focus for both DRR phases. Full details of that work will be made available to interested parties.

The following section summarises the findings in this area, focussing on the key decisions on technical solutions that would impact the business case for DRR.

## 5.1 Solution requirements

This analysis began by identifying what the needs for a technical solution might be. Since DRR is an innovation project, the team had the freedom to define an optimal solution in terms of one that maximises benefits. This meant ignoring many of the other constraints that may apply – depending on decisions about how DRR might ultimately be implemented (see previous section). The costs of these different solutions were not modelled, however it is proposed that analysis should be part of any future stages of DRR.

A key underpinning design assumption was that the optimal solution should be scalable and deliver the widest possible benefits at the lowest cost. To this end, a range of scenarios were developed to analyse costs and benefits of different implementation scenarios (section 8) with a decision on the correct balance between benefits, costs and risk a key consideration for further work. A solution should benefit as many reporting processes as possible at firms and regulators. To understand the potential for benefits, the process for regulatory reporting was mapped. This identified the parts of that process that could be fully or partially automated by publishing digital regulation. This exercise showed how DRR could benefit other firm processes beyond those mapped in the cost section, such as understanding the impact of a new regulation and understanding if a firm was in scope of a reporting requirement.

In a similar vein, an optimal solution would use a data standard that is scalable across domains. This could decrease the incremental cost of implementing DRR for additional reporting domains – a crucial assumption when looking at the viability of DRR (see Section 6). Developing data standards that could be reused for processes other than reporting may also bring wider benefits to firms (see Section 6).

Ideally, any DRR solution should be inclusive for all users – not just work for a subset of firms. This means building solutions on open standards, and that where possible solutions should be open themselves in order to avoid competition issues and potential vendor lock in where possible. This also means working with standards that work with a variety of technologies. By taking this approach, it encourages choice, increases competition and allows solutions to be tailored to the needs of individual users.

Users should be able to work efficiently and not require any specialist knowledge to use the DRR solution. This means solutions that are supported by a sufficiently large and affordable market of people with the right skills to use the technology or an easy route for people to develop these skills. Solutions should be supported by appropriate enterprise-grade tools so they can be used efficiently. Solutions that are already in use by organisations may more easily meet these criteria.

Finally, an optimal solution would be transparent to firms and regulators. Ideally, the content of digital regulation would be understandable beyond technology experts. For instance, it would be beneficial if a lawyer, policy maker or firm compliance officer could verify the digital version of a regulation was the same as the natural language version. Firms may also need to verify a report is correct before it is submitted and understand why the results of a report arise. If a solution cannot meet these requirements, the costs of setting up and running DRR may rise or DRR may not be feasible at all.

## 5.2 Third-party solutions

Reusing existing solutions may reduce the costs of implementing DRR. To understand if it was likely that there were existing solutions that could be reused, time was spent exploring the market. To do this the existing understanding of products and initiatives was built on by researching other solutions. Meetings were then held with a number of firms and organisations to understand in detail what their solutions offered.

Overall, the team did not find existing solutions that met all the requirements for an optimal solution. Rather, this exercise found solutions that partially met the requirements, or met requirements for some areas of reporting but not others. However, the marketplace appears to be changing quickly, and many of the firms and their products were still evolving. This suggests that third-party solutions to meet the DRR requirements may be developed in future.

Third party solutions for data standards were close to meeting the requirements for derivatives. The Financial products Markup Language (FpML) standard is a widely-adopted open source data standard commonly used for derivatives reporting. The emerging Common Domain Model (CDM) standard had additional benefits relative to FpML but has not yet been widely adopted by industry. The CDM, in a similar manner to FpML is a data standard used for swaps and derivatives reporting. The data standards looked at in the mortgage domain were further from meeting the DRR requirements. Many standards used by industry are tied to commercial products and failed to meet to meet the openness criteria. Other standards failed to meet the breadth and detail that would be required to supply data for all regulatory reports. This suggests implementing DRR for reporting domains with higher levels of existing data standardisation, like derivatives, may be relatively simpler and less expensive than areas like mortgages.

For digital regulation, no existing third-party solution appeared to meet all the requirements. A simple solution, e.g. just publishing code in a common programming language like Javascript, failed the technology-agnostic test. Other solutions relied on proprietary standards. In both cases this could mean they would lock firms and regulators into using a particular solution. Some solutions that were open-source and aimed to be technology agnostic also had issues, for instance they were focussed on representing a specific aspect of regulation or were poorly supported by an ecosystem of tools and users. This may increase the cost of using these technologies and the cost of setting up DRR were they to be used.

There is a large and active market in commercial regulatory reporting solutions. Many of these add value for one of the reasons DRR expects to add value – by avoiding duplication in processes around interpretation of reporting instructions and building and maintaining reporting systems. One option, as has happened in Austria, would be for an industry body to use a single vendor to provide a reporting solution for a group of firms. However, vendor solutions may also be tied to specific proprietary data standards and technologies – something that should be avoided if possible.

## 5.3 Developing a DRR-specific approach

The feasibility of developing a custom solution was also explored. As part of DRR Phase 1, processes for building solutions to meet DRR's needs were developed. This work continued in Phase 2.

Developing their own solutions was not just about the team trying to build DRR. Instead, it allowed all participants to better understand what would be needed to deliver DRR, how third-party solutions worked, and the likely impact of using those solutions on firms and regulators.

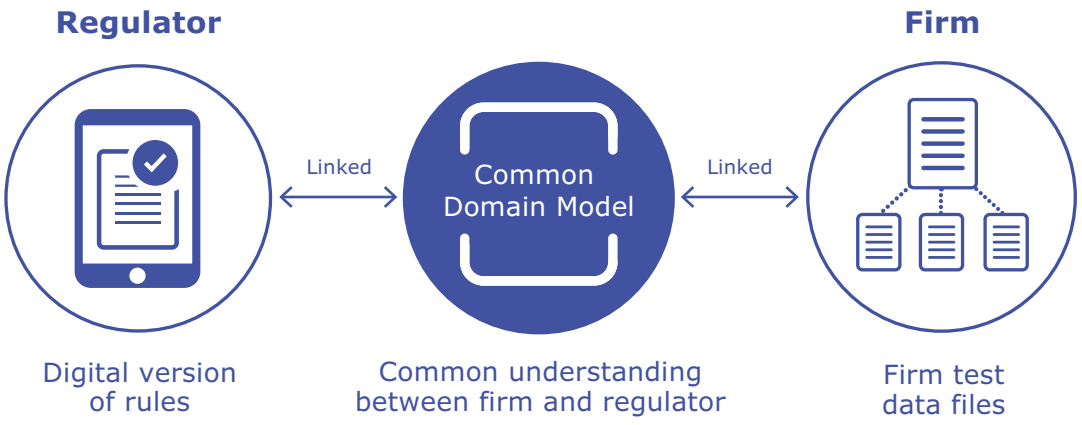
In the work on digital regulation the team focussed on "model-driven approaches". These would have the potential for decreasing the cost of implementing DRR, provide flexibility in the exact technologies used to deliver DRR and could also increase the transparency of digital regulation.

Two proof-of-concepts were also completed: both of which took a model-driven approach and both of which were built on open standards.

One approach looked at how to use open-source "semantic" technologies and standards to deliver a set of UK mortgage reporting. The chosen mortgage reports were modelled using such semantic technologies, and also looked at how to build the links between a model of a mortgage report and how that could then be converted into executable code. However, this work was hampered by the lack of tools to develop the model, which would need to be built were this approach to be used in practice. Further investment would also be needed to create the applications that would automatically create executable code from the model.

A collaboration with the ISDA Common Domain Model (CDM) project for derivatives was also conducted. This collaboration looked at how to build derivative reports and digital regulation using the technology that ISDA were developing. The intention was to extend their tools to meet DRR needs. Four data points for two separate transactional derivative reports were described using the CDM's version of digital regulation, opening the potential for a single data model to cover the production of multiple regulatory reports. This suggested the DRR approach could be scalable across reports – a key indicator of economic viability. The digital version of the reporting instructions were linked to the CDM and the CDM to real test files of operational data provided by firms. To the extent that firms implement the CDM, this could materially reduce the cost of implementing an approach like DRR for derivatives reporting (figure 3). This work also demonstrates how regulators could change reports by changing to digital regulation, seeking to have a single common data model for a product type, with reports produced off this single model – a key benefit of DRR for regulators. However, for this approach to be used more broadly further investment would be required.

***Figure 3 – A visual representation of how the ISDA CDM was used to test the DRR approach by providing a common understanding between coded regulatory rules and firm test data files***




A process for developing a mortgage data standard was also developed. They then started to apply that process to develop a mortgage data model. Within six weeks they built a model that could describe 10 UK mortgage reports. Combining this data model with a set of digital regulation could allow firms to understand and implement a model with 160 data point definitions rather than 860 data point definitions currently contained in those 10 reports. This model also aimed to be flexible beyond the mortgage domain. Showing scalability from mortgage reporting to other areas helps show economic viability. However, the DRR mortgage model has not yet been validated. Nor has the model been used by a firm for a live use case. So, although the work suggests it is possible to build a model that meets our needs, further work would need to be done before that can be proven to be the case.

The focus of DRR Phase 2 was not to explore technologies for generating reports. However, this did play a larger role in DRR Phase 1.[20] During that phase the team built a prototype system using distributed ledger technology (DLT) that showed how compliance reporting could be automated.[21] This showed how the solution could be built to be inclusive for smaller firms and how setup costs for firms could be limited. However, building a working prototype for a small set of synthetic firms is simpler than building a system that works for thousands of firms. Exploring the right blueprint to realise the DRR vision and turning that blueprint into a working solution requires further investigation.

## 5.4 Estimating cost and benefits

There are several decisions that would need to be made before DRR could be implemented. Some of the decisions have been explored in the previous two sections. Each of these decisions would impact the business case for DRR. This section analyses how decisions made in key areas may introduce new costs to reporting processes while also bringing new benefits.

20 See DRR Phase 1 Report for details

21 Reports that show whether or not a firm is compliant with a regulator obligation or rule.

## 5.5 Key assumptions

To start to understand the costs and benefits of DRR, assumptions as to how DRR could be delivered were made.

For the purposes of this cost benefit analysis, the project focused solely on the mortgage reports currently collected by the FCA and Bank. This allowed the development of a base cost benefit analysis on the cost estimates collected for mortgage reporting (see Section 3).

Another assumption is every component of the DRR vision is implemented. This requires six key functions to be carried out for a report to be created.

Three functions relating to managing standards and building common applications:

1. A function to manage and govern the data standards and develop any technology needed to support those standards ("Managing Data Standards")
2. A function to manage and govern the technical standards (including standards in digital regulation) and develop any technology needed to support those standards ("Managing Technical Standards")
3. A function to build, manage and publish an application that allows the regulator to publish the digital regulation, pull in firm data according to a standardised interface and generate a report ("Managing the DRR Application")

And three functions to write the digital regulation, generate the data in line with the data standards and physically generate the report:

1. A function to write and publish the digital version of the reporting instruction ("Writing Digital Regulation")
2. A function to supply firm data to the application according to the data standard ("Supplying Data")
3. An infrastructure function that uses the DRR Application to physically generate the report by applying the digital regulation to the firm's standardised data ("Running Infrastructure")

For the purposes of analysis, it is assumed a central body consisting of public and private sector collaboration carries out four of these functions: Managing Data Standards, Managing Technical Standards, Managing the DRR Application and Running Infrastructure to generate the Report. Collectively the four central functions are referred to as a central service body which would effectively supply the "DRR Platform". Also, it is assumed that the regulator is responsible for Writing Digital Regulation. Firms are responsible for Supplying Data to the DRR Platform.

In order not to prejudice the outcome of the technical work stream, no assumptions were made about what technology solutions were used. Nor were any explicit assumptions about the compatibility of the reports with the current reports supplied to regulators. However, the lack of assumptions in this area make it hard to fully assess the costs and benefits of DRR. In turn, this limits the statements and conclusions that can be made about the business case for DRR as a whole.

## 5.6 Estimated costs

Delivering DRR in line with the various scenarios would result in new costs to the reporting process. It will also move costs from one party to another.

The DRR reporting process will also create costs for a new central body. It requires two new central functions that are not currently part of the reporting process: the development of Data Standards and Technical Standards. There will be a cost to setup and run these functions; while setting up the central body itself may result in further new costs for firms. Two functions move from the firms to a central body– developing and maintaining the DRR Application and Running Infrastructure. Doing so moves costs from the firms to the central body.

The cost of setting and running the DRR Platform (Managing the Data Standards, Technical Standards, DRR Application and Running the Infrastructure) was estimated. These activities and related costs are assumed to be allocated to the central body. A "bottom up" approach was used to estimate how much these activities would cost including some necessarily arbitrary assumptions about technology, given the uncertainty about the technical solution. They have estimated the functions and number of people needed to setup and run the central body. They then applied an assumed market rate to come to an overall setup cost of £5,310,000 and £3,028,000 annual run cost (see Appendix A for full details). Although the team cross checked these estimates with representatives from the Open Banking Implementation Entity (OBIE) the projects are too different for OBIE setup costs to be directly relevant.[22]

Any implementation of DRR would also create new costs for the regulator(s). Under DRR, the regulator would be responsible for the function of "Writing Digital Regulation" that is currently carried out by firms or vendors. The regulator may also incur costs if the processes to produce the new reports were not compatible with the current set of reports. Finally, DRR may require changes to the broader legal framework that governs how regulators can write reporting instructions. Changing that framework would also increase the setup costs for DRR. The team did not try to estimate the regulators' potential costs under DRR as the variation in these costs depending on the end solution were so significant.

Subject matter experts were used to estimate the setup costs to the firm of Supplying Data. Setup costs may be comparable to one and a half times a firm's annual operating costs for reporting. This means the standalone setup costs for DRR would likely be lower than the cost of a big change in regulation. This is because firms will already have processes to source the underlying data; they won't incur the cost of Data Preparation – a key cost for reporting change. This estimate is uncertain and depends on the exact characteristics of the firm. It will also partly depend on the exact technology used to transfer data to the DRR platform. To capture this uncertainty, an upper and lower limit for setup costs were estimated. The upper limit could be around the average annual total cost of reporting (operating costs plus change costs), however the lower limit of setup costs will be comparable to a large firm's annual operating costs [Annex A].

22 For instance, the scope of the data and its use in customer facing applications added complexity to the Open Banking project that are not applicable to our assumed DRR roll out. A roll out of DRR would also have the opportunity to make use of third party standards, such as those developed by the OBIE.

## 5.7 Estimated benefits

DRR is intended to create a more seamless reporting process for firms and regulators. By doing so, the benefits it delivers should outweigh its costs. It is challenging to fully comprehend the cost of implementing a project such as DRR, so potential savings have been calculated by comparing current reporting processes to the corresponding process under DRR.

As the regulator is assumed to write and publish a digital version of the regulation, this process no longer sits in firms. This should reduce the cost of interpreting and implementing reporting instructions, reducing change costs.

As a result, firms would be expected to save money relative to current costs. A "bottom up" approach was used to estimate the potential size of these savings for large firms. The savings relative to current reporting costs for each of the 21 low level steps of the current reporting process were analysed (see Appendix B). These savings were then applied to estimated current costs to come up an overall efficiency factor for the base scenario of between 30 – 40%.

The use of data standards and a standard version of digital regulation is expected bring benefits to regulators. For instance, by reducing the time spent responding to queries firms have about the reporting instructions, reducing the costs regulators spend on checking data, increasing the timeliness of regular and new requests and reducing the cost of writing new rules. However, the team did not estimate the financial benefits for regulators.

Rolling out DRR in line with the assumptions could have other, intangible benefits, to firms and regulators. Process standardisation could help improve data quality, while better data quality may help improve regulatory decision making. If the data standards developed could be used to improve internal firm processes, this could bring other benefits to firms. Rolling out DRR should also encourage innovation in the future and provide a model for future collaboration between regulators and industry.

# 6 Scenarios analysis and estimates of return on investment

Finally, the estimates of costs and benefits were combined to provide estimates for how key delivery decisions may feed into a business case for large firms. To do this, five hypothetical "implementation scenarios" were generated. Each scenario changes an aspect of how DRR is assumed to be rolled out and analyses how those decisions feed into a change to the business case. Four scenarios are outlined in table 2, with scenario 5 acting as a hypothetical scenario for implementation.

In order to do this, a further set of additional assumptions are needed. These are listed below.

- All costs of setting up DRR are allocated to Year 0 costs;
- the estimates assume a period of a year running both legacy and new solutions;
- ongoing costs of the central body and firms rise by 5% annually
- the cost numbers come from survey results from six firms that reported mortgage data
- the cost of the central body is allocated according to the market share of the firms. That is the largest 6 mortgage providers, who also account for about 50% of the market, pay 50% of the costs of the central body.

***Table 2: Potential Implementation Scenarios, levers demonstrate impact of optionality across scenarios***

| Options | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|
| | Business case for large firm, single domain (mortgages) with central body investment by firms | Business case for large firm, single domain (mortgages) without central body for standards, but some central mechanism still required for report generation | Business case for large firm, single domain with central body investment, implementation triggered by upcoming regulatory change | Business case for large firm, multiple domains with central body investment, incremental rollout to three domains within 3 years |
| Reports and data domains | • All regulatory and statistical reports that contain significant mortgage-related data | | | • Multiple domains – mortgage and two more with a similar cost/ benefit profile |
| Participant selection | • The business case is modelled for large firms only, but roll out assumed for all firms in scope of reports subject to a size threshold<br>• FCA and BoE as regulatory and statistical authorities | | | |
| Operating model | • Central body carries out DRR platform functions (managing standards, building common applications, running the infrastructure)<br>• Regulator responsible for writing digital regulation<br>• Firms responsible for supplying data to DRR platform | | | |
| Backward compatibility | • No assumptions | | • Includes new set of reports | • No assumptions |
| Component dependency | • All DRR components will be implemented, but no stated preference for whether should be concurrent or sequential | | | |
| Technical solutions | • No assumptions | • Extensive reuse of open source third party solutions | • No assumptions | |

These assumptions, and those listed in the previous section, feed into the four scenarios for rolling out DRR that are presented here.

## 6.1 Scenario 1: large firm, single domain (UK mortgages)

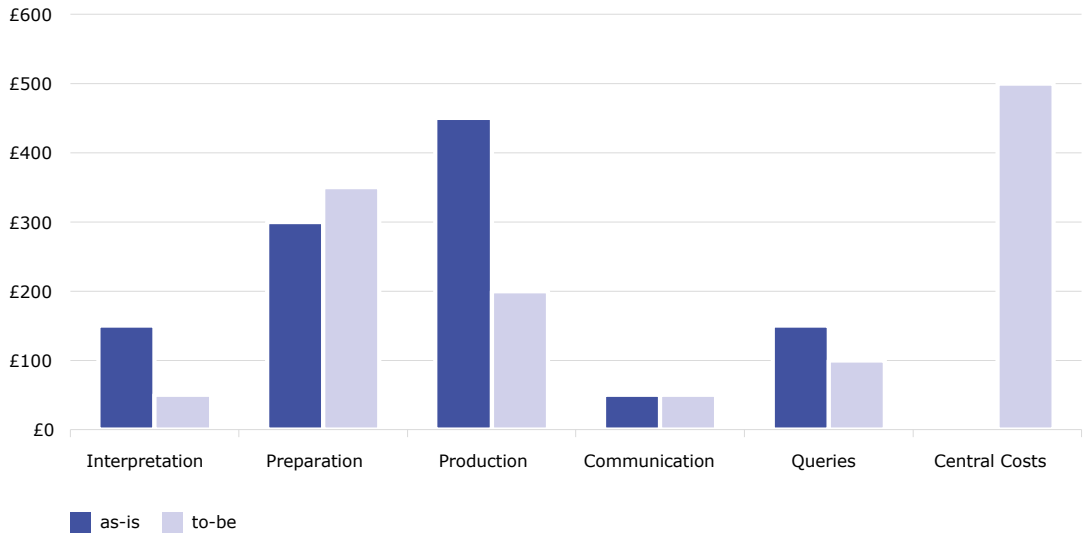
The first scenario establishes a baseline business case. This scenario can then be used to assess the impact of changes outlined in subsequent scenarios.

Under this baseline scenario, rolling out DRR produces annual cost savings for firms (see Graph 1). If the on-going costs of paying for the central body are included, there are slight savings of moving to DRR for a large firm.

***Table 3 - Estimated current vs estimated future annual costs for a large firm using the DRR model (in £000)***

| | Current | DRR | % Savings |
|---|---|---|---|
| Interpretation | £170 | £60 | 65% |
| Preparation | £320 | £330 | -3% |
| Production | £440 | £220 | 50% |
| Communication | £70 | £30 | 57% |
| Queries | £140 | £110 | 21% |
| Total (excluding central body costs) | £1,140 | £760 | 33% |
| | | | |
| Central Body | 0 | £361 | |
| Total | £1,140 | £1,118 | 2% |

***Graph 1 – Operations and Change annual costs: current vs DRR***

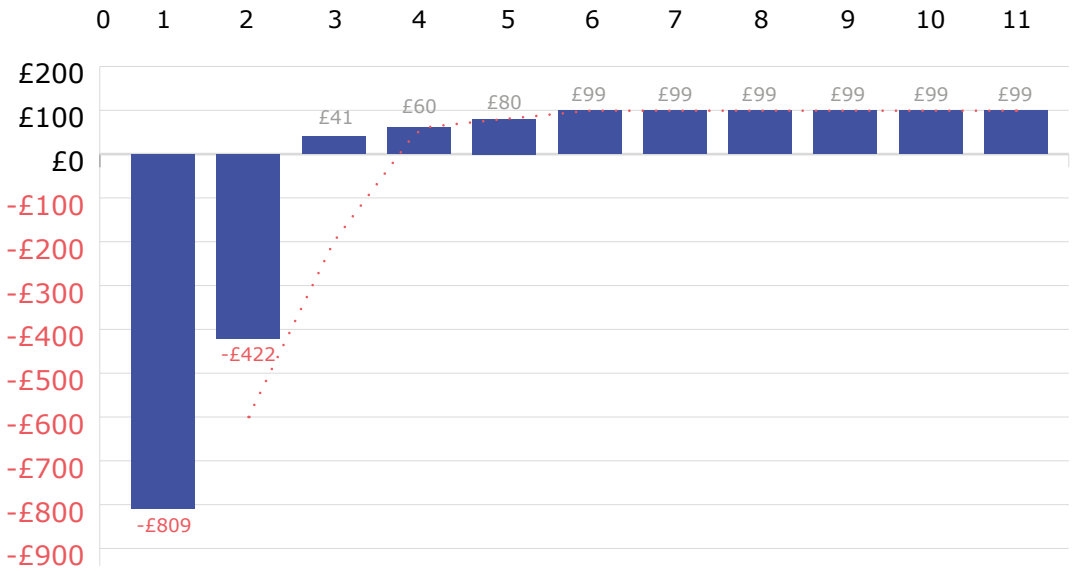



To establish a baseline business case, the setup costs and the ongoing costs and benefits for every year needed exploring – not just a single year. From this perspective, under the baseline scenario, the on-going saving from DRR would eventually pay off the setup costs. But the timeline for the firm to recover their setup costs is long. This means the initial investment is unlikely to be considered worthwhile for a firm. Further, these estimates do not include the full set of costs and benefits for the regulator. Therefore, without further analysis, it is not possible to conclude whether DRR would save money for all parties involved.

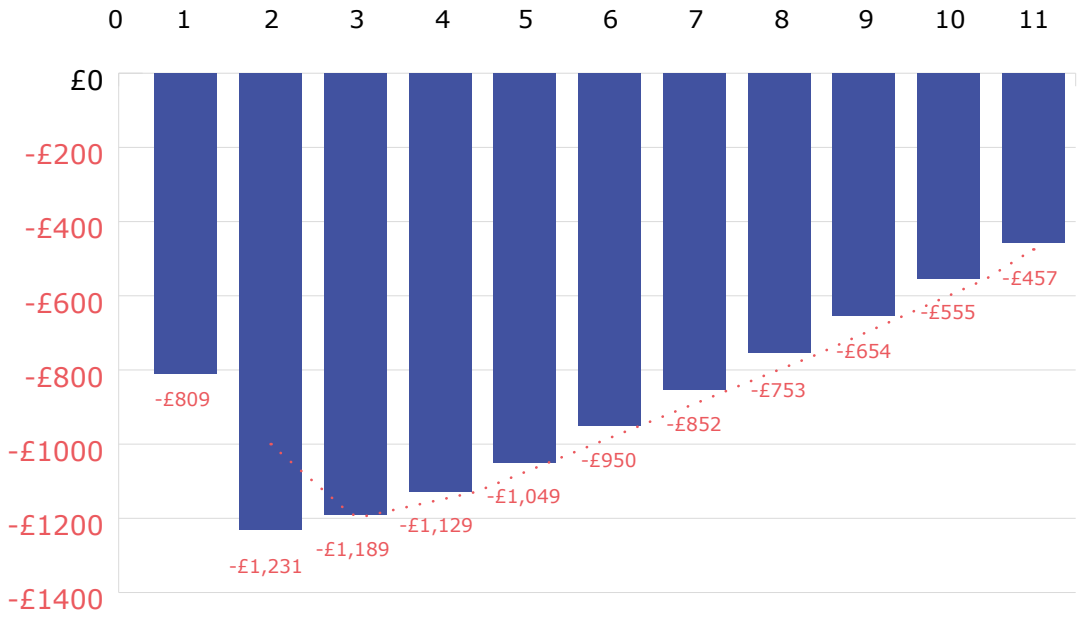
***Table 4 - Large Firm benefit of DRR implementation under scenario 1 – cost analysis (in £000)***

| Year | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cost sav. | -£809 | -£422 | £41 | £60 | £80 | £99 | £99 | £99 | £99 | £99 | £99 |
| cumulative. | -£809 | -£1,231 | -£1,189 | -£1,129 | -£1,049 | -£950 | -£852 | -£753 | -£654 | -£555 | -£457 |

***Graph 3 – Annual Cost/Benefit of DRR implementation under scenario 1***




***Graph 4 – Accumulated Net Benefit of implementing DRR under scenario 1***



## 6.2 Scenario 2: single domain (UK mortgages), reusing third party solutions

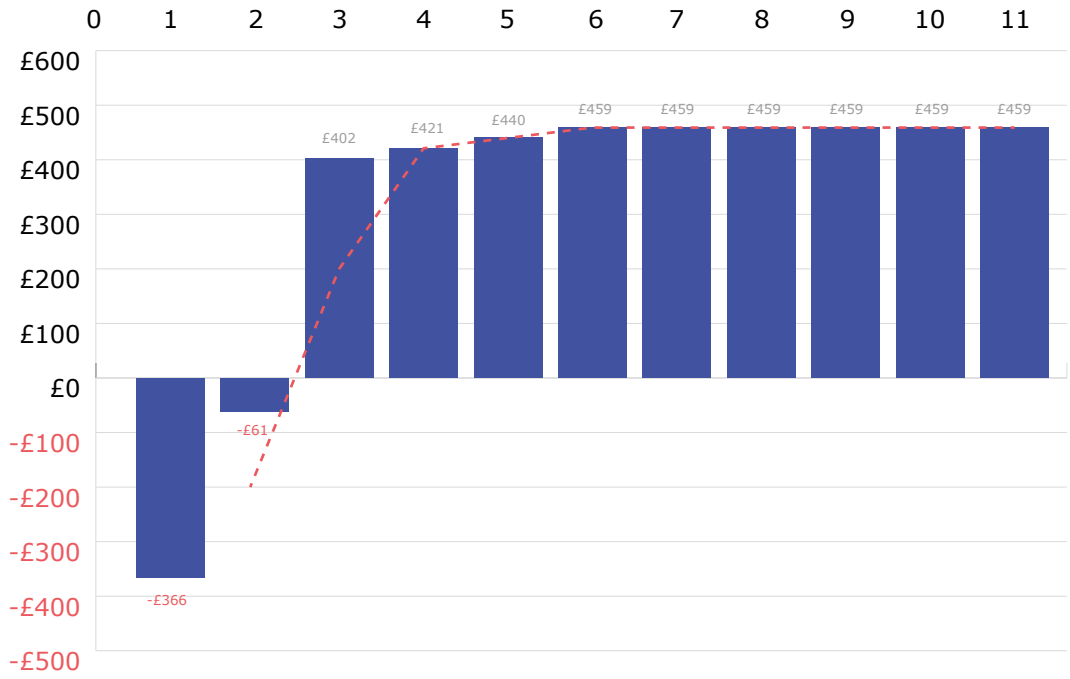
The second scenario had the same assumptions as the first. However, in this scenario it is assumed the setup costs for the central body are lower. This may be because the DRR process reuses third-party data and technical standards where possible (see Section 5 on the possible use of third-party solutions).

Unsurprisingly, the investment case for firms becomes much more attractive. A large firm saves money relative to the status-quo by year two and sees its investment back by year three relative to the baseline scenario.

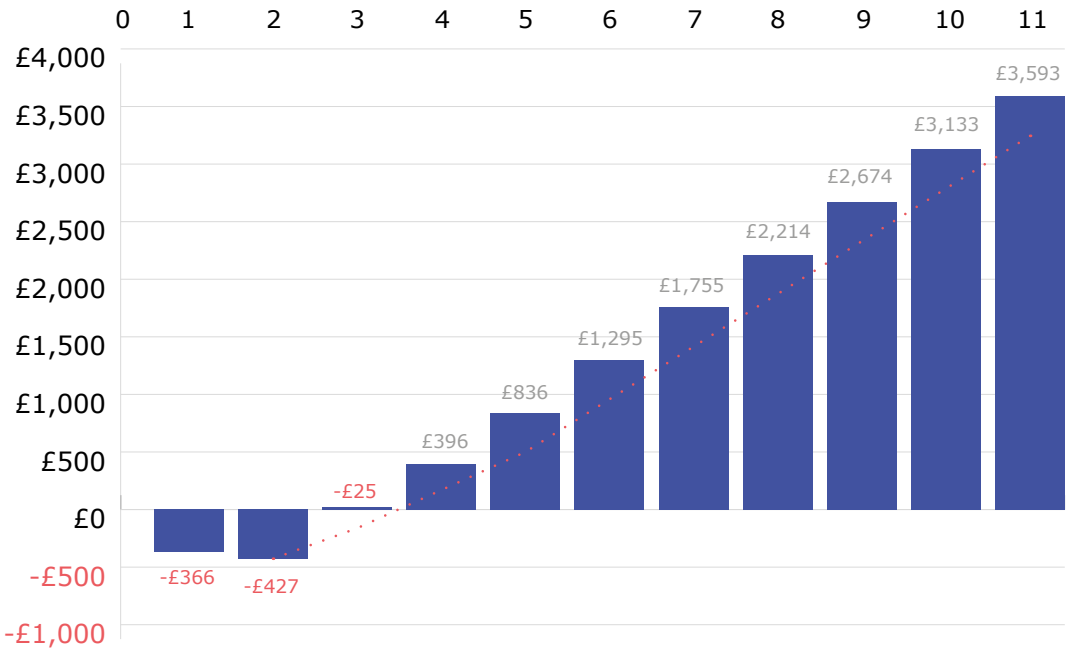
***Table 5 Large Firm benefit of implementing DRR under scenario 2 – cost analysis (in £000)***

| Year | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cost Sav. | -£366 | -£61 | £402 | £421 | £440 | £459 | £459 | £459 | £459 | £459 | £459 |
| Acc. | -£366 | -£427 | -£25 | £396 | £836 | £1,295 | £1,755 | £2,214 | £2,674 | £3,133 | £3,593 |

***Graph 5 - Annual Cost/Benefit of implementing DRR under scenario 2***



***Graph 6 - Accumulated Net Benefit of implementing DRR under scenario 2***




## 6.3 Scenario 3a: Large firm, single domain (UK mortgages), roll out followed by change

As discussed in Section 4, the benefits of DRR may be largest where it is used to implement a new set of reports. This is because many of the largest savings come during the change process. This is modelled by assuming a change shortly after DRR has been rolled out.

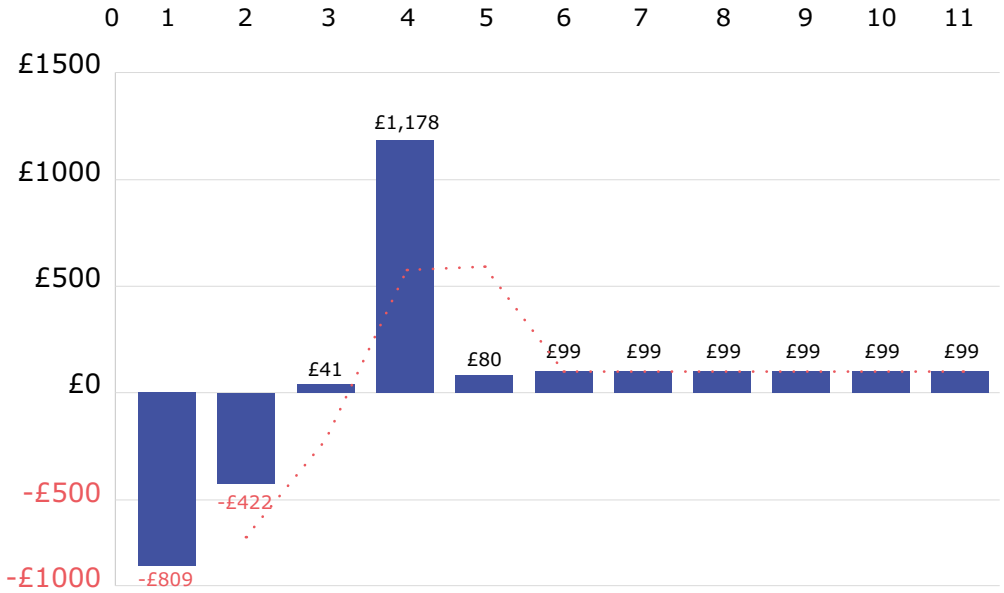
The reporting change is assumed to cost £3million in the absence of DRR. These costs are incurred in year four. Apart from this, the assumptions are the same as for the baseline scenario one.

This results in an investment case analysis that shows a positive return on the investment by year four relative to the baseline scenario. By year five, a firm would achieve cost savings of nearly £170,000. The efficiency factors presented in appendix 2 were used to form the basis of these calculations.

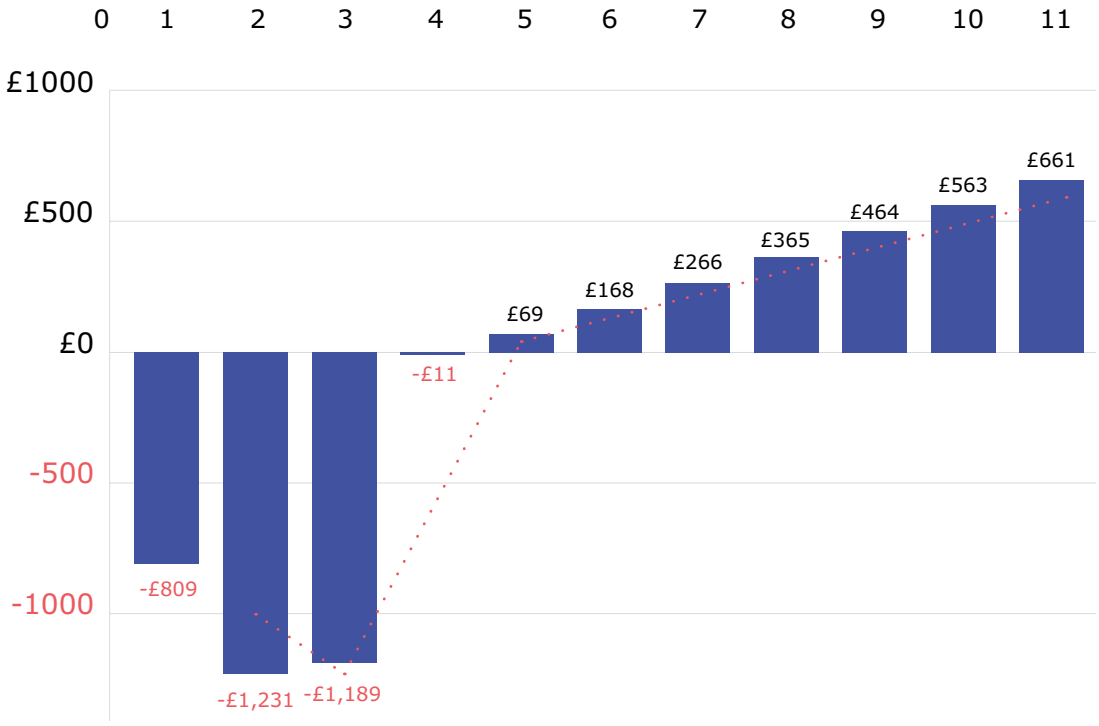
***Table 6 - Large Firm benefit of implementing DRR under scenario 3 – cost analysis (in £000)***

| Year | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cost Sav. | -£809 | -£422 | £41 | £1,178 | £80 | £99 | £99 | £99 | £99 | £99 | £99 |
| Acc. | -£809 | -£1,231 | -£1,189 | -£11 | £69 | £168 | £266 | £365 | £464 | £563 | £661 |

***Graph 7 - Annual Cost/Benefit of implementing DRR under scenario 3***




***Graph 8 - Accumulated Net Benefit of implementing DRR under scenario 3***




## 6.4 Large firm, single domain (UK mortgages), Implementation triggered by upcoming change

In a variant of the previous scenario, the impact of DRR being rolled out at the same time as a new change was analysed. This may have additional benefits to the firms since the firms would have to invest money to meet the change, regardless of whether DRR was being rolled out.

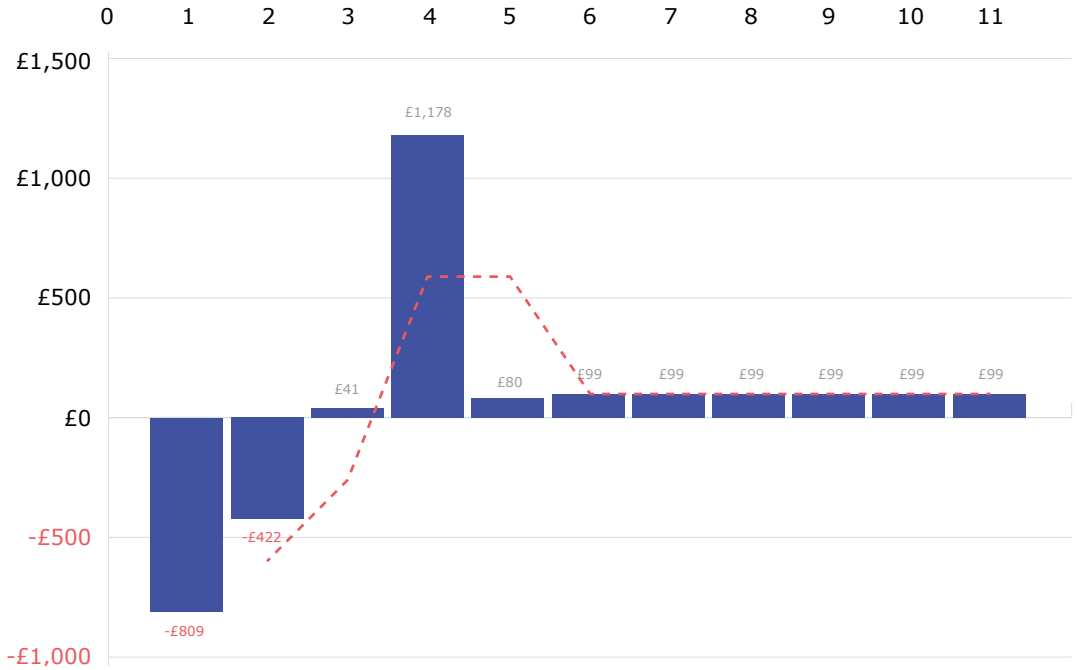
Again, the reporting change is assumed to cost £3million the assumptions are the same as for the baseline scenario one.

This investment case analysis shows a positive return on the investment by year four relative to the baseline scenario. By year five it is estimated a firm would achieve cost savings of nearly £170,000.

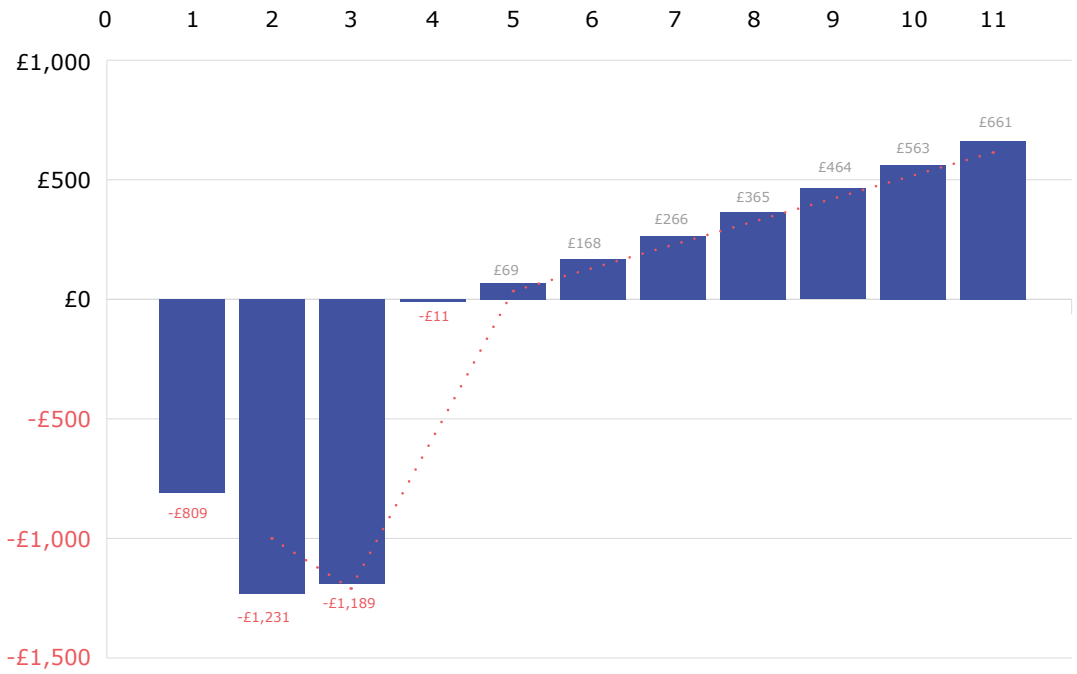
***Table 7 - Large Firm benefit of DRR implementation under scenario 3– cost analysis (in £000)***

| Year | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cost Sav. | -£809 | -£422 | £41 | £1,178 | £80 | £99 | £99 | £99 | £99 | £99 | £99 |
| Acc. | -£809 | -£1,231 | -£1,189 | -£11 | £69 | £168 | £266 | £365 | £464 | £563 | £661 |

***Graph 9 - Annual Cost/Benefit of implementing DRR under scenario 3***



***Graph 10 - Accumulated Net Benefit of implementing DRR under scenario 3***




## 6.5 Scenario 4: Large Firm – DRR incrementally rolled out to multiple sets of reporting

A key decision for DRR is whether it becomes a strategic solution, rolled out across multiple areas of reporting. The more widely DRR is applied the greater its benefits should be. This is because the setting up of DRR would involve a number of upfront costs. These costs could be spread across more firms, with a corresponding wider range of benefits, were it applied to multiple domains.

In order to quantify this impact, in this scenario it is assumed DRR is rolled out across three domains of reporting. The first domain is mortgage reporting as in the baseline scenario. The following two domains are hypothetical domains rolled out in year two and year three. However, the model assumes that they have a similar profile of costs and benefits to mortgages. This is an assumption that would need revisiting when the specific domains are identified.

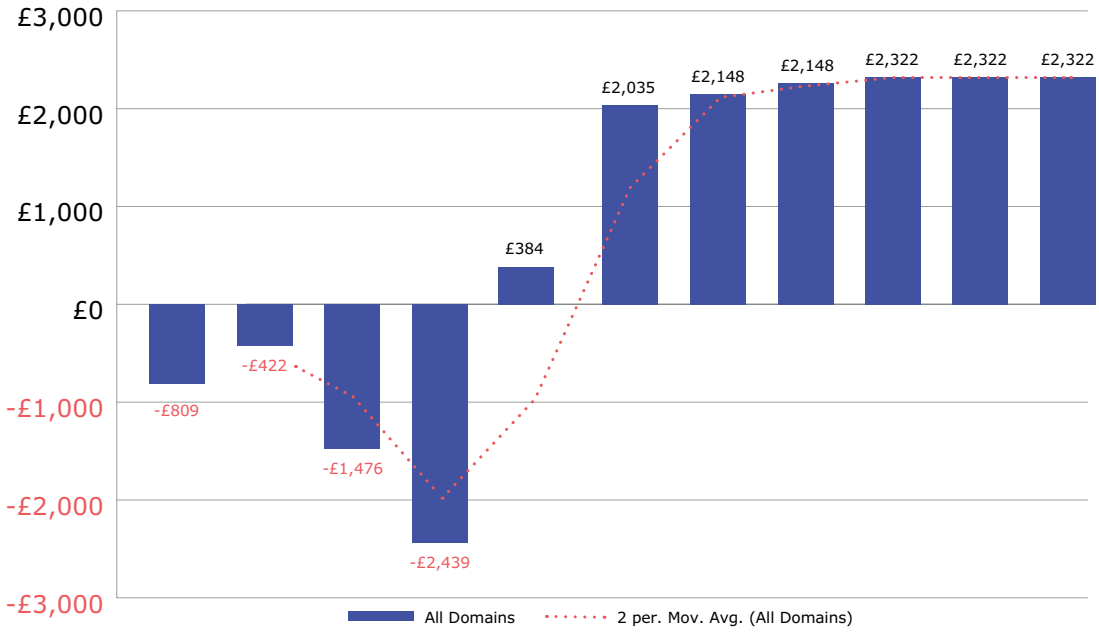
Under this scenario DRR could start realising benefits for firms on year 5 (see graph 9) relative to the baseline scenario one. The investment in DRR is fully paid off by year 7 (graph 10)

*The table and graphs below show the delta between cost and benefit on a year per year and accumulated for this scenario.*

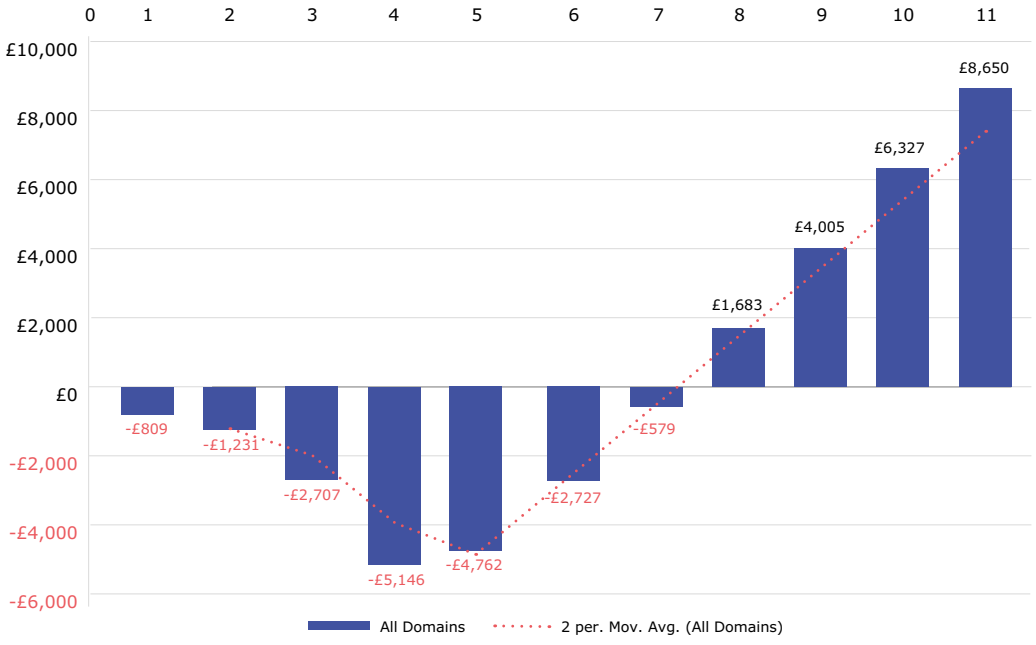
### *Table 8 - Large Firm benefit of implementing DRR under scenario 4 – cost analysis (in £000)*

| Year | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mortgages | -£809 | -£422 | £41 | £60 | £80 | £99 | £99 | £99 | £99 | £99 | £99 |
| Acc. | -£809 | -£1,231 | -£1,189 | -£1,129 | -£1,049 | -£950 | -£852 | -£753 | -£654 | -£555 | -£457 |
| Domain 2 | £0 | £0 | -£1,518 | -£455 | £833 | £885 | £936 | £988 | £988 | £988 | £988 |
| Acc. | £0 | £0 | -£1,518 | -£1,972 | -£1,140 | -£255 | £681 | £1,669 | £2,657 | £3,645 | £4,633 |
| Domain 3 | £0 | £0 | £0 | -£2,044 | -£529 | £1,052 | £1,113 | £1,174 | £1,236 | £1,236 | £1,236 |
| Acc. | £0 | £0 | £0 | -£2,044 | -£2,573 | -£1,521 | -£408 | £766 | £2,002 | £3,238 | £4,473 |
| Total | -£809 | -£422 | -£1,476 | -£2,439 | £384 | £2,035 | £2,148 | £2,261 | £2,322 | £2,322 | £2,322 |
| Acc. | -£809 | -£1,231 | -£2,707 | -£5,146 | -£4,762 | -£2,727 | -£579 | £1,683 | £4,005 | £6,327 | £8,650 |

### *Graph 9 - Annual Cost/Benefit of implementing DRR under scenario 4*

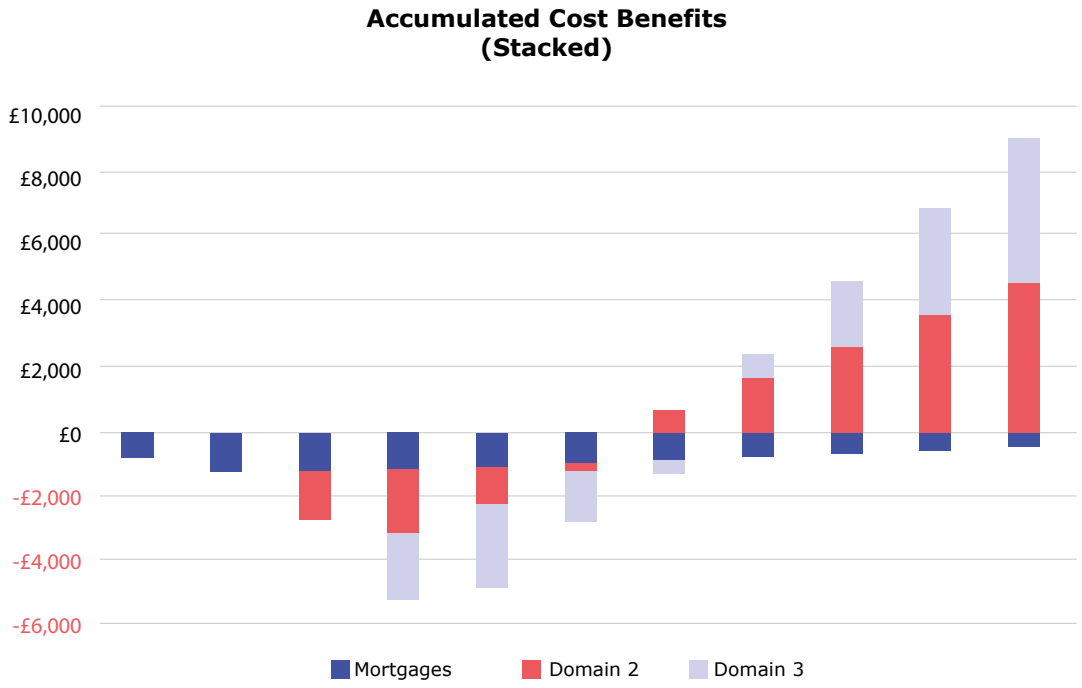



### *Graph 10 - Accumulated Net Benefit of implementing DRR under scenario 4*



Graph 9 explains the outcome of this modelling. Rolling out DRR for the mortgage domain includes a high set up cost. As shown in scenario 1, the benefits of DRR for the mortgage domain are limited (the blue bars in graph 11). However, when DRR is subsequently rolled out for other domains the setup costs are lower. This means these domains see a positive return on investment much earlier after roll out (see the grey and gold bars in graph 11).

***Graph 11 - Accumulated and Stacked Net Benefit of implementing DRR under scenario 4***




## 6.6 Scenario 5 – Industry wide roll out

The most ambitious view for DRR would be for it to be rolled out across all reporting. Here the assumption is that all UK banks meet all their global reporting requirements using a DRR approach. While this scenario is included to show the full spectrum of implementation possibilities, the likelihood that DRR will be more appropriate for some domains than others makes an industry wide, full scale implementation across all reporting domains unlikely.

According to research conducted by McKinsey, quoted in the Bank of England's 2019 "The Future of Finance" report, run and change costs related to regulatory reporting amount to £2bn - £4.5bn a year for UK banks. The analysis estimates that mortgage reporting covers just a small fraction of this cost. If the same benefits and overall firm efficiency factor of (35% appendix B) that have been assessed and presented at the beginning of this section was extrapolated across all reports, DRR would result in savings ranging between £680m - £1,800m a year. As explained above, it is unwise to extrapolate from mortgage reporting to other domains, given that they vary in complexity. In addition, rolling something like this out across jurisdictions would require unprecedented collaboration on reporting. So this could be seen as an estimate of the upper bound of savings to aim for in a wider roll-out.

# 7 Conclusion

Overall, the proposed best way to pursue the DRR vision is in small, incremental steps which prove valuable to all each time. The findings of the latest phase that relate to the economic viability of DRR have been presented in this paper.

During this phase of work, the current costs of mortgage reporting were estimated. They also analysed the benefits of which parts of the reporting process contribute most to cost. This provided a foundation for understanding where savings may be realised.

Looking forward, the key decision-making areas for future stages of a DRR roll out have been identified. One of these involves choices around technology. This has been a key focus for DRR in the past, and so this phase continued that work by starting to look at whether the DRR vision is technically feasible.

In the latest phase, the costs and benefits of DRR for firms and regulators were analysed. This showed the potential for financial benefits for firms and regulators, but also the introduction of some new costs. This work also suggested DRR could deliver intangible benefits for firms and regulators. These benefits may impact important goals for both types of organisation, such as improving regulatory decision making and helping firms deliver better services for their customers.

However, the work on analysing the business case for DRR is incomplete. There is more that is needed to do to understand the costs of setting up and running DRR – particularly for regulators. Further, there is a need for more evidence to get a clearer picture of the benefits DRR would bring.

As the work on the technical solutions shows, there are still a number of unknowns for how best to implement DRR technically.

The scenario analysis suggests that the benefits of DRR may be higher if it is rolled out across a number of reporting areas or as part of a coordinated change to a set of reports. In domains such as derivatives and mortgages this may involve coordination between multiple authorities. And so, for the full benefits of DRR to be realised, a strategic commitment to DRR by firms and regulators may also be required.

# 8 Appendix

## A Quantifying central body costs

Estimated central body set up costs and assumptions

| Column1 | Column2 | Column | Column | Column | Column | Column7 |
|---|---|---|---|---|---|---|
| | | £000s | FTEs | Months | Other Cost | Key assumptions |
| TOTAL | | £5,310 | 42 | 12 | £270 | |
| Data Standards | | £1,080 | 9 | 12 | £0 | Effort estimated using phase 2 data workstream effort to define mortgages |
| Data Governance (models, dictionaries...) | | £480 | 4 | 12 | £0 | |
| Ontology Management | | £120 | 1 | 12 | £0 | |
| Regulatory Transposition (MER) | | £480 | 4 | 12 | £0 | |
| Technical & Security Standards | | £720 | 6 | 12 | £0 | Security will likely drive a significant focus and effort as it has not been addresed in previous phases |
| Technology Strategy & Evolution | | £120 | 1 | 12 | £0 | |
| Security Standards | | £360 | 3 | 12 | £0 | |
| Architecture Standards | | £120 | 1 | 12 | £0 | |
| MER Tools & Technologies | | £120 | 1 | 12 | £0 | |
| Platform Development | | £1,520 | 11 | 12 | £200 | Assumption of decentralised platform architecture approach (but requiring some central components to be developed and maintained centrally) |
| Technical Design & Development | | £800 | 6 | 12 | £80 | |
| Configuration Management | | £140 | 1 | 12 | £20 | |
| Testing | | £430 | 3 | 12 | £70 | |
| Deloyment & Release Management | | £150 | 1 | 12 | £30 | |
| Platform Management & Operations | | £1,030 | 8 | 12 | £70 | Development of onboarding processes and stakeholder management |
| Onboarding & Enablement | | £290 | 2 | 12 | £50 | |
| Service Management | | £360 | 3 | 12 | £0 | |
| Environment Management (incl Infra) | | £260 | 2 | 12 | £20 | |
| Monitoring | | £120 | 1 | 12 | £0 | |
| Standards Alignment | | £120 | 1 | 12 | £0 | Engagement with other relevant bodies |
| Delivery & Change Mangement | | £360 | 3 | 12 | £0 | Project Management |
| Admin, Governance & Comms | | £480 | 4 | 12 | £0 | Implementation work needed to setup the new entity governance and legal framework |
| Board & Secretariat | | £60 | 0.5 | 12 | £0 | |
| Finance & Admin | | £60 | 0.5 | 12 | £0 | |
| Legal | | £60 | 0.5 | 12 | £0 | |
| Vendor Mangement | | £60 | 0.5 | 12 | £0 | |
| Audit | | £60 | 0.5 | 12 | £0 | |
| Knowledge Management | | £60 | 0.5 | 12 | £0 | |
| HR | | £60 | 0.5 | 12 | £0 | |
| Comms | | £60 | 0.5 | 12 | £0 | |

Estimated Central body operational costs:

| Column1 | Column2 | Column3 | Column | Column | Column | Column7 |
|---|---|---|---|---|---|---|
| | | | FTEs | Months | Other Cost | Key assumptions |
| TOTAL | | £3,028 | 24.4 | 12 | £100 | |
| Data Standards | | £120 | 1 | 12 | £0 | Assumptions based on support and maintenance (not change) |
| Data Governance (models, dictionaries...) | | £48 | 0.4 | 12 | £0 | |
| Ontology Management | | £24 | 0.2 | 12 | £0 | |
| Regulatory Transposition (MER) | | £48 | 0.4 | 12 | £0 | |
| Technical & Security Standards | | £216 | 1.8 | 12 | £0 | Assumptions based on support and maintenance (not change) |
| Technology Strategy & Evolution | | £48 | 0.4 | 12 | £0 | |
| Security Standards | | £72 | 0.6 | 12 | £0 | |
| Architecture Standards | | £48 | 0.4 | 12 | £0 | |
| MER Tools & Technologies | | £48 | 0.4 | 12 | £0 | |
| Platform Development | | £288 | 2.4 | 12 | £0 | Assumptions based on support and maintenance (not change) |
| Technical Design & Development | | £72 | 0.6 | 12 | £0 | |
| Configuration Management | | £48 | 0.4 | 12 | £0 | |
| Testing | | £48 | 0.4 | 12 | £0 | |
| Deloyment & Release Management | | £120 | 1.0 | 12 | £0 | |
| Platform Management & Operations | | £1,780 | 14 | 12 | £100 | Assumes we need to keep a similar level of effort as during imple |
| Onboarding & Enablement | | £480 | 4.0 | 12 | £0 | |
| Service Management | | £720 | 6.0 | 12 | £0 | |
| Environment Management (incl Infra) | | £340 | 2.0 | 12 | £100 | Assumes that the infarstructure cost is billed as a service |
| Monitoring | | £240 | 2.0 | 12 | £0 | |
| Standards Alignment | | £24 | 0.2 | 12 | £0 | Engagement with other relevant bodies |
| Delivery & Change Management | | £24 | 0.2 | 12 | £0 | Project Management |
| Admin, Governance & Comms | | | | | | |
| Board & Secretariat | | £576 | 4.8 | 12 | £0 | |
| Finance & Admin | | £72 | 0.6 | 12 | £0 | |
| Legal | | £72 | 0.6 | 12 | £0 | |
| Vendor Mangement | | £72 | 0.6 | 12 | £0 | |
| Audit | | £72 | 0.6 | 12 | £0 | |
| Knowledge Management | | £72 | 0.6 | 12 | £0 | |

## B Estimated efficiency factors for regulatory reporting

In order to arrive at the large firm efficiency factors a series of assumptions around potential efficiency gains were made.

Broadly, there are two sets of efficiency savings from implementing DRR. There are a set of efficiency gains in firms' run costs and a further set in relation to firms' implementing regulatory reporting changes. These figures have been rounded to the nearest 5% and act as an indicator of potential efficiency savings.

### *Run efficiency gains*

| Type of gain | Estimated efficiency |
|---|---|
| **Production:** There may be significant savings here as this activity may no longer be performed by firms, depending on the final implementation. For this calculation, the assumption was made that report production would no longer be required by firms. Rather, this activity is assumed to be covered by the central body based on digital regulation produced by the regulator. This activity would be expected to be more efficient overall as the activity would be carried out in a single consistent way rather than separately by individual firms. There would still be some process required, however this would be taking the form of a throughput of underlying data points, and so greatly simplified. | **~40%** |
| **Communication:** There may be significant simplification for firms in relation to producing outputs in the required format, since firms would move from creating multiple reports to populating a single data source.<br>● Once the information is received by regulators, there may be tangible benefits in the form of:<br>● Reduced data validation costs (data less likely to be incorrect or inconsistent).<br>● Reduced data transformation costs (as data will already be in useable format).<br>● Reduced costs to generate analysis, reports and dashboards. | **~60%** |
| **Query management:** The impact of ad-hoc queries is estimated (not necessarily the frequency) to be significantly reduced. The estimated reduction in questions relating to interpretation of the regulation due to an increase in the quality and clarity of the reporting instructions themselves. This should improve the efficiency of the process for firms and regulators. Some questions around cross-report assurance could also be centrally governed. Queries for firms would focus on supplying the underlying data. | **~20%** |

### *Change efficiency gains*

Change and implementation activities drive a significant effort and cost from financial firms. This is an area where implementing DRR may present an opportunity for realising benefits across the industry. It is expected both firms and regulators would see a fall in the cost of introducing future changes. This results from a more consistent end-to-end process. When regulators develop and introduce new rules, they could be more confident that these would be rolled out in a consistent way across firms. Apart from the potential industry-wide cost advantages of this, it could result in better data quality. DRR could also reduce the time taken to introduce changes in regulatory reporting.

| Type of gain | Estimated efficiency |
|---|---|
| **Regulation interpretation:** The project team assumed the regulator producing a code version of the regulation would decrease the cost of interpreting regulation. It would still be necessary for firms to understand regulation and what it means to the firm (ie what will be reported and the data required that will feed in to it), however we assume no new reporting systems would need to be built and internal discussions on interpretation would be reduced. | **~70%** |
| **Production:** The project team estimated there could be significant savings in setting up the systems and processes to create a report. This is because we assume this activity would be done once by a central body. From a firm perspective, the focus on producing the underlying data rather than generating reports results in a simpler, cheaper process. | **~60%** |

# 9 Acronyms and abbreviations

| Acronynm | Definition |
|---|---|
| **AUREP** | Austrian Reporting Services GmbH |
| **BIRD** | Banks Integrated Reporting Dictionary |
| **CBI** | Confederation of British Industry |
| **CDM** | Common Domain Model: a single, common digital representation of derivatives trade events and actions |
| **DPM** | Data Point Model |
| **DRR** | Digital Regulatory Reporting |
| **FPML** | Financial Products Markup Language |
| **FTE** | Full Time Equivalent |
| **IReF** | Integrated Reporting Framework |
| **ISDA** | International Swaps and Derivatives Association: trade organization of participants in the market for over-the-counter derivatives |


DRR
DIGITAL
REGULATORY
REPORTING