



National Audit Office

Report

by the Comptroller
and Auditor General

Cross-government

Managing the risks of legacy ICT to public service delivery

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Managing the risks of legacy ICT to public service delivery

Report by the Comptroller and Auditor General

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Amyas Morse
Comptroller and Auditor General
National Audit Office

9 September 2013

This study analyses the risks legacy ICT poses to the delivery of public services focusing on four case studies that illustrate three different strategies for managing legacy ICT

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This report can be found on the
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Key facts

£480bn

estimate of government revenue reliant on legacy ICT

£210bn

estimate of government non-staff expenditure reliant on legacy ICT

£193bn

collected or paid out in 2011-12 by the four public services reviewed in this report

£865m

total cost in 2011-12 of operating the four public services reliant on legacy ICT as reviewed in this report

Strategies for delivering change from legacy ICT

	No change to the legacy ICT	Enhance and maintain the legacy ICT		Replace most of the legacy ICT
The four public services reviewed in this report	OFT's consumer credit licensing service	HMRC's VAT collection service	DWP's pension payment service	NHSBSA's prescription payment service
Collected or paid out in 2011-12	£0.01 billion	£99.6 billion	£84.3 billion	£8.8 billion
Full cost of service in 2011-12 (ICT, processes, enforcement and overheads)	£10.4 million	£429.6 million	£384.6 million	£40.7 million
Cost of legacy ICT in 2011-12	£0.7 million	£4.5 million	£8.9 million	£0.1 million
Legacy ICT cost as a percentage of the full cost of service	7 per cent	1 per cent	2 per cent	0.3 per cent

Summary

1 There have been changes in the government's approach to improving value for money from Information, Communication and Technology (ICT). We have examined the steps the Cabinet Office has taken to save money to begin to introduce reform and implement its new ICT, digital and cyber security strategies. In this report we focus on legacy ICT which we define as systems and applications that have been operationally embedded within a business function but superseded by newer and more effective technologies or changed business needs.

2 Both private and public organisations have legacy ICT challenges to manage to some degree. This is because it would not be value for money to constantly replace all systems when a new need or a more effective technology is identified. We estimate that in 2011-12 at least £480 billion of the government's operating revenues and at least £210 billion of non-staff expenditure such as pensions and entitlements were reliant to some extent on legacy ICT. Good practice in managing legacy ICT as an integrated part of public service delivery is therefore crucial to maintaining the performance of these services.

3 The government's ICT strategy, published in March 2011, recognised legacy ICT as a barrier to the rapid introduction of new policies and particularly the move to 'digital by default'. Legacy ICT reduces the flexibility to improve public services, makes it harder to protect against evolving cyber threats and increases government's reliance on long-term contracts with large ICT companies. It is also likely to increase the cost of operating public services by preventing higher levels of automation and hinder data sharing intended to prevent fraud and error.

4 The risks of legacy ICT will increase over time as the gap between the system functionality and business need widens and the complexity of the systems and software increases. The management and technical resources needed to maintain and make further changes also increases.

5 The cost and risk of retaining the legacy system has to be balanced against the cost and new set of risks of implementing a new system. These risks include migrating data, operations staff and customers (citizens and business) on to the new service while ensuring business and service continuity. In the public sector, system changes often have to be planned in parallel with an evolving policy environment. Making a convincing and robust financial case to replace or adapt and extend a system's life in a period of austerity is a significant challenge, but also an opportunity for government. This has become increasingly important as departments move ahead with transforming their services to digital, at potentially less cost.

6 Deficiencies in planning for legacy ICT and the failure to modernise ICT infrastructure across government are now more visible and open to challenge by the Cabinet Office through its review of all ICT business cases of £5 million and above. This is highlighting the challenges that government bodies share in managing legacy ICT.

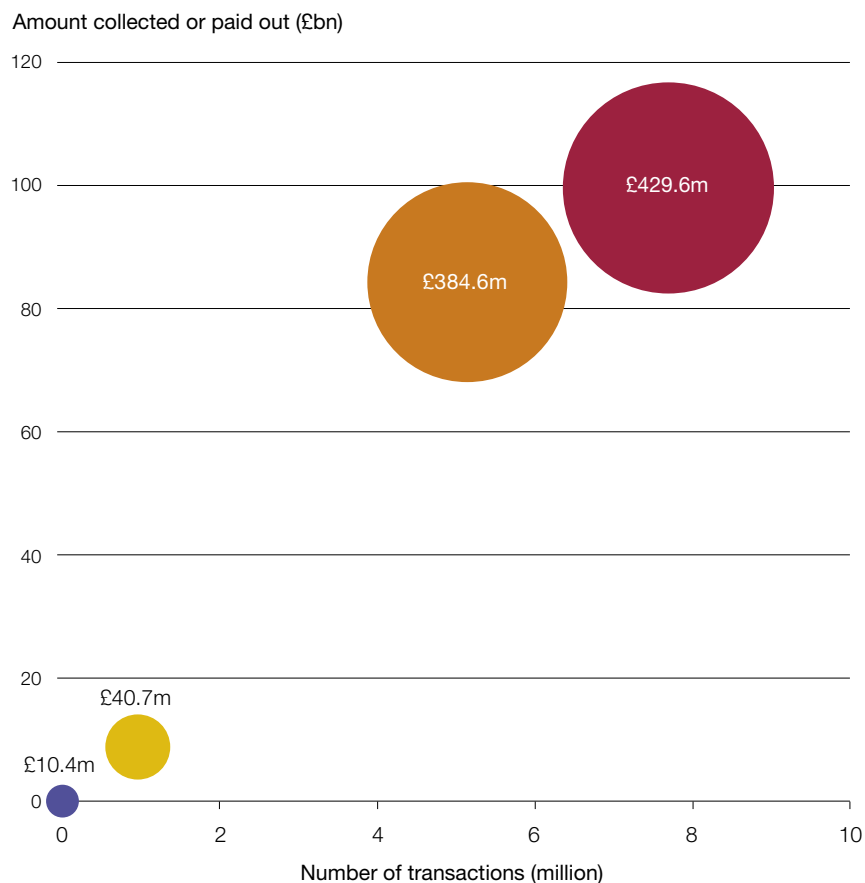
7 This report draws on the government's experience in managing legacy ICT risks and applying different strategies for delivering change and improvement in four public services: state pension; Value Added Tax (VAT) collection; prescription payment; and consumer credit licensing services. Our analysis of each service is available at www.nao.org.uk/search/year/2013/monthnum/08/sector/ict-and-systems-analysis/type/report. These case studies were selected to illustrate the range of approaches that small and large government bodies are taking to address the issues arising from legacy ICT (**Figure 1**). Their experience provides valuable insight for others who have legacy ICT and are considering transforming their services.

8 The four case studies shown in Figure 1 are:

- The Department for Work & Pensions' (DWP) **pension service**. This assesses entitlement to state pension, pension credit and winter fuel allowance. Originally introduced in 1987, the service had 13 million customers in 2011-12, processed 5.2 million new claims or adjustments, cost £385 million to run and had 6,000 processing staff.
- HM Revenue & Customs' (HMRC) **VAT collection service**. This processes, collects, repays, risk assesses and, where appropriate, enforces VAT. Introduced in 1973, the system has been heavily developed and moved on to new hardware since that date. In 2011-12, the service was used by 1.9 million customers, processed 7.7 million VAT submissions, had 5,900 staff and cost £430 million to run.
- The NHS Business Services Authority's (NHSBSA) **prescription payment service**. This is operated by two systems working in parallel, one new, the other a legacy ICT system dating from 1996. This service administers payments to pharmacists and others who handle NHS prescriptions. It cost £41 million to run in 2011-12 and is operated by 930 staff.
- The Office of Fair Trading's (OFT) **consumer credit licensing service**. This supports around 70,000 businesses that provide goods or services on credit or for hire and deals with 25,000 applications, renewal notifications and licence surrenders each year. The credit licensing service cost £10 million to run in 2011-12, with 110 processing, compliance and enforcement staff. Its ICT system, PROMOD, went live in 2007, is an illustration of how relatively new systems can develop the characteristics of legacy ICT.

Figure 1
Comparative analysis of the four services

Case studies range from the small consumer credit licensing service to the large VAT collection service



- HMRC VAT collection service
- DWP pension payment service
- NHSBSA prescription payment service
- OFT consumer credit licensing service

Notes

- 1 Size of bubbles represents the full cost of the services (ICT, processes, enforcement and overheads). VAT service cost excludes registration processes as these processes are supported by a separate system.
- 2 The HMRC figure of £429.6 million includes the cost for all staff using the VAT service, many of whom spend only a small proportion of their time using the legacy system in the course of their day-to-day work.
- 3 For NHSBSA, a transaction is defined as the processing of 1,000 prescription line items.
- 4 Based on 2011-12 annual data.

Source: National Audit Office

Key findings

9 The failure of legacy ICT would have a significant impact on government.

The reliance on legacy ICT is highlighted in our case studies. In 2011-12, the DWP legacy ICT system paid out £84.3 billion of state pension and associated benefits, and the HMRC systems administered £99.6 billion of VAT receipts (net of repayments). This makes them of considerable significance and their failure would potentially endanger the payment of pensions and benefits and the collection of revenues (paragraphs 3.3, 3.4 and 3.6, Figure 5).

10 The case studies demonstrate three strategies typically used for managing legacy ICT systems, each with their own associated risks and benefits. The four government bodies we audited had adopted the following strategies:

- Due to uncertainties about the nature of, and responsibility for, consumer credit licensing following government announcements, OFT was constrained in investing in its legacy ICT and had little choice but to apply a **'no change' strategy**. Since April 2013, it has been clear that a new system will replace PROMOD from April 2014 (Part Two).
- Both DWP and HMRC applied an **'enhance and maintain' strategy** to respond to evolving business need, including introducing new digital channels for users of their pension payment and VAT collection services. Consequently, for these systems they have left the legacy ICT intact but built interfaces to new ICT systems to provide additional functionality. DWP's overall strategy is a combination of 'Digital transformation' and 'replace' (Part Three).
- NHSBSA decided upon a **'replace' strategy**, investing in a new system to meet new business needs that successfully replaced its core legacy ICT. This was done without either radical transformation of the overall service or decommissioning of the legacy system, which continues to operate in parallel (Part Four).

11 Well managed legacy ICT systems deliver continuity of service and suggest the lives of such systems can safely be extended. We examined two older legacy ICT systems: DWP's Pension Strategy Computer System (PSCS) which began service in 1987; and HMRC's collection of VAT legacy ICT systems which originated in 1973. Both have been successfully adapted, were well managed and provided stable platforms, with availability typically above target and few technical problems (paragraphs 3.2, 3.4 and 3.5).

12 Well planned strategic investments have been successful in enhancing the functionality of legacy ICT, for example to improve customer service, while minimising risk to service continuity and reducing the full cost of service.

DWP reduced the cost per customer of its pension payment service by 30 per cent between 2008-09 and 2011-12. It did this by successfully implementing a new Customer Account Management system that draws together customer information from multiple legacy ICT systems to simplify the processing of pension cases (Figure 5 and paragraph 3.11).

13 The NHSBSA has implemented a more cost-effective replacement for its legacy ICT system.

The new system introduced automation to improve capacity processing. With the growth in issued prescriptions, it would eventually become unsustainable and too costly to process them by hand using the legacy ICT system. In 2011-12, the NHSBSA handled 965 million line items of prescription data. The cost of processing 1,000 prescription line items on the legacy ICT system is 90 per cent more than for the new system. In bringing the new system into operational service, however, there was a fall in the accuracy levels achieved (paragraphs 4.3 to 4.6 and Figure 6).

14 In contrast, adopting a strategy of no change may impede organisational efficiency.

OFT's ICT system has had a number of faults since implementation and has quickly developed the characteristics of legacy ICT as it has not been able to adapt to changing business needs. From April 2014, OFT's credit licensing service will be replaced by the new Financial Conduct Authority's (FCA) authorisation service. This has created uncertainty about the future service model and so OFT has not invested in any changes to its legacy ICT. The credit licensing service continues to process transactions on a timely basis for its users. However, the cost of the credit licensing service on a per customer transaction basis rose by an average of 10 per cent per annum between 2008-09 and 2011-12. Between 2008-09 and 2011-12, the total cost of the credit licensing service (compliance, enforcement and transactional) rose by 2 per cent but the number of customer transactions declined by 23 per cent as the overall size of the licensed population fell. Since introducing PROMOD, statutory changes have meant that OFT has to carry out more rigorous checks of applications than it previously did. It also undertakes more compliance and enforcement activity. OFT could not fully split out this additional work from the underlying transactional cost and therefore we could not determine whether the increased cost was due to the extra activity or an adverse impact from the legacy ICT (paragraphs 2.5, 2.6 and 2.9).

15 Legacy ICT systems expose organisations to particular risks which the organisation has to understand and have the resources to manage. The size and likelihood of risks occurring will increase over time and require an increasing amount of management effort to mitigate. The common risks we have seen in our four case studies that departments need to manage are (paragraph 1.13):

- **Higher security vulnerabilities.** Among our case studies, the legacy ICT within OFT is operating with software that is no longer supported by its suppliers.
- **Lock-in to uncompetitive support arrangements with a single supplier.** When the original outsourcing arrangements were coming to an end in June 2012, OFT had doubts whether any suppliers other than the original developer could support the system due to it being complex, bespoke and not fully documented. OFT made the decision to extend its contract with the existing supplier after consideration of a wide range of options, and in the context of the government consulting on changing the nature of credit regulation, including shifting responsibility to another body. HM Treasury approved this approach in March 2012.
- **Skills to maintain and support legacy ICT become scarcer, leading to gaps in capability.** HMRC is facing a shortage of the skills it needs to sustain the VAT legacy ICT due to the current age profile of its staff. DWP also recognises the skills and knowledge it needs are declining both within DWP and its supplier. We also found that within NHSBSA, its wider ICT estate required a large support team because of the complexity created by its diverse range of legacy ICT.
- **Manual processes proliferate to overcome the difficulty in adapting legacy ICT to meet changing business needs.** In DWP, although benefit processing legacy systems have been integrated with online channels, this has not been undertaken for the PSCS for business reasons. This has resulted in new claims made online having to be manually re-entered by staff into the legacy system.
- **Legacy ICT is harder to adapt to meet changing business needs. We found that where an organisation has replaced its legacy ICT system, adaptability has increased.** OFT commissioned an efficiency and effectiveness review in April 2010, which recommended the redesign of business processes to streamline consumer credit processing. While most changes were implemented, some could not be supported by the legacy ICT and therefore were not adopted. NHSBSA had developed a new system adaptable to changing business needs. Although it was designed to capture data from scanned images of prescription forms, its design included support for prescriptions submitted electronically via the Electronic Prescriptions Service (EPS). This is a far more accurate and efficient means of processing prescriptions.

- **Hidden costs arise as new business processes are introduced to compensate for the limited adaptability of the legacy ICT system.** The administration cost involved in using legacy ICT can be considerable. There can also be hidden costs when the information to make informed decisions is not available. We found that HMRC had designed exception processes to manually intervene in the normal straight-through processing. These processes represented 20 per cent of cost.
- **Increased complexity caused by additional interfaces and connections with other systems makes routine changes to legacy ICT costly and protracted.** The existing complexity of DWP's pension legacy system means changes take up to 18 months from planning to deployment. This can be due to funding limits and the ability of the business to take on change as well as the nature of the technology and related development processes.

We note elsewhere in this report the actions the case study organisations are taking to address these risks (paragraphs 2.8 to 2.12, 3.10 to 3.17 and 4.10 to 4.15).

16 Business transformation, including the drive for digital transformation is proving challenging for departments when it involves legacy ICT. Many legacy systems require data to be processed as a sequence of batches that is incompatible with a fully real-time digital service. In the pension system, for example, online applications have to be manually re-entered into the main system by a DWP operator, as the website and the main legacy ICT system are not integrated. The approach of adding functionality through the addition of interfaces to the core legacy ICT is likely to be insufficient to achieve full digital transformation (paragraph 1.2).

17 We found a lack of cost and performance data for the four public services we audited. We found gaps in both the time series and breakdown of cost and performance data from which management could assess the impact of legacy ICT. This becomes critical when decisions need to be made about the financial and risk trade-off between the retention of legacy systems and the benefits of replacement. Without a full analysis of service performance, operational efficiency and cost breakdown for the service over recent years, it is impossible to generate a robust business case for change (paragraphs 2.7, 3.14, 3.15 and 4.15).

18 Business owners were not fully aware of the risks to their department posed by their legacy ICT. Our audits of two of the four services found legacy ICT strategies and decisions being the responsibility of the ICT function with insufficient dialogue with the business owner. A more integrated approach between ICT and business functions is necessary to optimise decision-making about legacy ICT and its impact on future digital services (paragraphs 3.2 and 3.6).

Conclusion

19 We estimate that at least £480 billion of central government revenue and at least £210 billion of non-staff expenditure in 2011-12 is reliant on legacy ICT. Legacy ICT could present a very significant risk to public service delivery and value for money if handled poorly.

20 We found examples where government has understood and managed the short-term risks of legacy ICT well. Specifically, for VAT collection, state pensions and prescription payments, legacy ICT has delivered satisfactory levels of performance. Government bodies have developed strategies to deliver incremental business change and service improvement from their legacy ICT. These strategies have inevitably, in times of austerity, become more focused on short-term decision-making, seeking to minimise both investment need and the risk to service delivery.

21 However, government is changing the way it commissions public services, to make them digital, cheaper and more adaptable to user needs. The strategies that government bodies have been applying to legacy ICT are unlikely to be sufficient to deliver the level of transformation envisaged by the government's digital strategy. The lack of a full end-to-end view of the service, gaps in cost and performance information and the siloed working of ICT and business functions also restrict decision-making.

Recommendations

For those responsible for transforming public services involving legacy ICT

- a Public bodies should ensure that they have a full analysis of the cost, performance, and risks of their services over time and of the impact of legacy ICT.** With the pressure on resources, the challenge of digital transformation and the need to gain the approval of the Cabinet Office for all ICT business cases that exceed £5 million, all government bodies should make sure their business cases for change involving legacy ICT are robust from many perspectives: user; operational efficiency; commercial; financial; and technical. They should also examine the running costs of legacy ICT to identify the scope for ongoing efficiencies.
- b Public bodies should draw more on cross-government comparisons and examples of best practice of managing legacy ICT while transforming to digital.** There is good experience in government and teams are becoming more open to sharing.
- c Public bodies should ensure that service managers are fully aware of the risks to their services, posed by legacy ICT.** The requirement for every public service to have a service manager taking responsibility for the whole life cycle and performance of the service, as identified in the Government Digital Strategy, is a good opportunity to develop this more holistic view.

For the Cabinet Office

- d There is demand across government for the Cabinet Office to do more to support public bodies in making change and delivering service improvement involving legacy ICT.** Its growing visibility of service performance, risks and capabilities gained through the working of the Government Digital Service and the IT spend control process, puts the Cabinet Office in a good position to share knowledge and to offer practical advice. This would be particularly beneficial to smaller public bodies lacking the breadth of digital and commercial experience needed to optimise decision-making.
- e Organisations should follow existing Cabinet Office guidelines and advice. However, in deciding what form of additional support to offer, the Cabinet Office should listen to the needs of service managers and those undertaking digital transformations across government.** Options include:
- Making good practice case studies available illustrating successful strategies for delivering change or managing complex legacy ICT infrastructure.
 - Harnessing the Cabinet Office's resources such as strategic supplier relationship management, the ICT asset register and ICT professional development networks to improve cross-government management of risk and service delivery with legacy ICT. For example, using the ICT asset register to identify the extent of dependency on specific legacy technologies, stimulating opportunities such as supplier negotiations and sharing skills.
 - Developing advice about the business and commercial analysis needed to underpin digital transformation and decision-making on legacy ICT in particular. This will raise the quality and consistency of government business cases, reducing the time and resources needed for their evaluation.

Part One

Introduction

1.1 The past three years have seen rapid changes in the government's approach to Information, Communication and Technology (ICT). We have reported on the steps the Cabinet Office has taken to introduce reform. These include implementing its new ICT strategy and spend controls, professionalising its ICT workforce, introducing agile methods, moving and securing public services online, and delivering savings through shared back-office services. In Appendix Three we show how this piece of work fits in with other National Audit Office publications on government ICT.

1.2 None of our reports so far has focused on older systems which are critical for delivery of key public services. These are often referred to as 'legacy ICT'. All organisations will have some legacy ICT. This is because it would not be value for money to constantly replace all systems when a new need or a more effective technology is identified. Legacy ICT systems, however, pose an important and growing risk to the continued availability of public services and the ability of government to implement their planned reforms. As budgets are reduced, departments with large legacy ICT estates have found it challenging to reduce costs and improve customer service through better use and sharing of information. Delivering the government's digital strategy is constrained by long-standing modes of operation, with data processed as a sequence of batches instead of in real-time.¹ Legacy ICT can increase vulnerability because re-engineering legacy systems' infrastructure and applications to strengthen their resilience to cyber threats is often not possible.² Government departments are therefore required to deploy additional protection to manage their information risks. Managing the risk of legacy ICT has also prevented some government bodies from reducing their dependency on a few large ICT suppliers, reducing competition and increasing the risk to value for money.

1.3 We define legacy ICT as systems and applications that have been operationally embedded within a business function but superseded by newer and often more effective technologies or changed business needs, for example the need to deliver a new policy or deliver a service in a different way. While ageing systems are often automatically considered to be legacy, we have also found relatively new ICT that has been superseded by technology and need.

¹ The Cabinet Office, *Government Digital Strategy*, November 2012.

² A MacWilson and B Phelps, *Countering today's cyber threats*, Accenture, August 2010, available at www.accenture.com/us-en/outlook/Pages/outlook-online-2010-countering-cyber-threats.aspx, accessed 10 April 2013.

1.4 In its 2011 ICT strategy, the Cabinet Office recognised legacy ICT as a barrier to transforming public service delivery.³ The Cabinet Office recently issued advice⁴ on the approach to handling legacy ICT and is taking the lead in the implementation of the government ICT strategy including reviewing all ICT business cases of £5 million and above. It is also overseeing the programme that will replace or adapt these systems to better meet the requirements of the digital, ICT and cyber security strategies. Departments also need to know the running costs of their ICT, including legacy ICT, to be able to identify efficiencies.

Our approach

1.5 We examined four public services to illustrate how government is managing legacy ICT risks. Our audit approach is shown in Appendix One and our evidence base in Appendix Two. The services were selected to illustrate three different strategies for handling change:

- No change
- Enhance and maintain
- Replace.

1.6 In reality, departments combine elements of these strategies:

- The Office of Fair Trading's (OFT) consumer credit licensing service was used to demonstrate the impact of a '**no change**' strategy (Part Two). The core legacy ICT is left largely unchanged – in the case of OFT due to uncertainty about the policy environment – and business processes are adapted to meet the shortcomings of the ICT system.
- The Department for Work and Pensions' (DWP) state pension, pension credit and winter fuel allowance services, and HM Revenue & Customs' (HMRC) VAT collection service, illustrate an '**enhance and maintain**' strategy (Part Three). In both cases functionality is added to the service through the addition of interfaces to new or other systems and applications, leaving the core legacy ICT largely intact.
- The prescription payment service, operated by the NHS Business Services Authority (NHSBSA), shows the impact of developing a new system that runs in parallel with the old (Part Four). The core legacy ICT has been replaced with a new ICT system that offers modern technological capability, meets current business needs and is consistent with government policy.

³ The Cabinet Office, *Government ICT Strategy*, March 2011.

⁴ The Cabinet Office, *Government Service Design Manual*, April 2013, available at www.gov.uk/service-manual/technology/architecture.html#the-legacy-estate

1.7 In examining each case study, we adopted our standard methodology for auditing technology-based services. This enables us to compare the effectiveness of service delivery across government. The methodology and detailed reports on the case studies can be found at www.nao.org.uk/search/year/2013/monthnum/08/sector/ict-and-systems-analysis/type/report.

Estimating the scale of the legacy ICT challenge

1.8 Departments with the largest legacy ICT estates have found it challenging to achieve value for money and improve customer service. For example:

- In 2009, HMRC described its 600 systems as “complex, ageing and costly”.⁵ That year, HMRC renegotiated its main ICT outsourcing contract to make savings through a combination of decommissioning legacy ICT applications, reducing the prices paid for equipment and managing the contract more efficiently. By the end of 2011-12, HMRC had switched off 65 legacy applications.⁶ In 2013, we found HMRC had saved £158 million from its target of £161 million.⁷ As part of implementing its IT strategy, HMRC is working to decommission old systems and consolidate current and future systems on fewer applications more suited to current needs and the delivery of the digital agenda.
- Within DWP, we have previously found that administrative errors within the benefits system were, in part, caused by poor communication between its network of some 140 systems.⁸ However, the Department is now rationalising its ICT estate with a view to reducing the number of ICT applications by 2017.

1.9 The government does not collect data on legacy ICT expenditure but we estimated the scale of dependency on legacy ICT by examining government operating revenues and non-staff expenditure from departmental resource accounts and trust statements. We focused on public-facing services and so excluded back-office functions such as the procurement of goods and services or accounting for transactions.

1.10 For 2011-12, we estimate that at least £480 billion of operating revenues (94 per cent of items we examined) and at least £210 billion of non-staff operating expenditure (61 per cent) in central government were reliant on legacy ICT (**Figure 2**). This includes large revenue items such as income tax and VAT and payments such as the state pension and tax credits. This highlights the importance and potential risk of not managing legacy ICT adequately as failure in these systems would endanger the government’s ability to pay pensions and benefits and to collect revenues.

5 P Pavitt, *HMRC Case Study*, HM Revenue & Customs, September 2009, available at www.gov.uk/government/uploads/system/uploads/attachment_data/file/60947/HMRC-Case-Study-Phil-Pavitt.ppt, accessed 10 April 2013.

6 B Goodwin, *CW500: Transforming IT at HMRC, with CIO Phil Pavitt*, April 2012, available at www.computerweekly.com/feature/CW500-HMRC accessed 10 April 2013.

7 Comptroller and Auditor General, *HM Revenue & Customs: Progress on reducing costs*, Session 2012-13, HC 889, National Audit Office, February 2013.

8 Comptroller and Auditor General, *Minimising the cost of administrative errors in the benefits system*, Session 2010-11, HC 569, National Audit Office, November 2010.

Figure 2

Scale of dependency on legacy ICT

We estimate that in 2011-12, at least £480 billion of operating revenues and at least £210 billion of non-staff operating expenditure in central government were reliant on legacy ICT

	Operating revenues		Non-staff operating expenditure	
	£ billion	Percentage of total	£ billion	Percentage of total
Examined by NAO, found to be underpinned by legacy ICT systems	477.8	94	211.2	61
Examined by NAO, found not to be underpinned by legacy ICT systems	29.8	6	133.7	39
Total examined by NAO	507.6	100	344.9	100
Memo: Not examined by NAO as less than £1 billion	21.7		59.3	

Items over £10 billion examined by NAO and found to be underpinned by legacy systems are:

Income tax	151.8	
National Insurance contributions	101.6	
VAT	99.6	
State pension		74.1
Corporation tax	40.1	
Tax credits		30.5
Hydrocarbon oils	26.9	
Grant to local authorities for non-domestic rates		19.7
Disability living allowance		12.6
Child benefits		12.2

Notes

- 1 We examined all identifiable line items above £1 billion disclosed in 16 of the 17 main departmental resource accounts and trust statements. We also examined some items under £1 billion where these were considered significant. The departments examined are the Cabinet Office, the Department for Business, Innovation & Skills, the Department for Communities and Local Government, the Department for Culture, Media & Sport, the Department for Education, the Department for Environment, Food & Rural Affairs, the Department for International Development, the Department for Transport, the Department for Work & Pensions, the Department of Energy & Climate Change, the Foreign & Commonwealth Office, HM Revenue & Customs, the Home Office, the Ministry of Defence, the Ministry of Justice and HM Treasury. The devolved nature of the Department has prevented us from completing our analysis of the Department of Health.
- 2 In addition to income and expenditure, major balance sheet items, such as the student loans of £28 billion, and HM Treasury's central funds, such as the Consolidated Fund of £514 billion, are also reliant on legacy ICT systems.
- 3 The £99.6 billion of VAT income is a net figure. Gross VAT revenue was £174.9 billion in 2011-12 and repayments were £75.3 billion.
- 4 The £84.3 billion figure quoted as the amount paid out by the DWP pension service includes the £74.1 billion in the table above for state pension plus pension credits and winter fuel allowance.

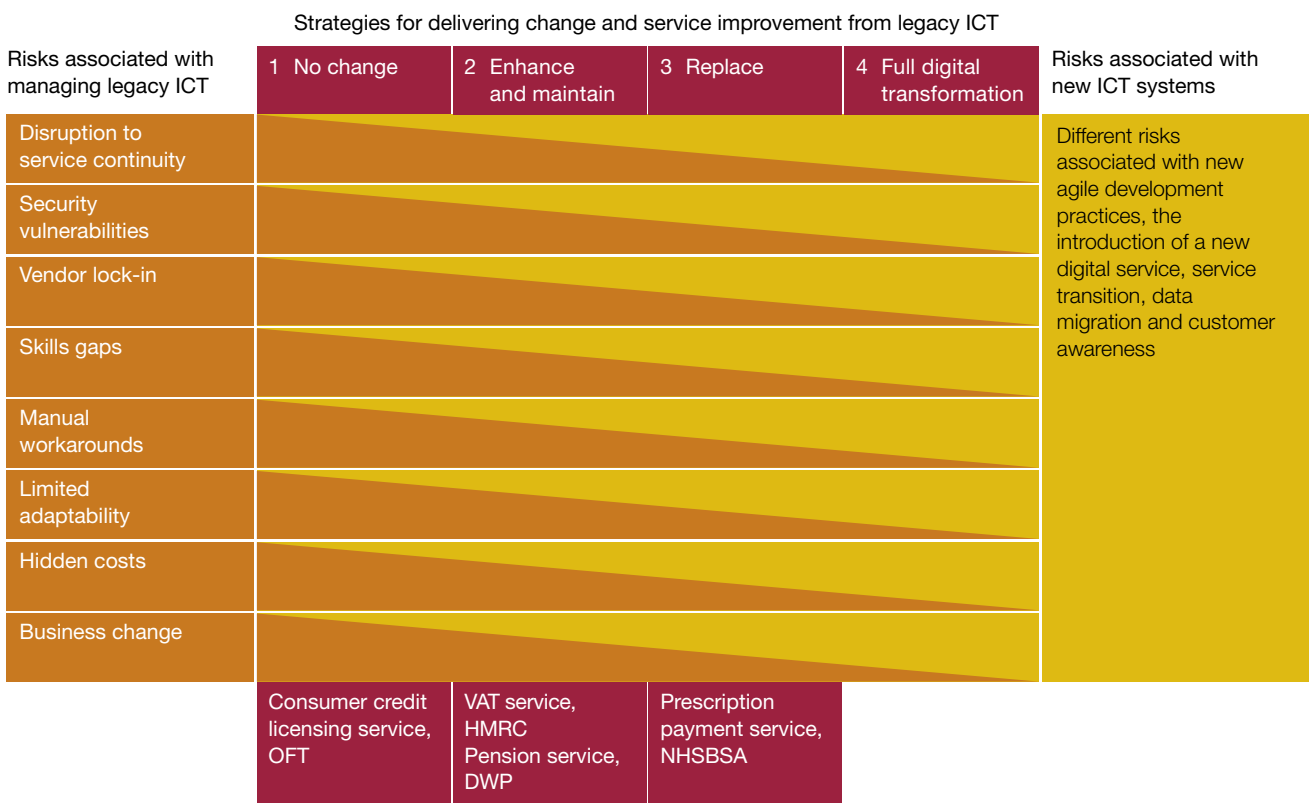
Source: National Audit Office analysis of departmental resource accounts and trust statements for 2011-12

1.11 In addition, the administration cost involved in using legacy ICT can be considerable. The cost of operating HMRC’s VAT collection service is £430 million per annum and the cost of the DWP pension payment service is £385 million per annum. The VAT service has 5,900 staff and the pension service has 6,000 processing staff.

Managing risk and delivering service improvement with legacy ICT

1.12 In **Figure 3** we identify from our analysis eight key risks that departments need to manage when handling legacy ICT. We also list the strategies we have found for responding to business change and delivering service improvement. These may be stimulated by the introduction of customer targets, customer feedback, changes in government policy and legislation, the need to reduce costs or the decision to change service delivery to ‘digital by default’. In most cases it is likely to be a combination of these factors.

Figure 3
Managing risk and delivering service improvement with legacy ICT



Note

1 The legacy ICT risks diminish as an organisation’s approach to legacy moves from no change to enhancing to eventual replacement. However, other risks associated with new ICT increase.

1.13 The eight key legacy ICT risks identified in Figure 3 are:

- **Disruption to service continuity.** Legacy ICT infrastructure or applications are prone to instability due to failing components, disrupting the overall service. Failure of the legacy ICT may be more difficult to rectify due to the complexity or shortage of components.
- **Security vulnerabilities.** Older systems may be unsupported by their suppliers, meaning the software no longer receives bug fixes or patches that address security weaknesses. The system may not therefore be able to adapt to cyber threats.
- **Vendor lock-in.** Legacy ICT systems are often bespoke and have developed more complexity over time to the extent that only the original supplier will have the knowledge to support them.
- **Skills gaps.** Specific skills in old programming languages may be required that are not widely available. Staff working with legacy ICT over a long period will have often developed a depth of understanding of the system that is difficult to replace.
- **Manual workarounds.** More manual processing can be required due to the lack of functionality within the system or its inability to interface with other systems. Examples of workarounds include performing detailed calculations outside the system on spreadsheets; re-entering data on to other systems or having to manually check for processing and input errors.
- **Limited adaptability.** New business requirements may not be supported by the legacy ICT. These may include requirements such as the provision of digital channels, the provision of real-time information and not being able to process transactions in a new way.
- **Hidden costs.** The true cost of operating the system may not be known. Workarounds to the system and the cost of the additional manual processes may not be recorded. By not having all the information available at the right time, legacy ICT may not be able to provide real-time performance information which could lead to poor decision-making.
- **Business change.** Due to the complexity or the limited availability of the skills required, change may be difficult, lengthy to implement and costly. This makes it difficult for the business to be responsive and changes may have to be prioritised.

1.14 A potential ninth risk is that legacy ICT may be less energy efficient than modern systems. The government is targeting a 25 per cent reduction in greenhouse gas emissions by 2015, from its 2009-10 baseline.⁹ Older ICT equipment is generally less energy efficient than modern equivalents. A report by the Auditor General of Canada into the ageing information technology in Canada's largest ICT spending departments found older ICT systems were both less energy efficient and harder to modify to reduce their environmental impact.¹⁰ For the systems we looked at, most of the legacy hardware had been replaced, therefore we excluded the environmental impact of legacy ICT from our review.

1.15 Figure 3 also acknowledges that major change that involves underlying ICT will create a new set of risks which will increase as the degree of system change increases. These risks include the failure to manage people to adapt to new ways of working or to deliver the required changes in time. In addition, in the public sector system changes often have to be planned in parallel with an evolving policy environment. These risks are not directly examined in this report but will be important considerations when government decides on which change strategy to adopt.

1.16 Finally Figure 3 highlights the three strategies used by our case studies for managing legacy ICT while improving services. It also introduces a fourth approach of **Digital transformation**. The government's digital strategy aims to redesign public services so that they are 'digital by default', putting users at the heart of the service. This includes introducing new practices that allow it to rapidly and iteratively evolve services, and reduce build costs significantly.

1.17 None of the organisations had sought to digitally transform their services entirely. Many departments recognise they will need to replace their legacy ICT if they are to achieve the key objective of digital transformation in the Government Digital Strategy. For example:

- The legacy ICT we reviewed in DWP and HMRC both have origins that predate the internet and use technology based on Fujitsu's Virtual Machine Environment (VME) operating system. Some of the applications using VME process the data in batches. Jobs are set serially such as checking the credibility of the amounts declared on VAT returns. Such a mode of operation would be incompatible with a fully digital service and so these applications may require replacement or modification. A fully digital service would then enable online end-to-end processes with systems that respond in real-time.
- The Department for Business, Innovation & Skills has plans to refresh and replace legacy ICT used by the Intellectual Property Office. We will examine such systems in our future work.

9 The Cabinet Office, *Greening Government ICT Strategy*, March 2011.

10 Office of the Auditor General, Canada, *Ageing Information Systems*, Spring 2010.

Part Two

A 'no change' approach to managing legacy ICT

2.1 In this part we examine the impact of adopting a 'no change' approach to legacy ICT. Our findings are drawn from our case study of the Office of Fair Trading's (OFT) consumer credit licensing service. A full report on this service is available at www.nao.org.uk/search/year/2013/monthnum/08/sector/ict-and-systems-analysis/type/report.

2.2 Under this 'no change' approach business processes are typically adjusted to meet new requirements and may include additional manual processes. Introducing change in this way potentially offers the lowest capital cost and the lowest risk that service performance will deteriorate as a result of change. However, while it may allow an organisation to change its services to some degree, it is unlikely to reduce costs or improve performance. It is also unlikely that transformational change, such as introducing phone or web-based channels, could be delivered. This strategy therefore leaves the organisation exposed to the full risks of legacy ICT.

2.3 The OFT grants licences under the Consumer Credit Act 1974. It regulates organisations that offer consumer credit facilities and those that provide lending or debt advice. Approximately 25,000 credit licence applications, and associated transactions, are processed each year by 110 OFT staff using its PROMOD ICT system. This system was implemented in 2007 as a replacement for a legacy mainframe system and is managed through an ICT outsourcing contract with CGI Group Inc.¹¹ As the system has been superseded by technology and new business requirements we consider this relatively new system to be legacy ICT. Key facts about this service are provided in **Figure 4** overleaf.

2.4 From April 2014, OFT will cease to exist and its credit licensing service will be replaced by the new Financial Conduct Authority's (FCA) authorisation service. The government first made substantive proposals for change in December 2010, and, following a consultation, introduced a bill into Parliament in 2012. These proposals have created uncertainty for OFT for a number of years and constrained its ability to invest in the service and address weaknesses in the PROMOD system. Because of these uncertainties OFT's approach has been to deliver service improvement by altering business processes and managing, but not significantly changing, the PROMOD system. Since April 2013, it has been clear that a new system will replace PROMOD from April 2014.

¹¹ Previously the provider was Logica who were acquired by CGI Group Inc. in August 2012.

Figure 4Key facts on the OFT's consumer credit licensing service
(all cost and performance data based on 2011-12 data)

Contextual organisational data	Gross departmental expenditure	£71 million
	Gross ICT expenditure	£5.9 million
Service data	Name	Consumer credit licensing
	Service customers	70,000 licensed traders
	Service volume	25,000 applications, renewals, variations and surrenders
	Processing staff	110
Financial data	Amount collected (Service value)	£11.5 million of charges to traders for this service
	Full cost of service (ICT, processes, enforcement and overheads)	£10.4 million
	Total ICT cost	£2.4 million
	ICT cost as a percentage of full cost of service	23 per cent
Legacy ICT data	System	PROMOD, a case management system consisting of an application from LexisNexis called VisualFiles and a Microsoft Structured Query Language database
	Go-live date	2007
	Cost of legacy ICT	£0.7 million
	Legacy ICT cost as a percentage of full cost of service	7 per cent
	Monthly average availability of the system	Not known
	Monthly average number of major system faults	4

Notes

- 1 Gross departmental expenditure is the total of capital and resource expenditure that is within departmental expenditure limits.
- 2 The legacy ICT has received software enhancements and hardware changes since the original go-live date.
- 3 The average number of major faults in the system is the number logged by OFT as severity 1 or 2 meaning they result in a loss of data integrity, severely impair business functionality or prevent the system from being used.
- 4 Processing staff relates to all those involved in the service not managing or servicing the ICT equipment including compliance, enforcement, administrative and management.

Source: National Audit Office analysis of Office of Fair Trading data

Features of OFT's approach

2.5 Managing the PROMOD system has been a challenge for OFT and has impacted on its credit licensing service for customers. The OFT has targets for completing credit licensing applications depending on whether the application is high or low risk. For high-risk customers, OFT aims to process 75 per cent of transactions within 50 working days and for low-risk customers, 90 per cent of transactions within 25 working days. Between April 2010 and March 2012, OFT largely met these targets but in March and April 2011 it experienced a number of service failures with the PROMOD system, which caused it to miss its target for low-risk customers. Since May 2011, service performance has improved.

2.6 Between 2008-09 and 2011-12, the full cost of the credit licensing service rose by 2 per cent, after adjusting for inflation, but the number of customer transactions declined by 23 per cent as the overall size of the licensed population fell. As a result the overall cost per transaction of the service increased by 32 per cent in the period. OFT told us that it had changed the balance between the effort it invested in the transactional processing of licences and its regulatory functions over this period, with significantly more resource being put into regulation, although it could not provide a full breakdown of this. As a result we were unable to determine whether the transactional cost of processing a licence had increased or decreased or whether legacy ICT was having an adverse impact on transactional cost.

2.7 OFT had the full range of financial data that we expected. It did not have performance measures covering the overall effectiveness of the service, the quality of its processing activity or the availability of the PROMOD system.

Examples of where legacy risks are presenting significant challenges

2.8 Managing legacy ICT without the option of significantly enhancing its functionality means that OFT faces the increased cost of managing the following risks.

Service continuity

2.9 PROMOD has not proved a stable system. In 2011-12, there was an average of four major system faults per month. Such faults result in a loss of data integrity, severely impair business functionality or prevent the system from being used. Effective ICT service management typically requires formal processes to manage incidents and problems, along with a diverse range of skills to enable an organisation to challenge its ICT supplier. As a smaller organisation, OFT does not have all these skills and consequently has not been able to eliminate all the causes that contribute to service disruption. It has filled some roles using short-term contractor appointments, but the proposed machinery of government changes has limited its ability to plan its longer-term resourcing requirements.

Security vulnerabilities

2.10 PROMOD depends on unsupported vendor software which creates security and support vulnerabilities.

Vendor lock-in

2.11 PROMOD is a poorly documented and highly bespoke system. This, along with the impending migration to the Competitions and Markets Authority, has led OFT to become locked into a relationship with CGI Group Inc. When the original contract arrangements for PROMOD ended in June 2012, OFT had doubts whether any suppliers other than the original developer could support the system at a reasonable price. OFT also wanted to ensure that the future owner would have a range of options available to it when adapting the new statutory framework, including replacing PROMOD. OFT worked closely with HM Treasury to prepare both an options appraisal and a cost-benefit analysis. Taking a risk-based approach, OFT decided to offer its existing supplier a two-year support contract.

Limited adaptability

2.12 PROMOD constrains OFT's ability to introduce change to the credit licensing service. OFT commissioned an efficiency and effectiveness review in April 2010, which recommended the redesign of business processes. However, some of these changes could not be supported by PROMOD.

Part Three

An 'enhance and maintain' approach to legacy ICT

3.1 In this part we examine the impact of adding functionality to a service through the addition of interfaces to other systems and applications, leaving core legacy ICT largely intact. The Department for Work and Pensions' (DWP) pension service and HM Revenue & Customs' (HMRC) VAT collection service were selected as case studies for this 'enhance and maintain' strategy. Both departments use software and system 'wrappers' around legacy ICT to deliver additional functionality. Our full analysis is available at www.nao.org.uk/search/year/2013/monthnum/08/sector/ict-and-systems-analysis/type/report.

3.2 The government has referred to this approach to 'enhance and maintain' as applying 'wrappers'. This is government's preferred option for dealing with legacy ICT. This approach can be used to make transformational change, for example, introducing online channels. This results in a more complex technology estate, which tends to increase the full cost of service and skill requirements. Introducing change in this way requires some capital investment, and is generally slow to implement and exposes the organisation to a risk that service performance will deteriorate if new technology does not work as planned. As legacy ICT remains, this strategy still leaves the organisation exposed to its inherent risks and in the longer term can be unsustainable as the complexity and cost of maintaining the 'wrappers' increases.

3.3 DWP is responsible for processing and paying the state pension and related benefits to 13 million pensioners in the UK and abroad. Its pension service has around 6,000 staff responsible for delivering and supporting 750,000 new claims processed on the Pensions Strategy Computer System (PSCS). The approach for the PSCS has previously been to 'enhance and maintain' but the Department's wider strategy now for its legacy ICT is 'Digital Transformation' and 'Replace and Retire'.

3.4 HMRC has collected VAT using a series of legacy systems. These date back to a VAT mainframe computer that was implemented in 1973, but has been adapted and modernised since. It now hold details on 1.9 million VAT-registered individuals and businesses and is a repository for VAT return and payment information, providing a record of customer returns and transactions which are reconciled against cash flow.

3.5 Both the pension service and VAT collection service are administered using ageing and complex applications that have to interface with other critical systems (**Figure 5**). Both use the Virtual Machine Environment (VME). This operating system had its origins in the systems used by the mainframe computers that were first installed by central government. The current supplier of VME, Fujitsu, has announced that it will support the current version of VME until 2020. After this, organisations have the choice of moving to alternatives or extending VME applications by using Fujitsu's planned managed service.

3.6 The scale and importance of both services, combined with the materiality of the public money they administer, have deterred both departments from replacing these systems. Neither department had considered replacing their legacy ICT with a completely new end-to-end service. Instead they built new functionality around existing processes or systems, replacing an existing paper-based system. In both organisations we found that the ICT and business functions could have worked more closely together to develop a longer-term strategy for a complete end-to-end service. In addition, we found a lack of data that would enable management to assess the full cost of service and performance.

Features of the approach

3.7 The scale of DWP and HMRC means that they have large ICT teams. HMRC, for example, has 1,100 staff in its IT function with 23 supporting the VAT legacy ICT. HMRC has an in-house team who manage and support the VAT application itself whereas the hardware is provided through Aspire, HMRC's ICT supply contract with Capgemini and Fujitsu. In DWP, the pension service ICT is outsourced to Hewlett-Packard Limited. HMRC and DWP are able to apply a range of expertise to address the shortcomings of their legacy systems.

3.8 DWP and HMRC have extended the lives of the pension and VAT legacy ICT systems. They have also delivered efficiencies and achieved high levels of service availability while demonstrating service enhancements through the introduction of new telephone and digital channels.

3.9 The service enhancements, however, have more limited functionality than a fully digital service and the approach of DWP and HMRC has led to increased complexity in the technology and business processes. HMRC has found it challenging achieving a 'whole customer' view, as its customer data is stored across a number of legacy ICT systems. Perpetuating the use of older systems creates challenges for sustaining the right technical skills, for improving customer service and delivering value for money through better use of information.

Figure 5

Key facts on DWP's pension payment service and HMRC's VAT collection service
(all cost and performance data based on 2011-12 data)

		Department for Work & Pensions	HM Revenue & Customs
Contextual organisational data	Gross departmental expenditure	£8,344 million	£4,309 million
	Gross ICT expenditure	£1,391 million	£554 million
Service data	Name	Pension payment	VAT collection
	Service customers	13 million recipients of state pension and/or pension credit	1.9 million customers who are registered for VAT
	Service volume	5.2 million new claims or adjustments to existing claims	7.7 million VAT submissions
	Processing staff	6,000	5,900
Financial data	Amount collected or paid out	£84.3 billion of state pension, pension credit and winter fuel allowance payments	£99.6 billion of VAT receipts (net of repayments)
	Full cost of service (ICT, processes, enforcement and overheads)	£384.6 million	£429.6 million
	Total ICT cost	£87.1 million	£61.7 million
	ICT cost as a percentage of full cost of service	23 per cent	14 per cent
Legacy ICT data	System	Pension Strategy Computer System (PSCS), a mainframe on a Virtual Machine Environment platform	VAT mainframe on a Virtual Machine Environment platform
	Go-live date	1987	1973
	Cost of the legacy ICT	£8.9 million	£4.5 million
	Legacy ICT cost as a percentage of full cost of service	2 per cent	1 per cent
	Monthly average availability of the system	99.9 per cent	98.9 per cent
	Monthly average number of major faults in the system	0.1	0.3

Notes

- 1 Gross departmental expenditure is the total of capital and resource expenditure that is within departmental expenditure limits.
- 2 HMRC was providing us with data for this table close to the deadline for finalising this report. As a result we have not had the detailed breakdown of the data to be able to fully verify it and ensure its consistency with data supplied by other departments.
- 3 Legacy ICT systems have received software enhancements and hardware changes since the original go-live dates.
- 4 The average number of major faults in the system is the number logged as severity 1 or 2 meaning that 10 per cent of users are unable to access the service or there is a failure of overnight processing or an inability to produce printed output for the public. DWP monitors the performance of its system on a four- or five-week period rather than calendar months. It was unable to provide us with detailed performance reports for the period under review but obtained the average quoted above from the supplier.
- 5 The full cost of the VAT collection service excludes VAT registration processes as these are supported by a different system.
- 6 The HMRC figure of £429.6 million includes the cost for all staff using the VAT service, many of whom spend only a small proportion of their time using the legacy system in the course of their day-to-day work.
- 7 Processing staff relates to all those involved in the service not managing or servicing the ICT equipment including compliance, enforcement, administrative and management.

Source: National Audit Office analysis of Department for Work & Pensions and HM Revenue & Customs data

Examples of where legacy ICT risks are being well managed

Service continuity

3.10 Both DWP and HMRC have achieved high levels of service availability (Figure 5) through comprehensive governance and service management arrangements. These can, however, be complex. DWP and HMRC are committed to professional standards of service management that follow the Information Technology Infrastructure Library (ITIL) best practice. Both also ensure they have up-to-date service level agreements formalising relationships between business directorates, their ICT functions and ICT suppliers.

Limited adaptability

3.11 DWP and HMRC have overcome limited adaptability through moving their systems to newer hardware or software environments, and adding interfaces to new applications. This has enabled the services to reduce costs and support changing needs and technology:

- In 2005, DWP introduced a case management system that reduced the processing time for a new pension claim from days to around 20 minutes. This has contributed to a reduction in the cost per customer of the pension service by 30 per cent between 2008-09 and 2011-12.
- HMRC has gradually automated the way VAT and payment information enters the system. From 2003, VAT returns could be submitted online. However, as the majority of VAT returns were received on paper they were entered manually by operators. This was replaced by the electronic scanning of paper VAT returns, which in turn was superseded by the current online service, made mandatory in April 2012. The current online service does, however, have some limitations compared to a fully digital service as, for example, customers are unable to view their accounts in real-time.

Examples of where legacy risks are still presenting significant challenges

Vendor lock-in

3.12 The scale, age and complexity of DWP and HMRC legacy ICT has meant that only a small number of large ICT suppliers are able to support them as they are far too complex for a small- or medium-sized business to maintain. This will be an important consideration when preparing for contract end points, even more than the age of the technology. The government has recognised the issue of vendor lock-in by announcing plans for the creation of common ICT infrastructure. Through greater separation of the business application from the physical hardware, the aim is to reduce reliance on individual vendors.¹²

Skills gaps

3.13 HMRC faces potential future gaps in the skills it needs to support its legacy ICT. It is developing succession planning due to the age profile of its support team. HMRC has also developed a skills matrix to map the skills needed to support the VAT legacy ICT against the experience of its support team. DWP recognises that the skills and knowledge around the pension legacy ICT are declining both within DWP and its supplier. DWP is developing plans for reducing the risks of the loss of specialist skills. This includes in the short term, drawing on the expertise of the contractor market, while developing an assessment of future ICT skills requirements.

Hidden costs

3.14 Determining whether the management of legacy ICT within DWP and HMRC incurs hidden costs has proved challenging. DWP's financial data was comprehensive but it lacked effective measures to assess overall service performance, quality of process activity and the reliability of its legacy ICT. This will make it difficult for DWP to robustly plan for the longer term.

3.15 HMRC was still providing us with data in the very late stages of finalising this report and several months after it had originally been requested. For financial data, the late provision of data has prevented us from verifying that costs are on a consistent basis with other departments and forming clear conclusions. For performance information, we saw indications that HMRC has a good set of data that it uses in its day-to-day management. However, we were unable to fully confirm this finding or obtain sufficient data to allow us to conclude on the performance of the VAT service. The challenges we faced in obtaining data from HMRC suggest that it may face challenges in planning for the longer term robustly.

Manual workarounds

3.16 Additional processes are required due to the limited adaptability of systems using batch processing. The VAT return error correction process is a typical example of such manual intervention. VAT returns submitted online are only partially validated and corrected as they are entered. Full validation, risk identification and correction can only be done after the overnight batch is run. At that stage errors are picked up by the error correction team and addressed manually. This is typical functionality for the technology design of that era. Validating, and identifying more errors, at the point of submission would lead to greater efficiencies.

Cost of business change

3.17 While we were unable to establish the average cost of changes to the pensions and VAT systems, we did find the process of deploying change lengthy. For the pension system, its complexity means changes take up to 18 months from planning to deployment. This can be due to funding limits and the ability of the business to take on change as well as the nature of the technology and related development processes.

Part Four

Replacing legacy ICT

4.1 In this part we examine the impact of replacing the core legacy ICT with a new ICT system. The prescription payment service, operated by the NHS Business Services Authority (NHSBSA), was chosen as a case study to show the impact of replacing legacy ICT by developing a new system. A full report on this service is available at: www.nao.org.uk/search/year/2013/monthnum/08/sector/ict-and-systems-analysis/type/report.

4.2 The replacement approach can be used to make transformational change to reduce the full cost of service and make improvements in performance. This approach will typically require a high level of capital investment and carries a risk that service performance will deteriorate if the new technology does not work as planned. While this removes the risks of legacy ICT it will introduce other risks including the transition to live service.

4.3 The NHSBSA is an arm's-length body of the Department of Health. The prescription payment service calculates how much should be paid to pharmacists and others for medicines and medical devices dispensed to patients from NHS prescription forms. NHSBSA processed 965 million prescription line items amounting to £9 billion in 2011-12 (**Figure 6** overleaf).

4.4 In 2007, NHSBSA implemented a new system, the Capacity Improvement Programme (CIP), to replace its legacy ICT. As the number of issued prescriptions continued to grow, the new system automated a number of processes that were performed manually using the legacy ICT. CIP scans paper prescriptions and electronically captures the data from each line. The legacy ICT is still used for less than 1 per cent of total prescription items processed. Other priorities have prevented the work required to allow CIP to handle the types of transactions that the legacy system still processes.

4.5 On average, 593,000 prescriptions items were processed per month in 2011-12 by the legacy ICT system, primarily on behalf of the Channel Islands and the Isle of Man, who paid £630,000 for the service in 2011-12. The legacy ICT is also used for a small number of other transactions where the business rules have not yet been added to the CIP system.

4.6 NHSBSA has an in-house team who manage and support the two applications while the hardware environment is provided by Capita for CIP and Northgate for the legacy system.

Figure 6

Key facts on the NHSBSA's prescription payment service (all cost and performance data based on 2011-12 data)

Contextual organisational data	Gross expenditure	£186 million
	Gross ICT expenditure	£30 million
Service data	Name	Prescription payment service
	Service customers	19,000 pharmacies and other dispensers of medicines
	Service volume	965 million prescription line items, 7 million of which used the legacy ICT
	Processing staff	930
Financial data	Amount paid out	£8.8 billion of prescription payments
	Full cost of service (ICT, processes and overheads)	£40.7 million
	Total ICT cost	£10.5 million
	ICT cost as a percentage of full cost of service	26 per cent
Legacy ICT data	System	Legacy ICT which consists of a McDonnell Douglas Information System and a Sun Pricing System
	Go-live date	1996
	Cost of the legacy ICT in 2011-12	£0.1 million
	Legacy ICT cost as a percentage of full cost of service	0.3 per cent
	Monthly average availability of the system	Not known
	Monthly average number of major system faults	Not known
Replacement ICT system	System	Capacity Improvement Programme which is a group of technologies including high-speed scanning equipment, intelligent character recognition software and a Java-based application
	Go-live date	2007

Notes

- 1 Gross expenditure is the total resource and capital expenditure of the NHSBSA excluding bursaries and supply chain working capital.
- 2 The legacy ICT has received software enhancements and hardware changes since the go-live dates.
- 3 The NHSBSA does not have financial data on transactions processed exclusively on the legacy ICT. Neither does it have performance data for the legacy ICT separate from the other systems used by the prescription payment service. We have estimated that the total service cost for the legacy transactions only is £0.6 million of which ICT accounts for 23 per cent.
- 4 ICT costs for the prescription payment service are based on an allocation model and may not reflect the actual costs incurred by the outsourced service provider.
- 5 ICT costs include the resource costs of change management which may include non-ICT costs that NHSBSA is unable to separate out.
- 6 Processing staff relates to all those involved in the service not managing or servicing the ICT equipment including compliance, enforcement, administrative and management.

Source: National Audit Office analysis of NHSBSA data

4.7 In addition to the two approaches to processing prescriptions, the Electronic Prescriptions Service (EPS) provides customers with the ability to submit prescriptions electronically as an alternative to paper prescription forms. The CIP system was designed to be fed directly by EPS, further automating the process. The number of line items through this route has grown since 2009-10 but accounted for only 0.1 per cent of the total in 2011-12.

4.8 EPS could also be a significant tool in combating known prescription fraud. The policy imperative is, however, that prescriptions are made to those in medical need, which overrides the need to stringently combat potential fraudulent claims. While this remains the case, NHSBSA is unlikely to be allowed to invest in the systems that could combat the risk of such frauds. Such matters are therefore excluded from the scope of our investigation.

Features of the NHSBSA's approach

4.9 NHSBSA's decision to replace its legacy ICT through a phased approach has enabled it to avoid a number of risks associated with legacy ICT. However, NHSBSA is currently supporting two systems.

Examples of where risks are being well managed

Service continuity

4.10 We found that for the Channel Islands and Isle of Man, the service provided by the legacy ICT met their needs, although formal service level agreements had expired.

4.11 The development of the CIP system has led to a more cost-effective service which processed 958 million items in 2011-12. Initially, following go-live, the accuracy levels for data processed on CIP were below target. It took NHSBSA four years to achieve the processing accuracy target on CIP. Processing on the legacy ICT system was typically above the accuracy target.

Manual workarounds

4.12 Replacing manual prescription processing with electronic scanning led to a significant reduction in the cost per transaction. We have estimated that, in 2011-12, the cost of processing 1,000 prescription line items on the legacy ICT system was £77. This is 90 per cent more than the £41 on the new system.

Limited adaptability

4.13 The new system has helped NHSBSA overcome adaptability constraints as it has been designed to support prescriptions submitted via EPS. This is a more accurate and efficient means of processing prescriptions than paper scanning. The business case for CIP envisaged that widespread adoption of EPS would save a further £11 per 1,000 prescription line items (27 per cent of the 2011-12 cost).

Examples of where legacy risks are still presenting significant challenges

Skills gaps

4.14 NHSBSA told us that making major changes to the legacy ICT would be particularly challenging due to a lack of the right skills. For its wider ICT estate, NHSBSA noted its diverse range of legacy ICT required many different skills to support it, and that some of these skills were dwindling.

Hidden costs

4.15 Beyond the obvious cost of having to support two prescription systems, we were unable to determine whether NHSBSA incurred other significant hidden costs. NHSBSA does not have the financial data we would expect to manage its service. Due to the introduction of a new service costing model, the NHSBSA was unable to provide us with cost data earlier than 2011-12.

Appendix One

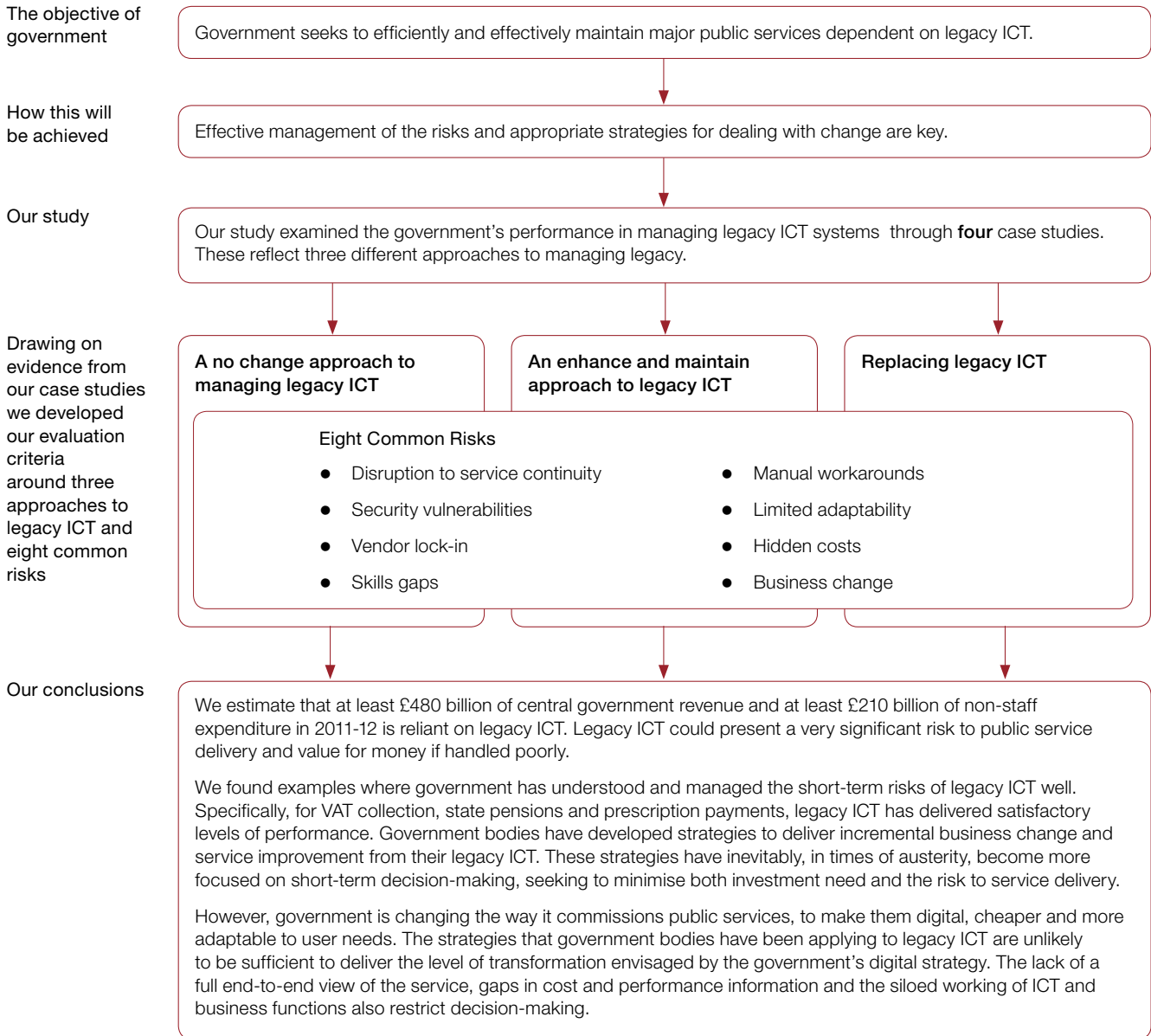
Our audit approach

1 This study analyses the risks legacy ICT poses to the delivery of public services focusing on four case studies that illustrate three different strategies for managing legacy ICT:

- No change
- Enhance and maintain
- Replace.

2 Our audit approach is summarised in **Figure 7** overleaf. Our evidence base is described in Appendix Two.

Figure 7
Our audit approach



Source: National Audit Office

Appendix Two

Our evidence base

1 This report examines how well government is managing its legacy ICT systems and the impact they have on public services. To do this we established the structure and key components of our four case studies' service models:

- We examined **enterprise and system architecture documentation** to understand the system, to establish where data reside and to assess the effectiveness of data sharing both internally and between individual services and their external partners.
- We reviewed **process maps** and **service descriptions** to identify the processes that underpin the individual service elements plus the manual and automated processes that support service delivery.
- We reviewed **target operating models** to understand both the current model of operation and its future configuration.

2 We found the monitoring of service costs was not as complete as we would have expected:

- All four services had data on total service costs, including overheads, for 2011-12.
- For the consumer credit licensing service, the OFT held data on the total cost of service from 2008-09 to 2011-12, and forecasts for 2012-13 and 2013-14. It also had data on the costs of its legacy ICT since the start of the implementation project in 2004.
- For the prescription payment service, the NHSBSA had data on total service costs for 2011-12 and 2012-13 only. This is due to the introduction of a new service costing model in 2011-12. In addition, the NHSBSA outsources its ICT and does not know the actual cost incurred by the service provider for each system. Costs are therefore based on an allocation model which may not reflect the true cost.

- For the pension payment service, DWP operates a cost allocation model. This includes an allocation for ICT costs that was £31 million (35 per cent) lower than the actual costs incurred by the ICT function within DWP. Further, the DWP cost allocation model has been in a process of evolution since it was first introduced in 2009-10, and gives very different estimates of overhead costs in each year. We have therefore used the full cost allocation model for 2011-12 only and adjusted it in that year to reflect the higher, actual, ICT costs. Similarly, when calculating costs over time we have excluded overhead allocations and used actual costs. Excluding overheads, DWP had data for the period 2008-09 to 2011-12 and a forecast for 2012-13.
 - For the VAT collection service, HMRC was only able to provide us with a total cost of service for 2010-11 and 2011-12.
 - We also used **volumetric analysis** to assess performance against each service's corporate performance targets.
- 3** We assessed the enterprise maturity of each of our case studies:
- We ran workshops with service stakeholders from each case study. These typically consisted of service and system owners along with staff with service delivery and operational responsibility. We also invited representatives from appropriate business units such as change directorates or functional areas that were effectively customers for the service or system. Against seven areas of performance (strategy, governance, implementation, service management, people, process and technology), we asked attendees to self-assess their organisation. We then undertook the following evidence-gathering to enable us to independently confirm or challenge the workshop members' conclusions.
 - We reviewed our case studies' **strategies** and **target operating models**. These included enterprise ICT and procurement strategies, plans setting out the future road maps for the services plus policy announcements that had a bearing on the future design or might impact on their existing scope.
 - We established **roles** and **responsibilities** of senior staff within our case studies and evaluated the **governance arrangements** in overseeing the services and controlling changes.
 - We reviewed **service incidents** to establish service stability and consistency.
 - We reviewed **contracting arrangements** between our case studies and their main ICT suppliers.
 - We researched **risk-tracking** and **management processes** to ensure our case studies understood the risks faced by their services, and assessed the mitigating actions in place.

- We established the levels of **security accreditation** achieved by each of our case studies' legacy ICT. Where no accreditation had been achieved or attempted, we established the security team's rationale for this.
 - We conducted **semi-structured interviews** with staff in our case study organisations, including system and process owners, financial directors and their staff, service delivery managers, change managers, heads of ICT and procurement, operations staff, project managers, security personnel and system users.
 - Upon the conclusion of our data-gathering, we held a final workshop with each case study and fed back our findings. Against each of the seven areas of our enterprise analysis, we highlighted where we were able to confirm the self-assessment findings and where our evidence brought us to a different conclusion.
- 4 We undertook a **literature review** of legacy ICT, including work completed by other Supreme Audit Institutions, research conducted by Gartner and Ovum, and case studies and academic material in the public domain.

Appendix Three

National Audit Office publications focusing on
the key components of government ICT

Published cross-government ICT reports

- Information and Communications Technology in government: Landscape Review*, February 2011
- Implementing the Government ICT Strategy: six-month review of progress*, December 2011
- A snapshot of the use of Agile delivery in central government*, September 2012
- The impact of government's ICT savings initiatives*, January 2013
- The UK cyber security strategy: Landscape review*, February 2013

This report
Managing the risks of legacy ICT to public service delivery,
 September 2013



Note

1 For published client reports focused on ICT see overleaf for a full list.

Source: National Audit Office

Published client reports, focused on ICT

Online services

- 1 HM Revenue & Customs: *The expansion of online filing of tax returns*, November 2011.

Business Intelligence systems

- 2 Ministry of Defence: *The use of information to manage the logistics supply chain*, March 2011.

Business systems

- 3 Department of Health: *The National Programme for IT in the NHS: an update on the delivery of detailed care records systems*, May 2011.
- 4 Department for Communities and Local Government: *The failure of the FiREControl project*, July 2011.
- 5 The Crown Prosecution Service: *The introduction of the streamlined process*, November 2011.
- 6 Department for Work & Pensions: *The introduction of the Work Programme*, January 2012.
- 7 Department for Work & Pensions: *Child Maintenance and Enforcement Commission: cost reduction*, February 2012.
- 8 HM Revenue & Customs: *The Compliance and Enforcement Programme*, March 2012.

Back-office systems

- 9 Department for Business, Innovation & Skills: *Shared services in the Research Councils*, October 2011.

Infrastructure

- 10 Department for Environment, Food & Rural Affairs: *Geographic information strategy*, July 2011.
- 11 Home Office and National Policing Improving Agency: *Mobile technology in policing*, January 2012.
- 12 Department for Culture, Media & Sport: *The rural broadband programme*, July 2013.

People delivering and operating government ICT

- 13 Department for Business, Innovation & Skills and Skills Funding Agency: *Adult apprenticeships*, February 2012.

Policies and strategies for information and technology and business

- 14 Department for Environment, Food & Rural Affairs and the Animal Health and Veterinary Laboratories Agency: *Improving the delivery of animal health and welfare services through the Business Reform Programme*, July 2012.



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