



**Durham**  
University

Business School

## Challenges and Opportunities for Big Data Analytics and Artificial Intelligence in the Public Sector:

### The Case of National Health Service (NHS) in the UK

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Director of the Durham MBA (FT) Program

Director of BSc Accounting – KPMG Program

Member of Durham University Council and Finance Committee



Institution	2020 rank	2019 rank	Change	Total points
University of Cambridge	1	1	0	90
University of Oxford	2	2	0	86
University of St Andrews	3	3	0	85
Imperial College London	4	4	0	77
Loughborough University	5	5	0	76
Durham University	6	6	0	75
Lancaster University	7	7	0	71
University of Bath	8	11	3	67
London School of Economics and Political Science	9	8=	-1	64
University of Warwick	10	8=	-2	63

# Durham University

## Top 10

**UK university**  
Ranked 6th in The Complete University Guide and  
4th in The Guardian University Guide

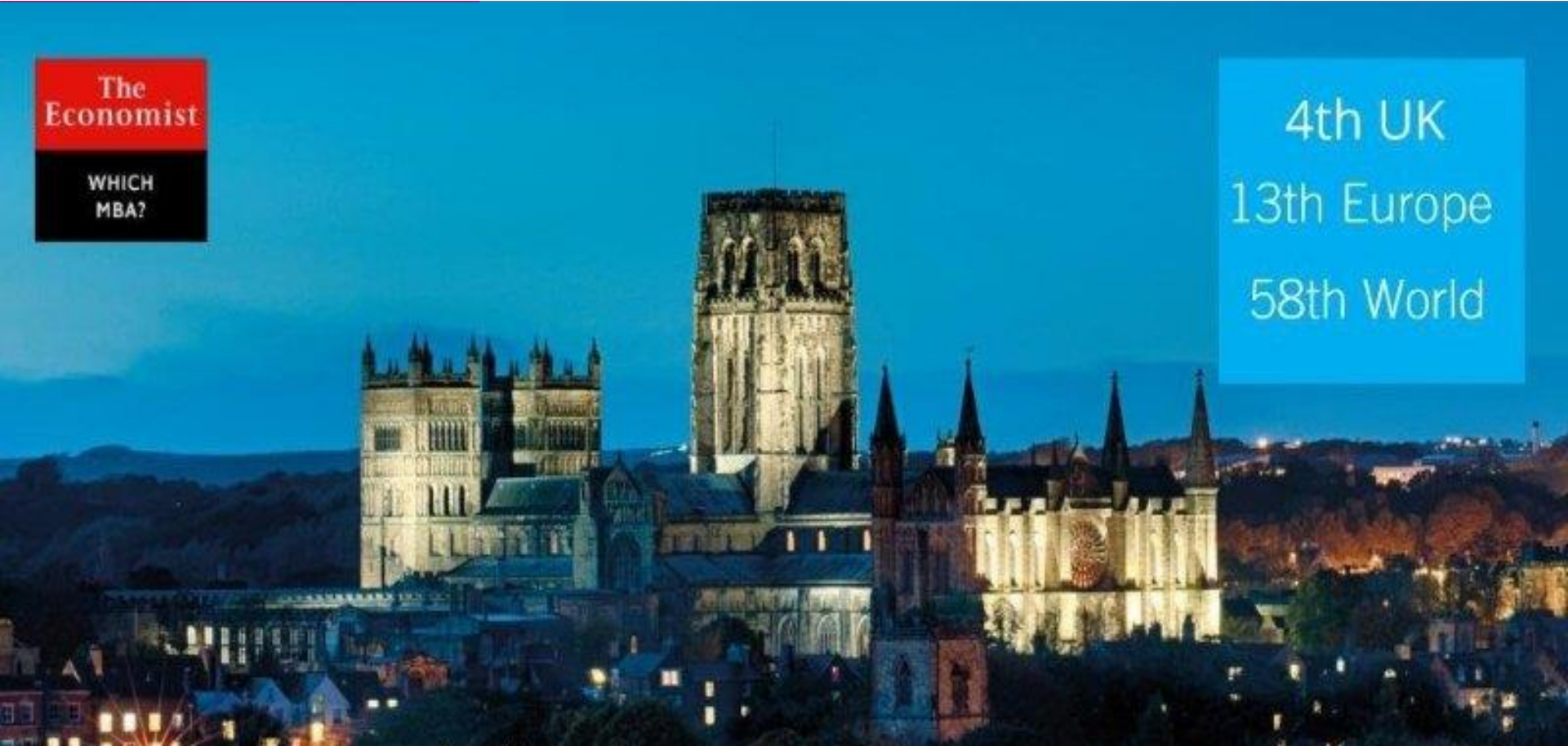


# Durham University Business School

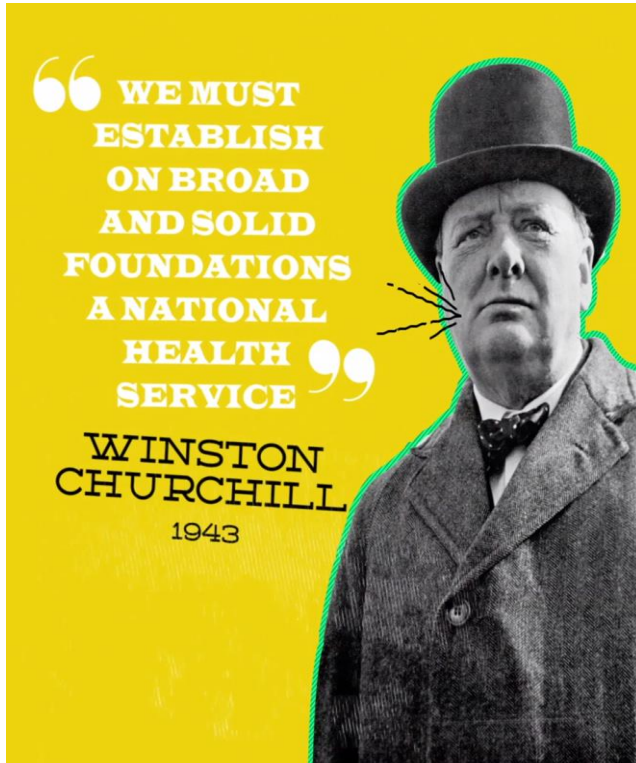
The  
Economist

WHICH  
MBA?

4th UK  
13th Europe  
58th World



# National Health Service (NHS) History 5<sup>th</sup> July 1948



## YOUR NEW NATIONAL HEALTH SERVICE

On 5th July the new National Health Service starts

Anyone can use it—men, women and children. There are no age limits, and no fees to pay. You can use any part of it, or all of it, as you wish. Your right to use the National Health Service does not depend upon any weekly payments (the National Insurance contributions are mainly for cash benefits such as pensions, unemployment and sick pay).

YOU AND YOUR FAMILY

HOSPITAL & SPECIALIST SERVICES

DENTAL SERVICES

MATERNITY SERVICES

MEDICINES, DRUGS AND APPLIANCES

EYE SERVICE

YOUR FAMILY DOCTOR



## British Icons



# National Health Service (NHS) & Politics



# National Health Service (NHS) & Brexit



## The NHS EU workforce

**1.5m** staff work in the NHS

**1 in 20** is from the EU

**9%** of doctors

**5%** of nurses and midwives

**16%** of dentists

**2,385** drop in EU nurses and midwives in past year

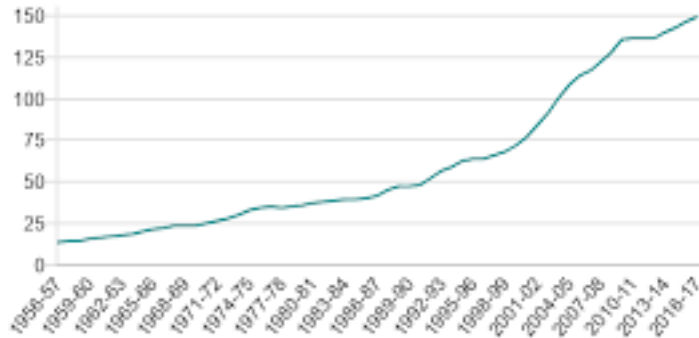
Source: Cavendish Coalition / NMC

PA

# National Health Service (NHS) Performance

## How the NHS budget has grown

Real-terms growth, 2017-18 prices (£bn)

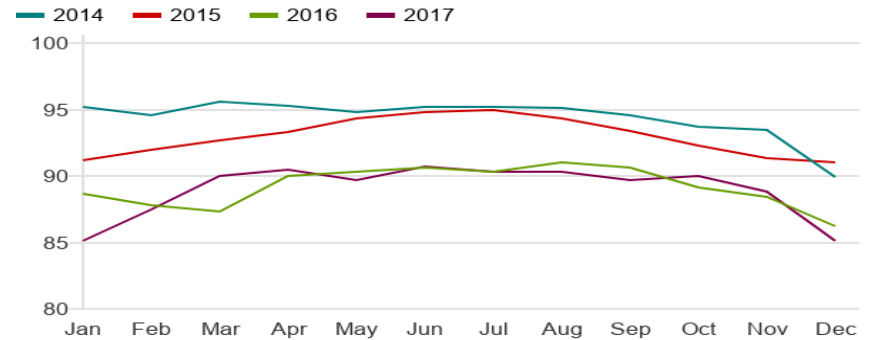


Source: IFS, Government



## A&E performance in England

Percentage of patients dealt with at A&E within four hours



Source: NHS England





# National Health Service (NHS) & Fraud

Table 1: Breakdown of losses in key areas of NHS spend, 2015-16

Thematic area	Estimated annual direct cost (£ millions)				
	Almost certain	Highly likely <sup>5</sup>	Probable <sup>6</sup>	Realistic probability <sup>7</sup>	Total
Help with health costs (patient fraud)	£216.7m	£60.9m	£120m		£397.6m
Payroll and identity fraud			£90.6m		£90.6m
Optical contractor fraud			£48m		£48m
Dental contractor fraud		£73.2m	£20.6m	£26.9m	£120.7m
Pharmaceutical contractor fraud			£100m		£100m
General practice fraud				£81m	£81m
Fraudulent access to NHS care in England				£35m	£35m
European Health Insurance Card			£2.6m	£16.1m	£18.7m
NHS student bursary scheme			£12.9m		£12.9m
NHS pensions		£1.4m	£1.1m		£2.5m
National tariff and performance data manipulation				£90m	£90m
Procurement and commissioning fraud			£165m	£87m	£252m
Fraud against NHS Litigation Authority administered funds				£2.55m	£2.55m
<b>Total</b>	<b>£216.7m</b>	<b>£135.5m</b>	<b>£560.8m</b>	<b>£338.5m</b>	<b>£1.251bn</b>

# National Health Service (NHS) & Fraud



**NHS**  
Counter Fraud Authority

Leading the fight against NHS fraud

Organisational strategy 2017-2020

[www.cfa.nhs.uk](http://www.cfa.nhs.uk)

The graphic features a large, stylized gear-like shape composed of several curved segments in shades of blue and orange. The NHS logo and text are positioned above the gear, and the website URL is at the bottom right.



**Our mission** is to lead the fight against fraud affecting the NHS and wider health service, and protect vital resources intended for patient care.

**Our vision** is for an NHS which can protect its valuable resources from fraud.

**Our purpose** is to lead the NHS in protecting its resources by using intelligence to understand the nature of fraud risks, investigate serious and complex fraud, reduce its impact and drive improvements.

The text is set against a dark blue background with a grid pattern. A circular inset image shows a person in a white lab coat looking at a device. The text is arranged in three paragraphs, each starting with a bolded heading.

## *The Austerity Playbook*

### New musical tunes audience into ground breaking research

With an aim of stimulating further debate around austerity and prosperity, and responsibilities for encouraging civic engagement, Professors Laurence Ferry (Durham University Business School) and Ilseanna Steccolini (Newcastle University) brought their research to life in the form of a jazz musical play, *The Austerity Playbook*, on 1 November 2017.



Professor  
Laurence Ferry



## Professor Laurence Ferry

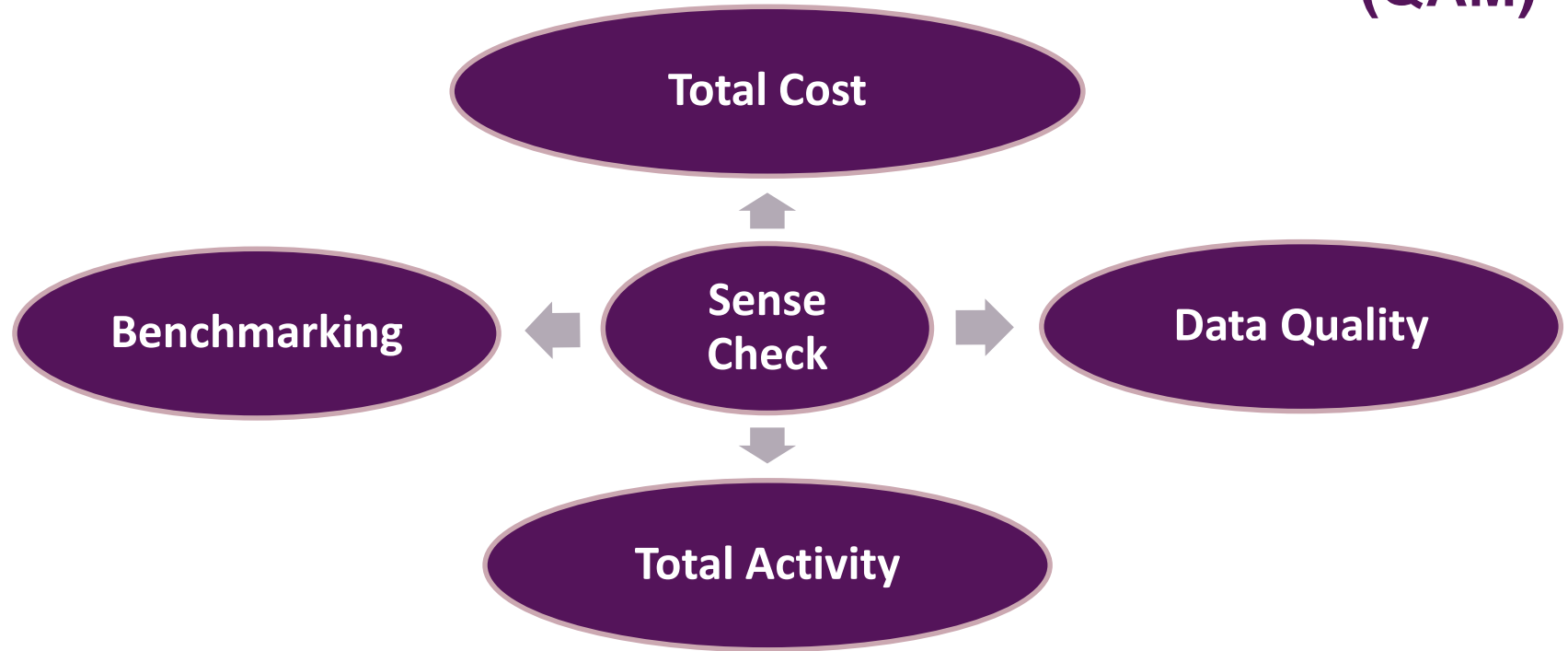
PhD (Warwick), FCPFA, BA (Hons), PCAPL, SFHEA



Head of Department of Accounting, Professor in Accounting

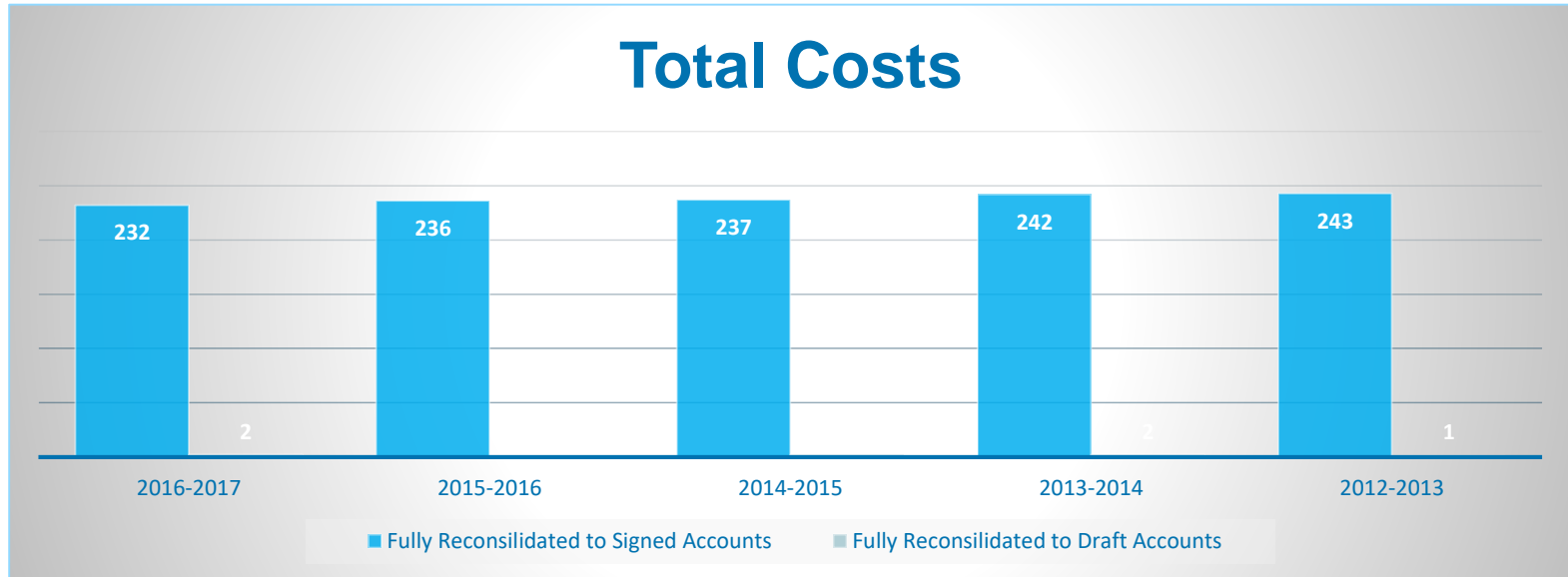
Prof. Laurence Ferry is a Professor in Accounting at Durham University Business School and prestigious Parliamentary Academic Fellow 2018/19 looking at public accountability. He earned his PhD from the Warwick Business School, is a qualified chartered accountant, and holds a first class accounting degree. His research, teaching and consulting covers accounting and accountability with a specific focus on the public sector where he is a recognized international expert in public financial management.

# National Health Service (NHS) Quality Assurance Model (QAM)



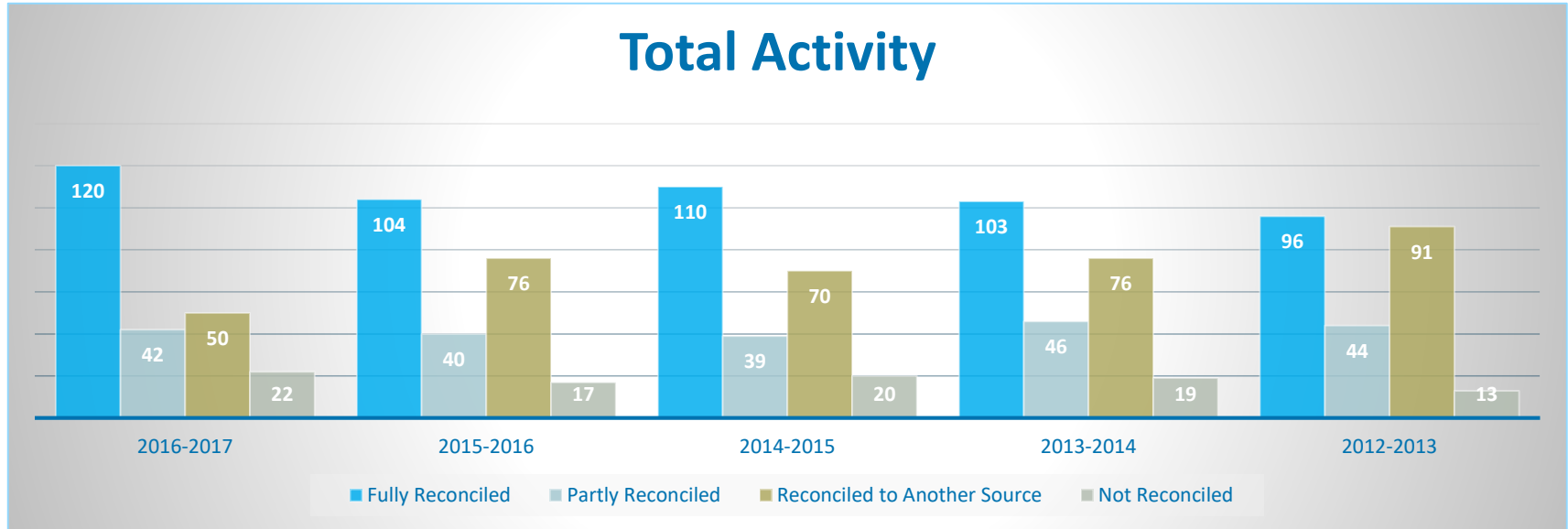
# National Health Service (NHS) Quality Assurance Model (QAM): Total Cost

**Total Cost:** Reconciliation of signed Vs draft accounts inline with guidance



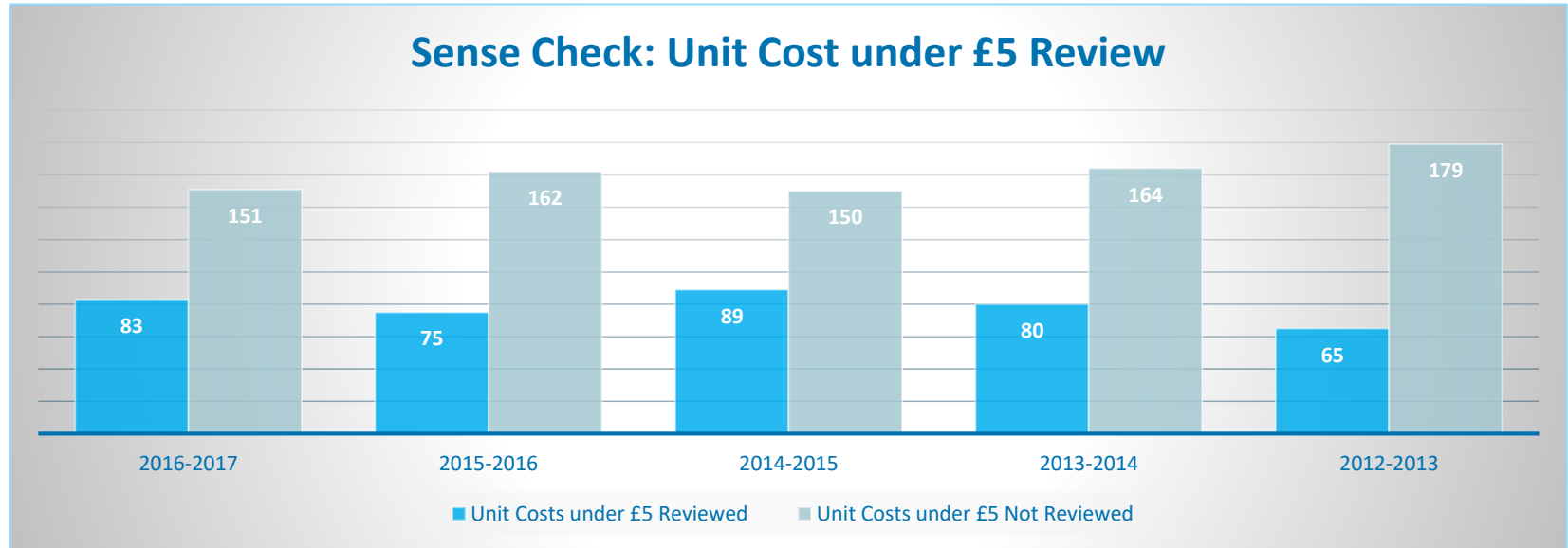
# National Health Service (NHS) Quality Assurance Model (QAM): Total Activity

**Total Activity:** Patients data Reconciliated fully, partly or not reconsolidated to hospital statistics.



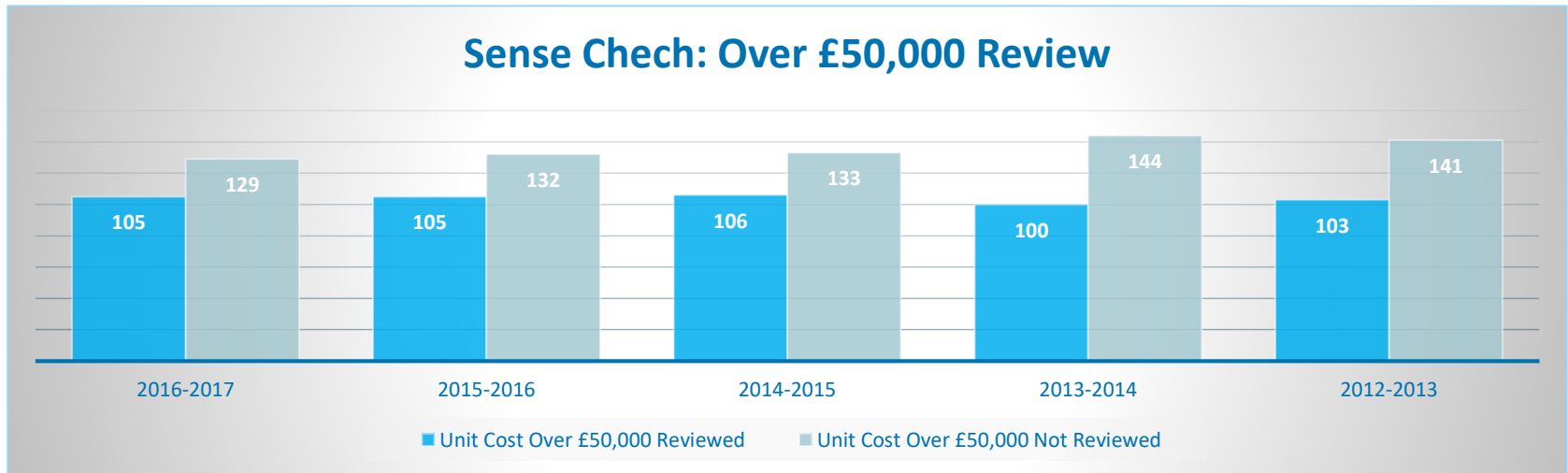
# National Health Service (NHS) Quality Assurance Model (QAM): Sense Check

**Sense Check:** All relevant unit costs under £5 have been reviewed or not.



# National Health Service (NHS) Quality Assurance Model (QAM): Sense Check

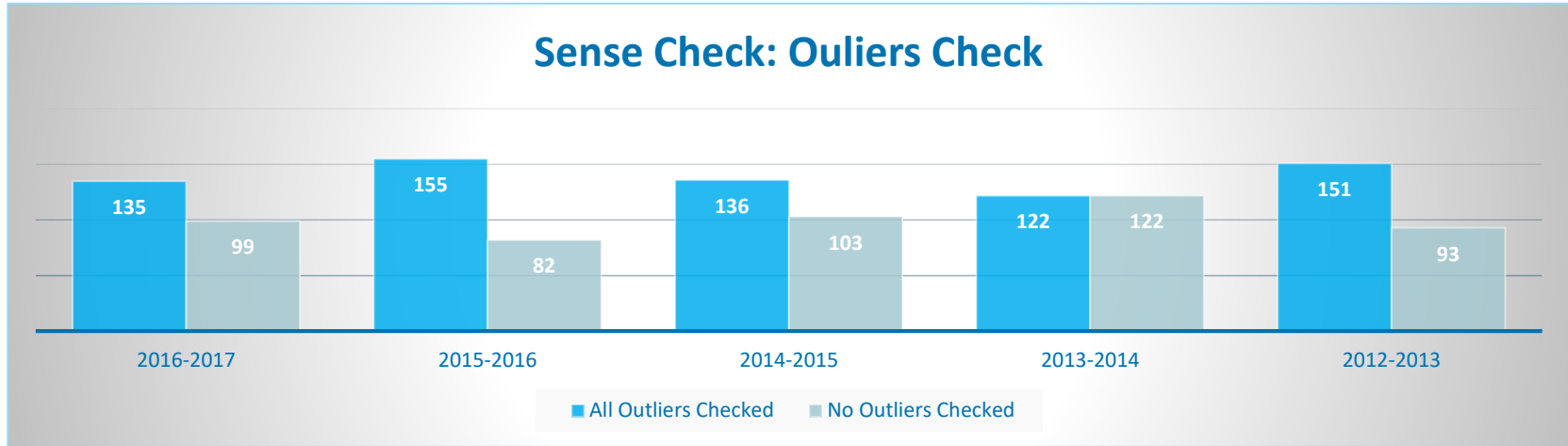
**Sense Check:** All relevant unit costs over £50,000 have been reviewed or not.





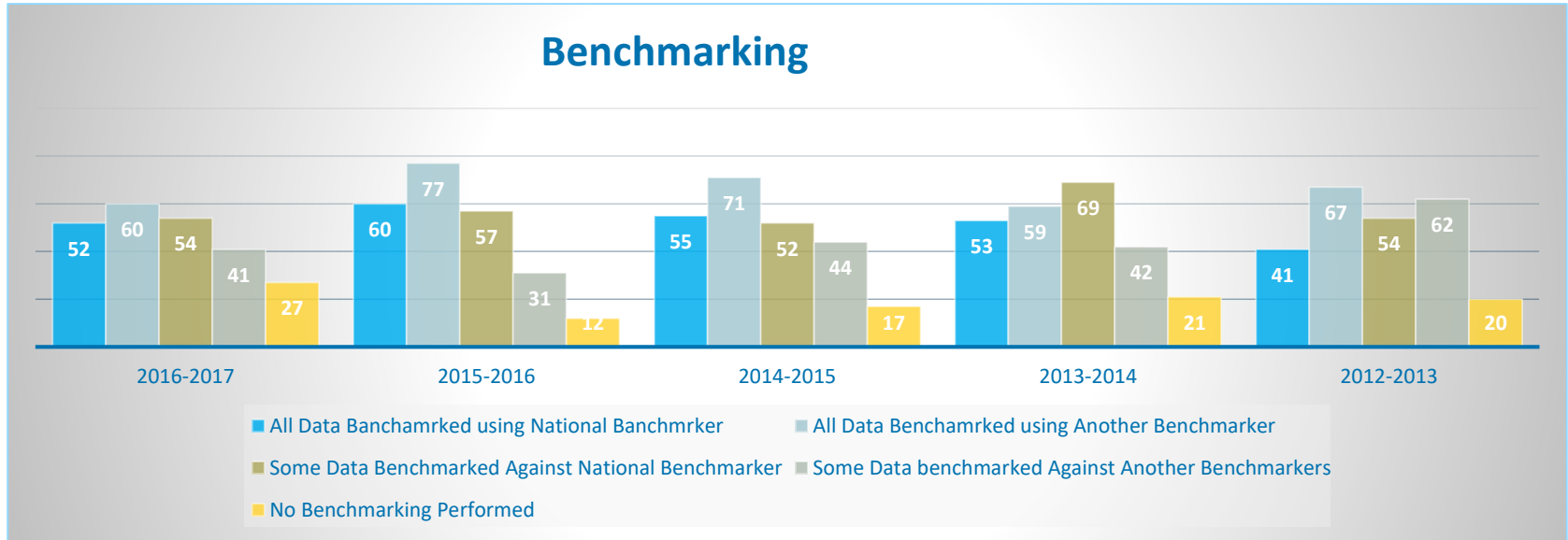
# National Health Service (NHS) Quality Assurance Model (QAM): Sense Check

**Sense Check:** All unit cost outliers have been reviewed or not.



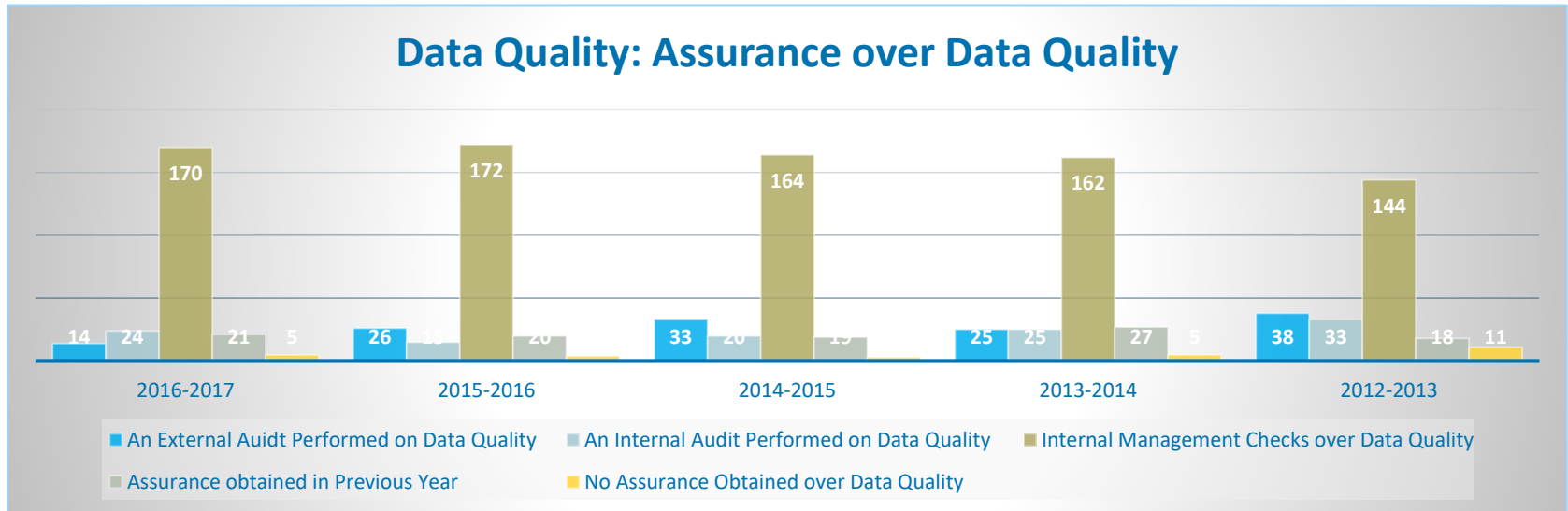
# National Health Service (NHS) Quality Assurance Model (QAM): Benchmarking

**Benchmarking:** Data benchmarking against National data.



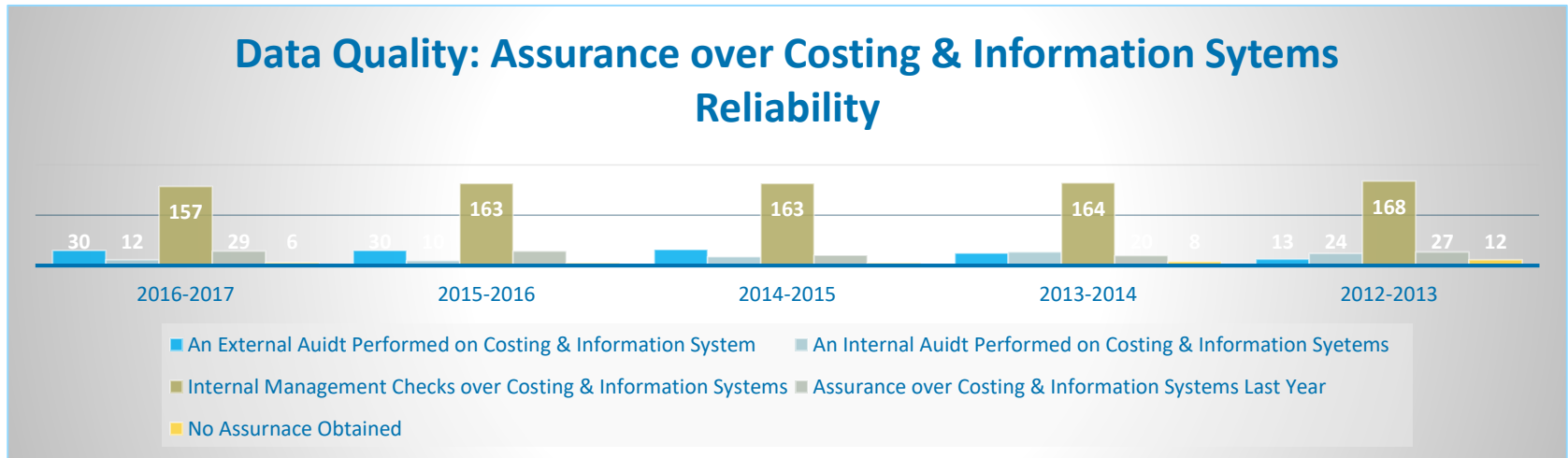
# National Health Service (NHS) Quality Assurance Model (QAM): Data Quality

**Data Quality:** Assurance obtained over quality of data by external audit, internal audit, internal management or no assurance provided.



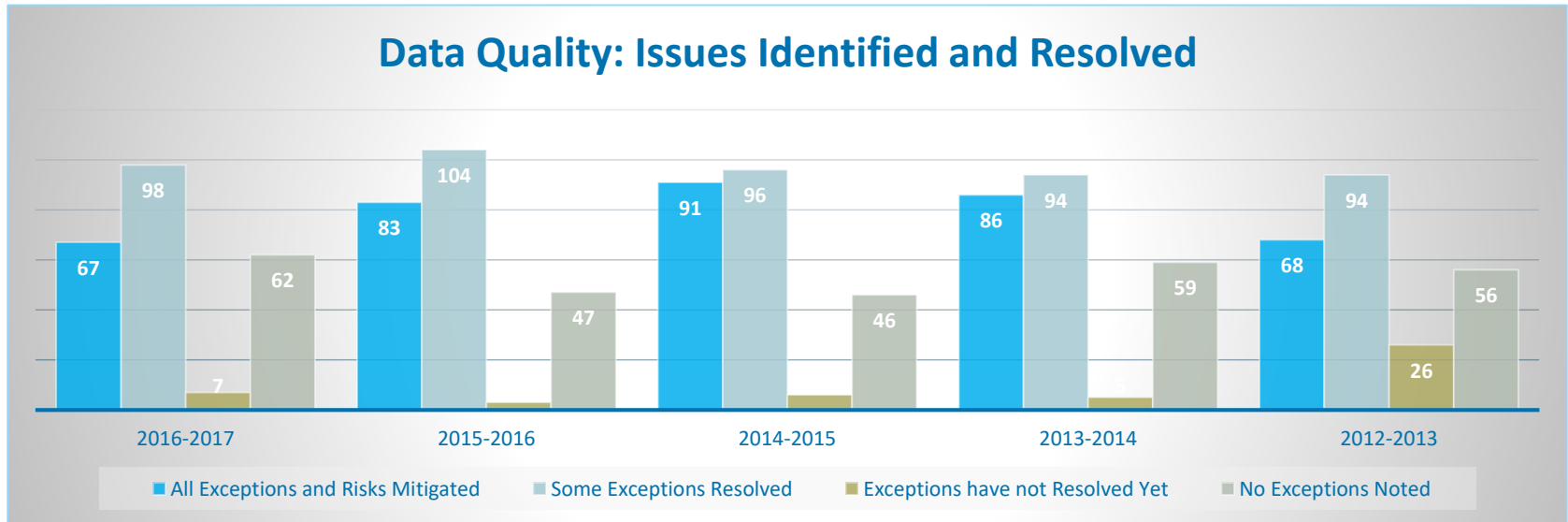
# National Health Service (NHS) Quality Assurance Model (QAM): Data Quality

**Data Quality:** Assurance obtained over the reliability of costing and information system by external audit, internal audit, internal management or no assurance provided.



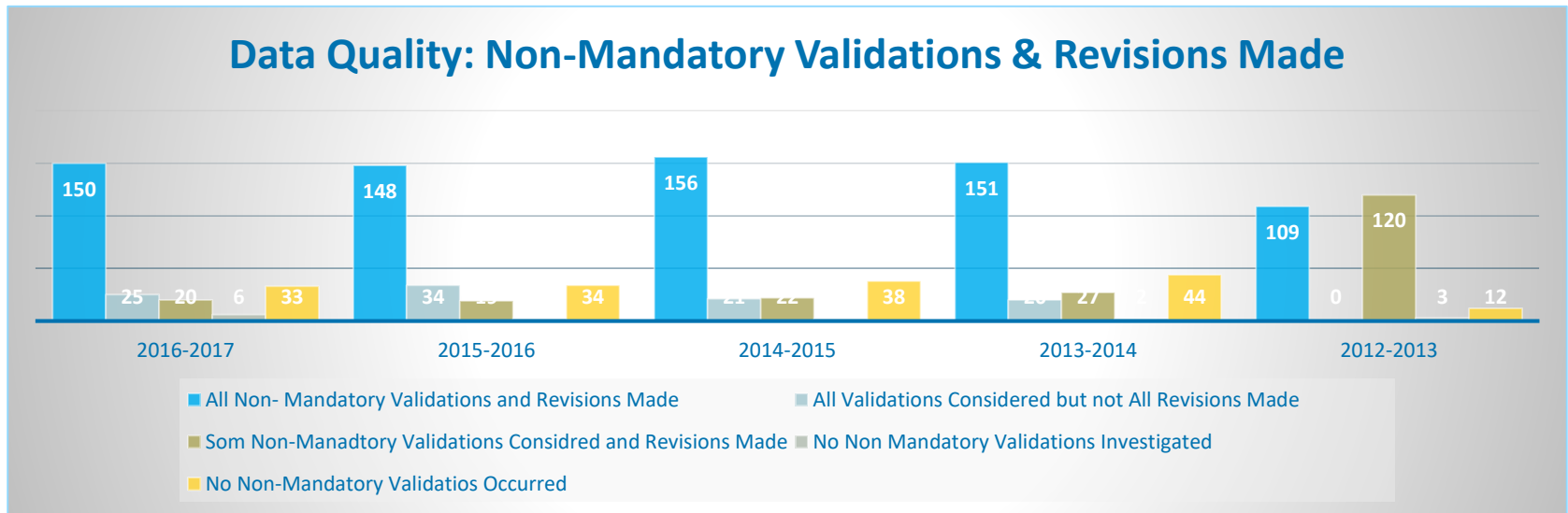
# National Health Service (NHS) Quality Assurance Model (QAM): Data Quality

**Data Quality:** Issues raised in previous years, if any, have been resolved, partially resolved or not resolved in the current year.



# National Health Service (NHS) Quality Assurance Model (QAM): Data Quality

**Data Quality:** All non-mandatory validations according to the guidance, if any, have been considered and necessary revisions made, or partially made.



# Who is the Auditor of the NHS?



National Audit Office

# AUDIT QUALITY THEMATIC REVIEW

## THE USE OF DATA ANALYTICS IN THE AUDIT OF FINANCIAL STATEMENTS

JANUARY 2017



 INTERNATIONAL  
ACCOUNTING,  
AUDITING &  
ETHICS

### Data analytics for external auditors

INTERNATIONAL AUDITING PERSPECTIVES

An International Accounting, Auditing & Ethics initiative

# Technology in the UK

Feedback Statement  
Prepared by the Staff of the IAASB  
January 2018

Exploring the Growing Use of  
Technology in the Audit, with a  
Focus on Data Analytics



# Industrial Strategy

Building a Britain fit for the future



## Technology in the UK

# ICAEW to incorporate emerging technologies into the ACA qualification

Monday 2 September 2019 - ICAEW is evolving its ACA qualification as part of an initiative to incorporate emerging technologies into accountancy education. Recognising the impact of technology on future skills, ICAEW is collaborating with Inflo, a leading provider of financial data analytics software to the accounting profession, to develop the skills required by advanced technologies, through knowledge and practical learning and examinations.

The collaboration will first focus on Audit and Assurance exams. Auditors in practice are increasingly using more advanced approaches to interrogate client data, applying techniques like data analytics to perform work such as risk assessment or fraud testing. ICAEW has been exploring ways the analytical and interpretive skills such techniques require can be incorporated in ACA training and assessment.

# Independent Review of the Financial Reporting Council

# Kingman's Review Report 2019

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Department for  
Business, Energy  
& Industrial Strategy

# Kingman's Review Report 2019

**Watchdog calls for UK's big four accountancy firms to be split up**

**Competition regulator says huge outfits should also have to work with smaller rivals**

**KPMG UK staff told to hand back work mobiles to cut costs**

**Accounting firm also plans to cut about 200 of its 670 administrative support staff**

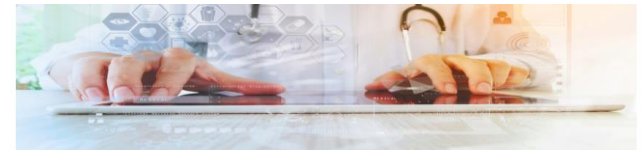


# National Health Service (NHS) Quality Assurance Model (QAM): Conclusion

- There are some deficiencies in the QAM factors that may be causing the overspending and cost deficiencies in the NHS.
- It is impossible to fix these issue and apply a QAM using traditional control and assessment methods.
- More real time and proactive systems need to be implemented.
- The suggestion is to use the QAM factors as the basic foundation for an AI system to detect fraud and forecast overspending.
- Visualization is another challenge of the massive and complex data of the NHS in the UK.

# National Health Service (NHS) Quality Assurance Model (QAM): What's Next?

- Investigating the relationships between the QAM and the different costing areas of NHS, such as: in patients services, out patient services, ambulance services, mental health, drugs, asset impairments, research and development, staff cost, non-staff cost, ...etc.
- To construct an algorithm model around the QAM to detect overspending and manage fraud risks.
- To investigate potential implementation of QAM continuous internal control system in pilot hospitals.



How learning to 'speak data' can transform the NHS

'There is massive data but very little analytics and this is the problem'



Thanks!  
Questions?

#### 9. BUSINESS SCHOOLS WILL FORM CLOSER TIES WITH BUSINESSES

"Students will request greater exposure to large business, and will want to build their technological and digital skills in order to keep pace with modern industry. Furthermore, students will begin to rely more and more on technology to receive their business education, and utilize this for their assessments.



"I think there will need to be a greater focus on experiential learning and integrating academic knowledge with modern business practice in real time, rather than engaging students in classroom-based learning and then applying their knowledge into practice.

"This will be more challenging for universities to accommodate, but one solution is to invest in workplace simulators within university premises, to improve students' practical experiences in alignment with the academic knowledge they acquire throughout their studies."

Amir Michael  
Director, MBA, Durham University Business School  
UK

