The future of the Civil Service:

Making the most of scientists and engineers in government

A review of the science and engineering profession in the Civil Service

January 2013

Picture Acknowledgements

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More information about the Government Science and Engineering community is available on our website:

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Foreword

Science and engineering are vital in helping us address global policy challenges such as climate change, increasing global population, the impacts of new technologies and threats to national security. The Government cannot deliver robust, long term policies without solid evidence and expert analysis, of which science and engineering are key components.

In June 2008 I established Government Science & Engineering (GSE) as the professional community for scientists and engineers in the Civil Service. I wanted both to identify, understand and support scientists and engineers, and to ensure that Government policy making and delivery was supported by the best available science and engineering. The result has been the development of the Government Science and Engineering (GSE) community, now attracting over 3,500 members, a significant subset of the estimated 15,000 people across the whole Civil Service whose science and engineering skills and expertise are invaluable to effective administration of the UK.

I am not surprised that this review concludes that the Civil Service is a great place for scientists and engineers to work. The Civil Service provides a wide range of pathways to building a career and the opportunity to make a contribution to interesting and important work. The science and engineering profession has a lot to offer the Civil Service: we are a diverse community already adept at supporting open and collaborative policy making by working closely with external experts, academics and the public and with strengths in working flexibly across departmental boundaries to provide strong and shared evidence.

We now have an opportunity to harness this potential further. My vision for the science and engineering profession is to become both more visible and better integrated in the day-to-day business of government. In doing so, we can ensure the Civil Service remains a place where scientists and engineers of all disciplines want to work and where the contribution of science and engineering are sought and valued across the Civil Service.

Realising this vision for our profession will take time and requires some cultural change. But we have strong foundations to build on and an opportunity now with implementation of Civil Service Reform to work together with colleagues from other professions across the Civil Service. This review has gathered together vital information on the state of our profession and points the way to some steps that can be taken now.

I have no doubt that our profession has an important role to play in making the Civil Service a more open, flexible organisation with access to the skills and expertise needed to tackle future challenges. I am absolutely confident that I will be leaving it in good hands when Sir Mark Walport takes over as Government Chief Scientific Adviser in April 2013.

Sir John Beddington
Government Chief Scientific Adviser and
Head of the Science and Engineering Profession

Acknowledgements

1 Introduction

In 2012 the Government Office for Science undertook a review of the future of the Civil Service and the implications for the science and engineering profession in government. The review involved extensive engagement across our profession. It proposes a vision for the future of the profession and highlights priorities for action.

A separate executive summary provides an overview of the review and its conclusions. This report offers a summary of the current state of the science and engineering profession in Government and explores the challenges faced by the profession. It is aimed at those in the profession (or working in related Civil Service professions) who want to better understand the approach we took and where the evidence for our conclusions and recommendations came from.

This introductory chapter offers some history and context to the review project.

The science and engineering profession in government

1.1 Scientists and engineers work in a wide range of civil service organisations. We are one of the larger expert professions in the civil service with a diverse and highly skilled workforce.

1.2 The Government Science and Engineering (GSE) community was established in June 2008. This is open to any civil servant with a science or engineering background or working in a related field. Over 3,500 members have registered to date. Figure 1.1 and 1.2 provide more detail about the profession and the kind of roles our people play.

1.3 The Office for National Statistics estimates there are almost 8,000 people in our profession across the civil service (1,540 engineers and 6,436 scientists) [1]. We suspect these figures under represent the number of people: according to our network of Heads of Science and Engineering Profession, we have over 12,000 specialist science or engineering posts across the Civil Service. Figure 1.3 provides an overview of estimated numbers of people and posts.

1.4 A key objective of this review was to learn more about our professional community and start to create a shared context, language and vision to describe ourselves as a profession and the value that we offer the future civil service. We need to engage our members, the 'users' of science and engineering advice across government, and our peers in the wider science and engineering community outside the Civil Service; and we need a strategy that helps us rise to the challenges facing the modern Civil Service (as identified in the Civil Service Reform Plan).

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[1] Professions declared by respondents to the Annual Civil Service Employment Survey 2012:
http://www.ons.gov.uk/ons/dcp171778_284549.pdf

1.5 One of the aims of the Civil Service Reform Plan is to drive increasing professionalisation of the Civil Service, both through clearer, consistent core standards for all civil servants and through strengthening the expert professions. This review sought to clarify how the science and engineering profession can respond to the challenges laid out in the Civil Service Reform Plan.

1.6 The science and engineering profession has some distinctive characteristics in the way we operate or organise ourselves:

1.6.1   Our particular skill is in making extensive use of the wider science and engineering community to draw in deep expertise, not just through senior appointments[2] but also through advisory committees and working closely with learned societies, institutions and professional bodies, and through our research programmes.

1.6.2   Within our profession, we are highly diverse, both in our occupations and our disciplines. In our occupations domain knowledge is often critical and disciplines are not always interchangeable. Individual roles need a combination of relevant professional training and experience within the policy or delivery contexts.

1.6.3   With our experience, we develop a strong understanding of the policy or operational context (and may be affiliated to more than one profession). We are not just advisers: We are often decision makers and accountable for our professional judgement, particularly in an operational context.

1.7 As a profession, we face some particular challenges:

1.7.1   We do not have detailed management information on capabilities available (who is in the profession) and have not had this since the days of the Scientific Civil Service;
1.7.2   We currently have no formal standards of entry/performance. Individual departments or agencies that employ scientists or engineers apply their own criteria for recruitment or performance appraisal. Performance tends to be measured against core civil service competencies rather than depth or application of their professional expertise.
1.7.3   Wider indicators of professional ability (e.g. publications in peer reviewed journals, chartered status, project delivery) are not consistently recognised or rewarded across all organisations.

1.8 This review explored aspects of how we operate and organise ourselves as a profession in the light of these and other challenges, and considered what we might improve or do differently. Section 1.18 describes the detailed objectives of the review.

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[2] Around a third of science and engineering SCS posts were filled through external recruitment compared to 39% for SCS as whole.

The science and engineering profession in government

Figure 1.1 - Who we are

34% have a PhD

58% are members of professional bodies

37% hold a professional qualification (eg chartered)

56% are in the grade/range HEO to grade 7

GSE
Government Science & Engineering

Large

Highly Skilled

Diverse

3500+ members (~**12,000** posts across government)

100+ different areas of expertise

Wide range of functions

Figure 1.2 - What we do

Percentages (figure 1.1) and word cloud (figure 1.2) generated from responses to 2012 survey of civil servants with a science and engineering background.

A brief history of science and engineering in the Civil Service

1.9 Throughout its history, the changing needs of the UK Civil Service have driven changes in its science and engineering capability and delivery models. Government has employed scientists and engineers since the 1800s and some statistics on these have been kept since 1930s. The Scientific Civil Service was created in 1945 to regularise the ad hoc arrangements made by Government for employing scientists during the war. It continued until the Fulton Report in 1968, which advocated the elimination of the various classes within the Civil Service because they imposed a rigid structure and made it difficult for staff to move between roles to gain a breadth of experience. Table 1 shows the events that have influenced the shape of science and engineering community

1.10   With changing Government priorities, developments in technology and the emergence of new industries and regulatory challenges. Similarly the skills and expertise required of scientists and engineers in the Civil Service have changed. The criteria for who is counted as a scientist or engineer have also changed so long term trends are hard to discern, but as far as we can identify, the total numbers of scientists and engineers seemed to keep track with the overall size of the Civil Service.

Figure 1.3 – Numbers of scientists and engineers in 2012[3]

1.11   Absolute numbers of civil servant scientists and engineers do not tell the full story about our ability to access science and engineering expertise.

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[3] Figures based on Annual Civil Service Employment Survey 2012, GSE membership data and data provided by departmental Heads of Science and Engineering Profession.

Table 1 - Timeline of Science and Engineering in Government

1930 Carpenter Committee investigated the organization of civil service scientific and technical staff

1943 Barlow Committee on Scientific Staff in Government Departments: led to the Scientific Civil Service white paper

1945 Scientific Civil Service established to 'regularise ad hoc arrangements made by Government for employing scientists during the war.' Organised into three classes: scientific officer, experimental officer, and assistant experimental officer.

1960 Select Committee Report on the work of the Scientific Civil Service

1964 Appointment of first Government Chief Scientific Advisor (Sir Solly Zuckerman).

1968 Fulton Report. 'Many scientists, engineers and other professional specialists were not given the responsibility or authority they deserve… these specialists should be given more policy-making and management opportunities, and training to equip them for their new work.' Also recommended abolition of 'classes' to promote career mobility.

1980 Holdgate Review – recommends greater interchange between civil service scientists and policy makers

1980s Cuts to government R&D spending on the grounds that applied research should be led by industry

1987 Ibbs (Next Steps) report - policy core with implementation through executive agencies (including many civil service scientists and engineers)

1990s Civil service operations and services increasingly opened up to private sector contractors and further moves towards more commercial approach to management of government laboratories

2000 Cross cutting review of science and research: investment in UK R&D infrastructure

2000s Growth in government R&D spending through Research Councils

2008 Government Science and Engineering (GSE) community established

1.12　Science and engineering in the Civil Service is an open profession. Since the appointment of Sir Solly Zuckerman in 1964 as the first Government Chief Scientific Adviser, there is now a Chief Scientific Adviser in almost every Whitehall department. The CSA role is often broader than that of other senior civil service professionals in government. A key element is to bring an independent viewpoint and challenge, with the aim of ensuring that the organisation uses (and is seen to use) the best available evidence to inform decision making. Some Chief Scientific Advisers also have executive responsibilities and, for all of them, engaging with the wider science and engineering community to inform or quality assure the scientific work of the department is an essential part of the job.

1.13　Government makes extensive use of fixed term contracts (e.g. for some Chief Scientific Advisers), secondments (e.g. current Deputy Chief Scientific Adviser, DfID) and over 70 scientific advisory committees to draw in the advice of experienced professionals and cutting edge knowledge.

1.14　Relationships with the research councils, learned societies and professional bodies are also important. For example, the analysis of scientific and engineering evidence relating to major policy issues and advice offered by the Royal Society and the Royal Academy of Engineering is extremely valuable and influential.

1.15　Government departments fund research and other forms of information gathering (monitoring, disease surveillance, statistics collection etc) to support their departmental policies and objectives. Publicly funded science and engineering activities undertaken within public sector research establishments or equivalent (such as the Met Office, the Defence Science and Technology Laboratory and the Health and Safety Laboratory) is directed to deliver specific outcomes to inform policy or deliver operations.

1.16　Links between scientists and engineers in the Civil Service and colleagues in Research Councils are important for ensuring the greatest possible impact from research relevant to policy and all publicly funded research delivers maximum value to the taxpayer.

1.17　Government can access expertise through links with industry and academia, through direct commissioning of research or contracting scientific and engineering services. One of the many functions of scientists and engineers in the Civil Service is to manage such contracts. Collaborations and research partnerships with academia or business are also common as the examples in Box 1 demonstrate.

Box 1 – Examples of collaboration and partnership

Living With Environmental Change (LWEC) is a partnership of UK government departments and agencies, devolved administrations, local government and research councils. Through its Business Advisory Board, the partnership draws on the expertise of business leaders from a wide variety of companies. Together, LWEC partners can identify the most pressing economic and social challenges to do with environmental change, align their efforts to meet those challenges and co-ordinate funding for the leading multidisciplinary research and observation that the UK can offer.

LWEC activities contribute to better predictions and analysis of environmental change and help society to adapt to the impacts of change without causing further damage to the natural environment. The partnership has a role in developing the UK's green economy with relevant skills, tools, knowledge and innovation.
http://www.nerc.ac.uk/research/programmes/lwec/aims.asp

The **Technology Strategy Board** is an executive non-departmental public body (NDPB), whose role is to stimulate technology-enabled innovation in the areas which offer the greatest scope for boosting UK growth and productivity. The Technology Strategy Board promotes, supports and invests in technology research, development and commercialisation, and advises Government on how to remove barriers to innovation and accelerate the exploitation of new technologies, working in areas where there is a clear potential business benefit and helping today's emerging technologies become the growth sectors of tomorrow.

Effective partnership with other bodies is fundamental to the role of the Technology Strategy Board. It works closely with other organisations who are involved in innovation, research and technology, combining and focusing resources. Programmes and activities are often jointly funded with research councils, government departments and the devolved administrations.
http://www.innovateuk.org/

The Energy Research Partnership (ERP) is a high-level forum bringing together key stakeholders and funders of energy research, development, demonstration and deployment in Government, industry and academia to identify and work together towards shared goals. The Partnership has been designed to give strategic direction to UK energy innovation, seeking to influence the development of new technologies and enabling timely, focussed investments to be made. It does this by (i) influencing members in their respective individual roles and capacities and (ii) communicating views more widely to other stakeholders and decision makers as appropriate.

ERP's remit covers the whole energy system, including supply (nuclear, fossil fuels, renewables), infrastructure, and the demand side (built environment, energy efficiency, transport). The Partnership is co-chaired by Keith MacLean, Policy and Research Director for SSE and Professor David MacKay, Chief Scientific Advisor at the Department of Energy and Climate Change.
http://www.energyresearchpartnership.org.uk/tiki-index.php

Objectives of the project

1.18   This review started in early 2012 with the aim of taking stock of the state of our profession in the Civil Service and considers what we might improve or do differently. The Government Science and Engineering (GSE) community had been established for over three years and grown to be a large and diverse community with a well attended annual conference, and some general guidance and support available to its members on professional skills and development.

1.19   The time was right to review 'where next?' for the profession and, in the context of development in the wider science and engineering community and reform of the Civil Service, to consider the future challenges facing the Civil Service and the Civil Service's future needs for science and engineering skills and expertise. An important goal was to develop a vision for the future of the profession and a strategy for achieving this vision.

1.20   To achieve these objectives, we also needed to gather some basic information about our people and how we compare to the wider science and engineering community:
- develop a better understanding of the current shape of the science and engineering professional community in government, including the range of specialist skills, depth and breath of technical expertise;
- identify the different functions that members of the community undertake and any barriers to development, application and retention of expertise;
- compare the employment offer and professional standards for scientists and engineers in the Civil Service with scientists and engineers in the wider science and engineering community.

Scoping workshops

1.21   In May 2012, we ran some early scoping workshops with experienced scientists and engineers in the Civil Service, representatives of other civil service professions and colleagues from the wider science and engineering community including Prospect trade union, professional bodies and sector skills councils.

1.22   We posed some initial questions:
- How can scientists and engineers in the Civil Service build their **reputation and effectiveness**?
- How can we ensure the Civil Service offers positive **career pathways** to scientists and engineers?
- How can we ensure science and engineering **advice** is available in a **timely** fashion?
- How can scientists and engineers have greater **impact and influence** on decision making?

1.23   Several themes emerged that helped shape the rest of the project:
- Breaking down communication barriers between policy officials and specialists
- Scientists and engineers becoming part of the policy process – to build capacity to anticipate the needs of policy colleagues and be more responsive and proactive
- Encouraging policy makers to ask for help at the right time (sooner rather than later) and scientists to be timely in their advice (understanding where their advice fitted in the policy cycle)
- Create a realistic and justified sense that a civil service career offers positive career pathways for scientists and engineers.
- Build a reputation that scientists and engineers in the Civil Service are involved in 'policy relevant' work where they can make a real difference to making delivering policy that works.
- Recognising that there is a 'glass ceiling' for specialists, and the reasons for it, and enabling those with high ambition to progress in other areas of the Civil Service while retaining their connection with the profession's networks of science and engineering expertise.
- Offering practical help and encouragement to scientists and engineers who want to broaden their capabilities and apply for senior posts

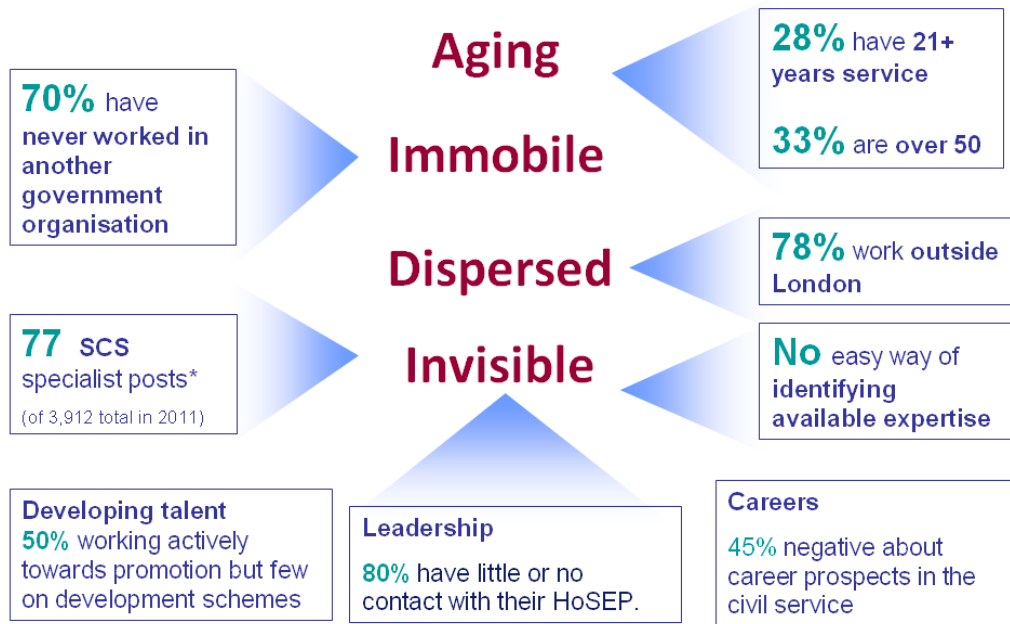1.24   The full report of the scoping workshops is available in Annex A.

2 Assessment of the Challenges

The following analysis of the strengths, weaknesses, opportunities and threats is based on extensive engagement across our profession, discussions with colleagues from across the Civil Service including other Civil Service professions. This involved a survey, workshops and discussions with civil servants with a science or engineering background, as well as workshops and discussions involving wider partners and stakeholders in and outside the Civil Service. This engagement is discussed in detail in the following chapters.

Table 2 – SWOT Analysis for the Science and Engineering Profession in 2012

Strengths – we have strong foundations as experts and civil servants

- Large, skilled, diverse profession
- Valuable expertise - it is hard to find a problem in government that could not benefit from the application of science or engineering advice
- Openness and collaboration - connected to industry, academia and international expertise
- Impartiality and integrity – we exemplify the civil service code

Weaknesses – we must make our expertise more visible and agile

- Aging
- Immobile
- Dispersed
- Invisible
- Seen as advisers not leaders

(see figure 2.1)

Opportunities – Civil Service Reform

- Within our profession, we have many of the skills sought by Civil Service Reform
- Harmonised HR systems and processes
- Increasing focus on developing professional skills and talent management
- Other Civil Service professions face many of the same challenges
- HoSEP network established, GSE community shows potential for linking up further
- People with science and engineering background across the Civil Service

Threats – can we offer scientists and engineers fulfilling roles and careers in the Civil Service?

- The Civil Service is becoming smaller and 'flatter'
- Limited number of specialist senior posts
- Perceptions that you must leave the profession to progress
- Competition from other employers for STEM skills
- Can we keep up with the pace of science and technology developments?

(see figure 2.2)

Figure 2.1 - Challenges that affect the profession's ability to access and harness our expertise

Aging

Immobile

Dispersed

Invisible

70% have never worked in another government organisation

77 SCS specialist posts*
(of 3,912 total in 2011)

28% have **21+ years service**

33% are over 50

78% work outside London

No easy way of identifying available expertise

Developing talent
50% working actively towards promotion but few on development schemes

Leadership
80% have little or no contact with their HoSEP.

Careers
45% negative about career prospects in the civil service

*Compared to 79 SCS economists, a profession about 10th the size

Figure 2.2 – Challenges facing the Civil Service as a STEM employer[4]

We must ensure staff maintain relevant knowledge and continue their **professional development**

We must ensure new staff quickly get to grips with the **policy and operational context**

We must ensure staff can **benchmark** their skills against professional standards in wider science and engineering community

We must be more **flexible** in **deploying** our in-house expertise

Science, technology and engineering develop rapidly.

As a modern employer, we should expect flow of staff in and out of the civil service.

The Civil Service is becoming smaller and 'flatter'

We must attract and retain **scarce expertise and cutting edge skills**

There are some roles where **external recruitment or secondment** is the norm

We must offer scientists and engineers **fulfilling roles and careers** while in the civil service

There are a limited number of **senior specialist posts** that any organisation will need

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[4] While employment refers to recruitment of staff as permanent or fixed term civil servants, the challenges listed in figure 2.2 can also affect ability to access external expertise through other forms of engagement, such as secondments, membership of advisory committees or commissioning of research programmes.

3   Survey of scientists and engineers

This chapter provides the aims, objectives and methods we used to conduct a survey of civil servants with a science and engineering background. It explores the key findings from the survey including positive findings on skills, diversity of expertise and spread across the Civil Service and emerging concerns expressed by survey respondents around opportunities to use their skills and develop their careers.

In a shrinking Civil Service, it becomes increasingly important to have detailed knowledge of what capabilities and skills we have and the ability to deploy them across the Civil Service.

'*Capability and talent will need to be managed and deployed corporately across the Civil Service, especially for high potential and senior officials, including specialist professionals.'*

Civil Service Reform Plan 2012

Aims and Objectives

3.1   The objective of the survey was to better understand the extent and activities of the GSE community in government, the kinds of skills, capabilities and expert knowledge we have within the profession, and how our people might be developed and deployed to best meet the future needs of the civil service

3.2   Our aim was to gather information to:
  •   develop a better understanding of the current shape of the science and engineering professional community in government, including the range of specialist skills, depth and breath of technical expertise;
  •   identify the different functions that members of the community undertake and understand their career aspirations and perceptions of barriers to development, application and retention of expertise; and
  •   compare the employment offer and professional standards for scientists and engineers in the Civil Service with scientists and engineers in the wider science and engineering community.

Methodology

3.3   For our survey of civil servants with a science and engineering background, we asked 38 questions organized under the following headings:
  • Professional background
  • Skills and expertise
  • Career history
  • Current role
  • Professional identity
  • Career prospects
  • Head of profession
  • Diversity
  • Working pattern

3.4   We were trying to gather some basic demographics in a way never done before, for example by discipline, career path, and future aspirations. We asked people what kinds of work or roles they were doing or performing, and also some more subjective questions such as how influential they feel they are with other professions and in their organisations and what kind of career support they would value. A full list of questions and an overview of civil servant responses can be found in Annex B. Detailed charts comparing survey responses are available in Annex C.

3.5   As a comparison for the responses we received from civil servants, we also developed a similar survey for the wider science and engineering community, i.e. people with a science or engineering background employed in the private sector, academia or non-civil service parts of the public sector. Questions were identical where ever this made sense (some civil service terminology such as grades, job descriptions or professional 'labels' are not easily comparable).

3.6   Our surveys were developed using www.surveymonkey.com and tested on GO-Science colleagues before launch. Both surveys were circulated to the Government Science and Engineering (GSE) community (at the time this was around 3,200 civil servants with a science or engineering background, drawn from all government departments and agencies) for them to fill in themselves or to pass to colleagues and friends in science and engineering roles, as appropriate. Prospect trade union also circulated both surveys to their members and the Science Council circulated the survey aimed at members of the wider science and engineering community.

3.7   We collected data from the survey of civil servant scientists and engineers between 21 May 2012 and 10 September 2012. We collected responses from the wider science and engineering community between 17 September 2012 and 19 October 2012.

Sampling

3.8   We did not have a clear target population from which to draw a representative sample. As described in the introduction, numbers of scientists and engineers in government have always been subject to varying estimates.

3.9   We do not apply strong gateway boundaries for membership (e.g. Masters or 'chartered' status) and therefore we promoted our main survey to a similarly broad group: anyone working in the civil service with a science or engineering background.

3.10   We had 2172 respondents to our survey of civil service scientists and engineers. Of these, only 799 (37%) declared their primary profession as GSE. We had a boost to numbers of people signing up to GSE during the survey period.

3.11   We had no precedent to work from. This was the first survey of its kind and we expect future versions will improve on our early efforts. Our analysis is based on a self-selected group. We feel this sample is sufficiently large and diverse to be reasonably representative of scientists and engineers across the civil service.

3.12   For the survey of the wider science and engineering community, we had a total of 2165 respondents. A large proportion of respondents to our wider science and engineering community survey were engineers (55%) compared to respondents to our survey of scientists and engineering in the civil service. This influenced the predominance of engineering disciplines and relative proportions of certain qualifications (such as apprenticeships, HNC/HND, chartered status) in our sample. Where there are discernable differences in the responses of scientists compared to engineers, we have highlighted these. We think this is a useful complementary data set which elicited responses from scientists and engineers working in a diversity of organisations across the UK, and helps give some context to the civil service results.

Overview of findings

3.13   The overall impression from our survey of scientists and engineers in the civil service is that of a diverse and highly skilled community, confident in their professional abilities and spread across all grades and areas of civil service work.

3.14   We have ambitious people, although help is needed to progress:
- 51% said they were 'actively working towards promotion.'
- 35% said they want to 'take on greater management responsibility.'
- 52% would value advice from their head of profession in handling a career issue, and
- 41% would value help in finding a professional mentor.

3.15   Most respondents (91%) said they were positive about declaring themselves to be a scientist or engineer and reported feeling influential in their current role (60% feel 'very' or 'often' influential).

3.16   However, respondents expressed concerns around opportunities to use their skills and develop their careers:
- A much higher proportion of civil servant respondents (40.9% compared to 15.6% of respondents from the wider science and engineering community) felt that their wider skills and capabilities are underused or undervalued.
- 73% reported lack of suitable roles or opportunities as the biggest barrier to fulfilling career aspirations
- 45% said they were negative or very negative about career prospects in the civil service.

3.17   Mobility between organisations is low: the majority of civil servant respondents (70%) have never worked in another government department or agency.
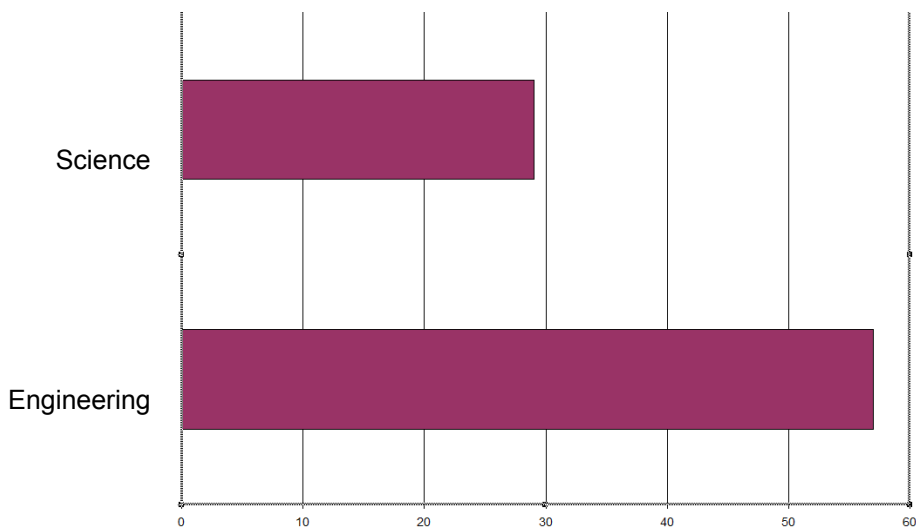
3.18   There is a challenge for leadership within the profession: 77% of respondents did not know, or had little contact with, their organisation's head of profession.
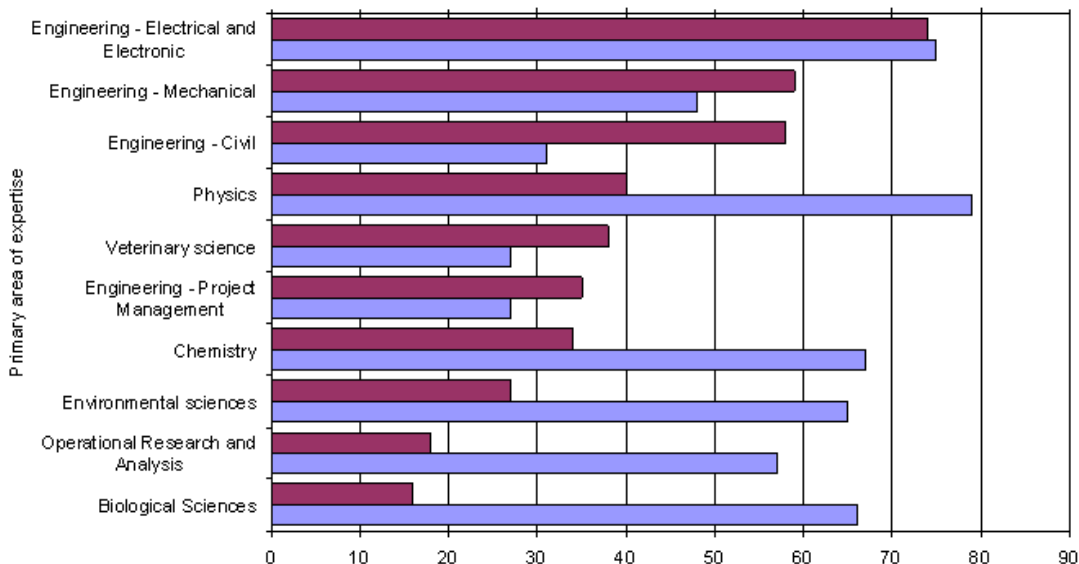
Qualifications

3.19   Compared to the wider science and engineering community, a low proportion of civil service respondents had apprenticeship (7%) or HNC/HND (17 %) qualifications. There was a higher prevalence of tertiary qualifications. For example some 34% of our civil service respondents have a PhD compared to 16% for respondents from the wider science and engineering community.

3.20   We have a high proportion of civil servant respondents (58%) who are members of a science or engineering professional body and a significant number (37%) who hold professional qualifications such as chartered status (see figure 3.1), which compares well with the wider science and engineering community. The means by which civil servant respondents maintain and develop their professional knowledge and expertise is also very similar to respondents from the wider science and engineering community.

Figure 3.1 – Professional qualifications are more prevalent among respondents with an engineering background

Percent of respondents with a professional qualification

Number of respondents

18

3.21   Most civil service respondents reported feeling influential in their current role (60% feel 'very' or 'often' influential, compared to 53.5% of respondents from the wider science and engineering community) and were generally positive about how influential scientist and engineers are in their wider organisation (50% felt scientists and engineers in general were 'very' or 'often' influential, consistent with view from respondents from the wider science and engineering community)

Skills and capabilities

3.22   The wider skills and capabilities we asked about in our survey would be valuable in any profession but we wanted to see which skills or capabilities were particularly highlighted by scientists and engineers in the civil service.

3.23   Capabilities for working collaboratively and for engaging and influencing decision makers were identified equally across civil service and wider science and engineering community responses.

3.24   Responses from civil servant respondents (both tick-box and comments) highlight the value of skills in applying rigour in problem framing, critical thinking, and developing networks and using their connections to seek our expertise. Responses from the wider science and engineering community also highlighted these areas but to a lesser extent.

3.25   Responses for the wider science and engineering community emphasised application of knowledge of relevant legislation, negotiating, contracting and commissioning, marketing, fundraising and income generation more frequently than responses from civil servants.

3.26   A much higher proportion of civil servant respondents (40.9% compared to 15.6% of respondents from the wider science and engineering community) felt that their wider skills and capabilities are underused or undervalued. Some 45% of civil service respondents with an engineering background reported feeling their skills were underused or undervalued.

3.27   In addition to our list of general skills and capabilities, respondents suggested other valuable skills and capabilities they offer, including:

- Horizon scanning and innovative thinking
'Creative thinking and innovation, pushing beyond barriers and anticipating future evidence needs'

- Communication and networking
'…to communicate and 'de-mystify' science and its findings to those without technical backgrounds'

'The value of communication and networking, is difficult to measure and its value is therefore often undervalued by senior management'

- Project management skills
'project management, fiscal responsibility, technical assurance [skills] all used in industry and not used in civil service'

- Willingness to challenge was felt to be beneficial to the organisation but doesn't help your career.
'Boldness in dealing with senior management and existing power structures is beneficial but quite rare.'

- Broader awareness of the context of advice e.g. legislative, politics, civil service or military operations
'among scientists a broader awareness of topics in politics, history, philosophy, the arts etc seems undervalued.'

Emerging concerns around skills

3.28   The issue of **trust** in professional skills and being **empowered** to apply them emerged as an important theme in the comments from respondents:

'there is not 'trust' in an individual's skills learned outside the Civil Service.'

'I feel that because I don't have a "Prince2" certificate stuck to my wall there is an assumption that I know nothing of project management ; no matter that in my last job, as a project manager, the budget I controlled was greater than the whole annual budget of the body I work for now.'

'The lack of ability to stretch commercial skills in a private sector sense is frustrating and a cap on development.'

'Unlike my role in private industry I now feel that I have been put into a straightjacket. You are not allowed the autonomy to make your own decisions, attend meetings, etc without feeling as if you are going cap in hand to your line manager.'

3.29   Another emerging theme from respondent's comments was the issue of being kept **confined** to a specialist niche and effectively being kept **'on tap'** rather than integrated with a full opportunity to contribute to their organisation:

'The Civil Service generally finds it difficult to know what to do with 'specialists' and as roles are tightly defined, it is difficult to enable a person with a broad range of skills to be deployed most effectively'

'One feels that [specialists] are now employed solely to provide a signature. In other words, senior management are paying only lip-service to the essential requirement to have [specialist] input.'

'Department procedures are intended to 'keep people in their place' - and NOT to utilise their knowledge, skills and experience. Past experience is NOT even considered when it comes to the VERY limited opportunities for promotion and development that exist.'

'I feel totally unvalued. Scientists are overlooked and kept down in preference of Generalists. I am told I am a specialist and therefore have limited scope whereas a Generalist can do any job at their current grade.'
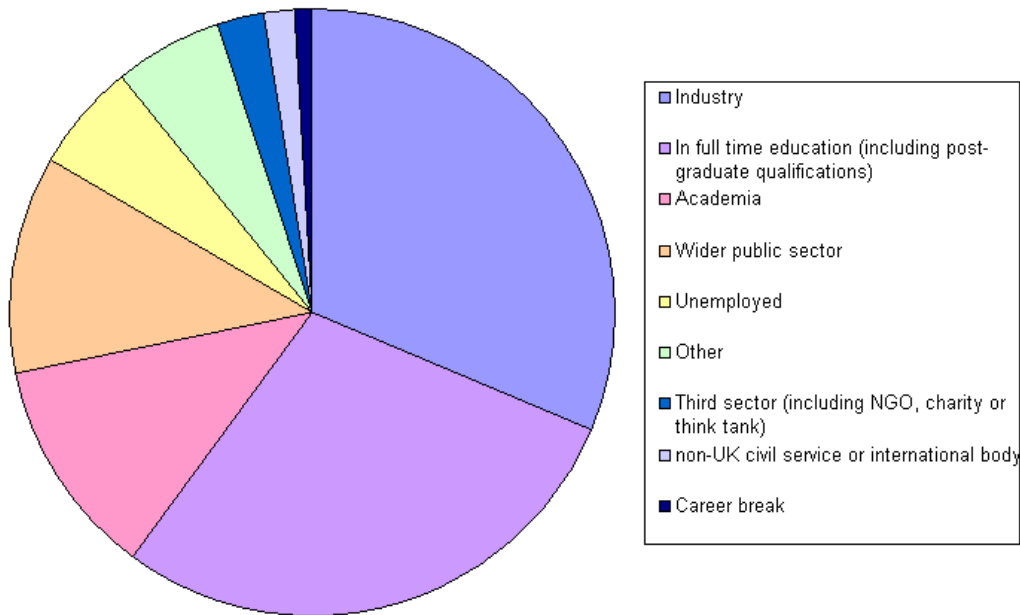
'I feel my role as a [specialist] narrows the opportunities to contribute to wider issues.'

3.30   Survey findings regarding recognition of broader skills and opportunity to apply them were also reflected in the wider project. For example, we encountered concerns that scientists and engineers can become 'invisible' in HR and general management systems, which find it difficult to recognise the broader applications of the kinds of problem structuring skills learned in a science or engineering education and training. For example, the skills to interrogate complex data sets could arise from numerous science or engineering education pathways, yet the perception was that the value of analytical skills in the civil service is not sufficiently recognised.

Employment history and mobility

3.31   The majority of civil servant respondents (70%) have never worked in another government department or agency but most (63%) joined the civil service direct from another employer.

3.32   Responses from the wider science and engineering community suggest that mobility between organisations during the career is normal (77% have worked for at least one other organisation) but the predominance of long service is similar to the civil service (33% have worked for their current employer for 21 years or more, compared to 28% for civil service).

Figure 3.2 Employment status prior to joining Civil Service
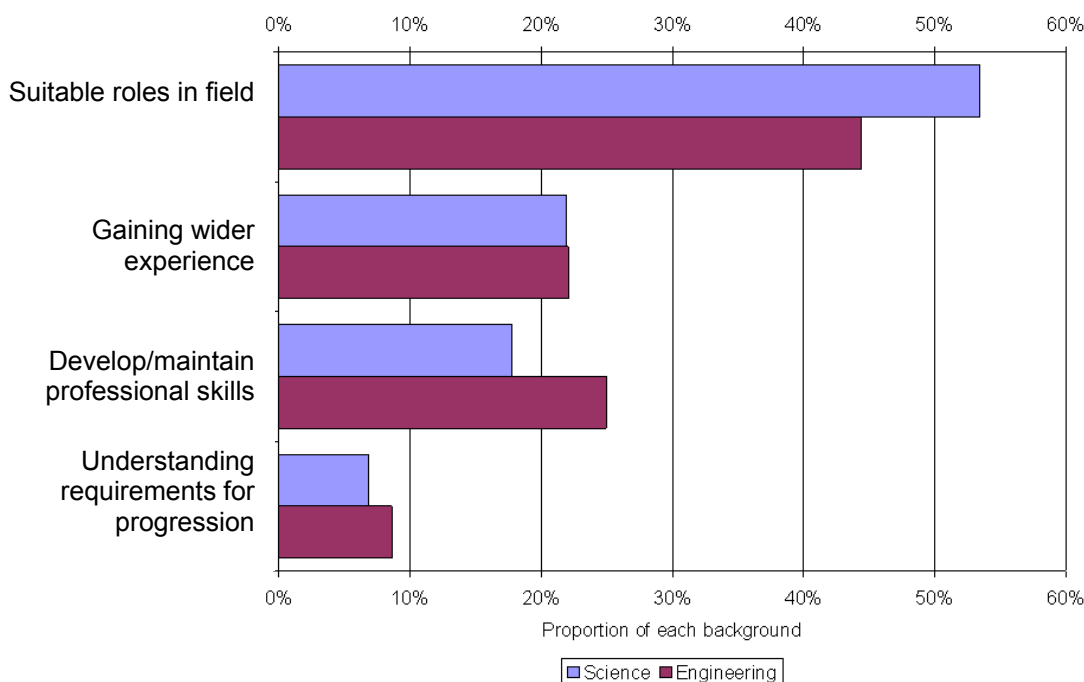

3.33   Figure 3.2 show the employment status immediately prior to joining the Civil Service, based on respondents to the survey for civil servants with a science or engineering background.

Career aspirations

3.34   Many of our civil servants are **looking for a change** in the next 5 years. Only 26.8% would prefer to stay in their current role (compared to 35.9% of respondents from the wider science and engineering community). Around half are actively working towards promotion (50.7%) but a significant proportion (much more than wider science and engineering community respondents) are looking to change employer, either within the civil service (10.9%) or outside the civil service (20.5%).

3.35   The preferred direction of career development for civil service respondents is very similar to peers in the wider science and engineering community – most (56.5%) want to **deepen their existing specialist knowledge and expertise**, although a significant proportion want to gain broader experience in a science or engineering function (36.1%) or take on greater management responsibility (34.3%).

3.36   Civil servant respondents were **negative about their career prospects**. Only 26.4% were positive or very positive about their career prospects compared to 47.1% of respondents from the wider science and engineering community. Most (50.7%) considered the lack of suitable roles in their field to be the biggest barrier to fulfilling career aspirations, although a significant minority of engineer respondents cited lack of opportunities to develop or maintain professional skills (Figure 3.4).

Figure 3.4 What will be the biggest barrier to fulfilling your career aspirations?

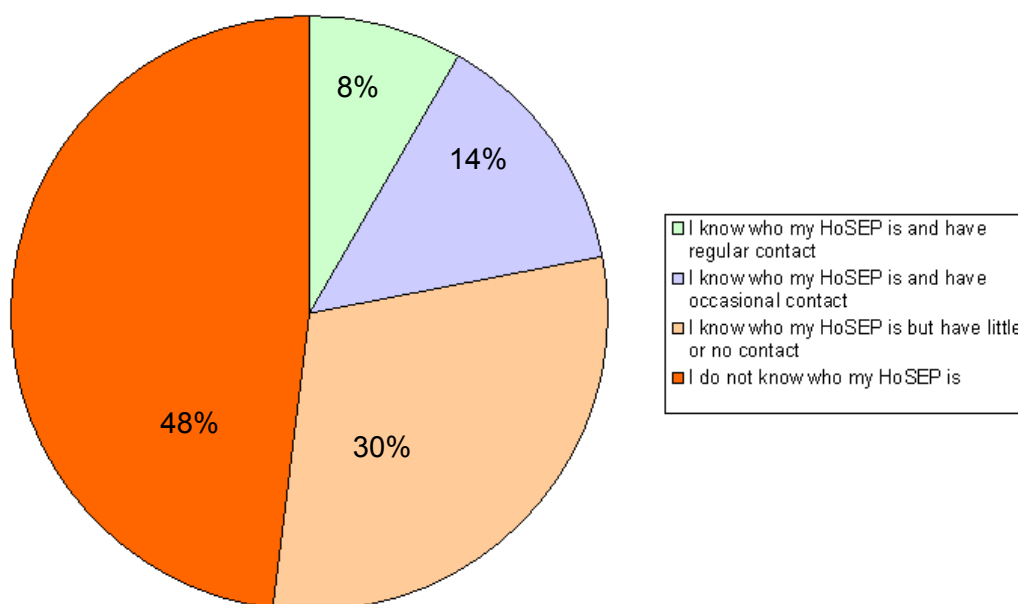(based on civil servant respondents to the survey)

3.37 These concerns about 'limited' career paths were also reflected in our careers workshops. In some cases there appears to be a perception that scientists and engineers have to do more than people from more generalist backgrounds in order to advance their careers. The profession might therefore consider what action can be taken to provide more visible support for development.

Visibility of leadership

3.38 The number of people who know who their organisation's Head of Science and Engineering Profession (HoSEP) is and have regular or even occasional contact with them is very low: 77% did not know or had little contact with their HoSEP (figure 3.5). This is in contrast to the wider science and engineering community where most respondents (73.4%) know who the head of profession or governing adviser is.

3.39 The concerns about visibility of 'HoSEPs' raised in the survey have also arisen elsewhere. For example, in our scoping workshops with experienced scientists and engineers, we heard that HoSEPs need to be more visible and outward facing. It seems clear from the survey that many civil service scientists and engineers would be willing customers of greater support from their HoSEPs if it were available.

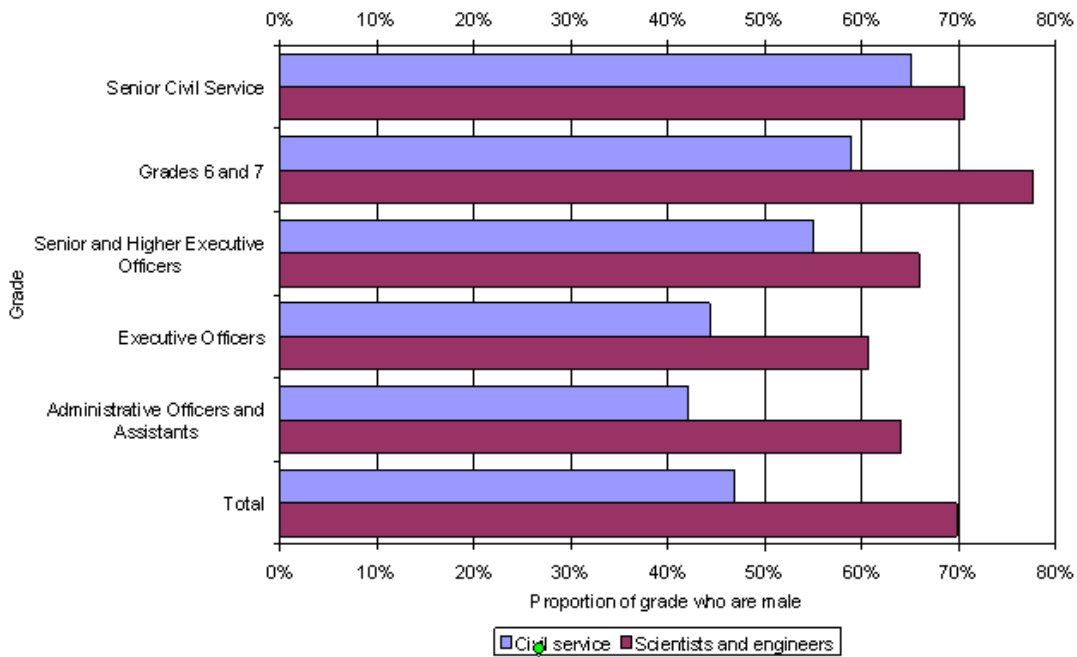**Figure 3.5 Poor visibility of head of profession**

(based on civil servant respondents to the survey)

Gender

3.40 Our profession has a high proportion of men (82%) overall. Gender split by age bracket shows a positive trend towards a more balanced workforce and reflects a similar trend in the wider science and engineering community.

3.41 The gender split by grade (figure 3.6) shows women tend to be in junior grades, with women particularly poorly represented at Grades 7 and 6 (or equivalent) compared to the average for the profession and for the civil service as a whole (women make up approximately 40% of Grade 6 and 7 in the Civil Service as a whole). Representation at SCS level reflects the norm for the civil service.

Figure 3.6 Gender of scientists and engineers distributed across grades (compared with Civil Service norm*)

*Civil service figures taken from Annual Civil Service Employment Survey 2012

Flexible working

3.42 Civil service respondents more frequently reported some form of flexible working pattern (80.8% compared to 65.8% of respondents from the wider science and engineering community). Shift working appears to be extremely unusual (0.6%) in the civil service (compared to 8.6% of respondents from the wider science and engineering community).

Segmentation

3.43   The survey offers a powerful insight into how the profession might better tailor the way it develops and supports its people.

3.44   The clearest segmentation within our professional community appeared to be along lines of *professional identity* (figure 3.7). Survey respondents were asked to choose one of the following descriptions[5]:

- the **Practitioner**, who provides specialist advice or services and is likely to become or remain a deep expert in their field;

- the **Facilitator**[6], who manages science or engineering programmes or works closely with researchers, and whose expertise depends on understanding both policy or operations *and* the wider landscape of science and engineering expertise and knowing how to engage with both; and

- the **Informed Advocate**, who works in policy or operations and retains a lively and informed interest in science or engineering and is able to identify opportunities for the use of science and engineering expertise to inform government activity.

3.45   We found that respondents identifying themselves as 'practitioners' work across the civil service and are the dominant group across all areas. The majority of respondents identifying themselves as practitioners are in operational delivery roles. Practitioners are also the largest group working in project management. People identifying themselves as facilitators are frequently found in either policy or project management areas. Respondents describing themselves as informed advocates tended to work in the policy arena.

3.46   In addition to our labels of practitioner, facilitator and informed advocate, respondents also described themselves as analysts, consultants and advisers (see figure 3.8). Discussions with our heads of profession network suggested that '***integrator***' may be a better term than facilitator to reflect that the most senior members of this segment of the profession are leading policy teams and executing major projects.

3.47   In the careers workshops following the survey we found that while most people could usually identify themselves one of the descriptions, they might see themselves playing different roles depending on what they were working on at the time.

3.48   Segmentation by professional function may be possible (figure 3.9) but respondents offered a diverse range of alternative descriptions to our original six categories (figure 3.10).

3.49   In the course of discussions with our people about roles and careers, we found that experience and occupational domain knowledge were often as important as the discipline of science or engineering in which they were originally trained or the broad functions they have undertaken during their career. Understanding the nature of policy making or the context in which technologies are applied to deliver solutions requires experience to be built up over time. This experience is therefore very valuable and we

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[5] Descriptions were developed by GO-Science staff based on discussions with HoSEPs and GSE members.
[6] Similar to the 'Broker' role described by Roger Pielke in his book 'The Honest Broker: Making Sense of Science in Policy and Politics'.

need to develop means of exchanging information about its availability in the Civil Service, including through developing an appropriate descriptive taxonomy, a difficult undertaking.

Figure 3.7 Segmentation by professional identity

Figure 3.8 – Alternative descriptions of professional identity

Figure 3.9 – Which best describes your current function?

Base: 1923

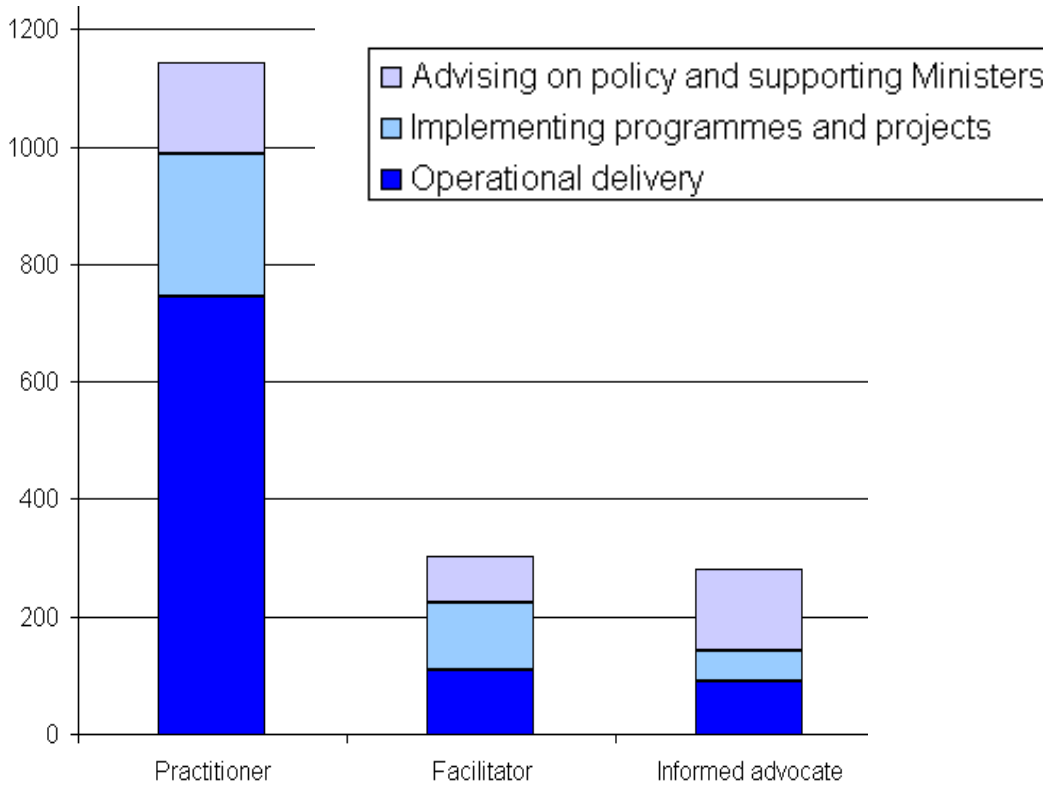*For this question respondents were able to assign themselves to more than one function*

Figure 3.10 – Alternative function descriptions

4 Career pathways

This chapter summarises the aims, objectives and methods we used to explore the career pathways of civil servants with a science and engineering background. It explores the key findings from our discussions with senior civil servants, including the breadth of opportunities open to talented scientists and engineers, the challenges facing people looking to move out of the profession and examples of advice and support for career development.

"It is vital to engage and empower staff, and to create a dynamic and flexible career path." "The Civil Service should provide an environment that allows all staff to be empowered. It must become pacier, more flexible, focussed on outcomes and results rather than process. It must encourage innovation and challenge the status quo, and reward those who identify and act to eradicate waste."

Civil Service Reform Plan 2012

Aim

4.1 Our aim for this aspect of the review was to gain an understanding of the career pathways of senior civil servants who have a background in science or engineering, the roles and functions they have undertaken and the support or barriers they have encountered. We also discussed how their experience might inform or support advice provided by the profession on career development.

4.2 We spoke to 18 senior civil servants who either work in a scientific or engineering area or have a science and engineering background. The interviewees came from a wide spread of departments including Department for Business Innovation and Skills (BIS), Department for Transport (DfT), Ministry of Defence (MoD), Department for Environment, Food and Rural Affairs (Defra), Department of Energy and Climate Change (DECC) and Department for Health (DH).

4.3 Questions focussed on:
• Interviewee's current (self-declared) professional identity and their career history and continued the survey's efforts to better understand the community's composition and explore the professional functions and identities of senior figures with science and engineering backgrounds.
• The drivers and motivations behind career choices were explored and the role that science or engineering has played in shaping them.
• The support for and barriers to developing their career in the civil service, especially related to science and engineering.
• For those who came through it, personal views were sought on experiences of the science and engineering fast stream, how it could be improved and what they saw for its future.

The topic discussion guide is attached in Annex D.

Key points:

4.4 **There is no typical career pathway to senior positions.** Among the people we spoke to, their starting points in the civil service ranged from joining as an apprentice, direct recruitment into a specialist post, science and engineering fast streamers, or direct appointment as Grade 7 in the civil service as a scientist or an engineer. For some prominent senior science or engineering posts (Chief Scientific Advisers) the norm is external recruitment.

4.5 However, there are some **core skills and competences of those who succeed**. They are not only competent and authoritative when handling science or engineering issues, they have also developed management and leadership competences, are good communicators and have a set of skills and aptitudes around policy making or delivery (or both).

4.6 **The opportunity to continue to work in science and engineering was a major factor in attracting people to the civil service.** Several of the people we spoke to only considered the civil service because the job advertisement (both fast stream or other grades) explicitly targeted scientists and engineers.

4.7 **Career planning** - A pivotal decision seemed to be how closely wedded to science or engineering they wanted their career to be and therefore how flexible they were prepared to be in moving outside of their professional function. The Civil Service Reform plan suggests that it should no longer be possible for civil servants, except in the most specialist roles, to get to very senior levels without having worked outside of a single department or the centre of Government, or having worked in more than one type of role. When reflecting on their career, few people started out with a long term plan but many people we spoke to felt having a goal was important.

"My greatest motivation was moving into project management so that I could develop wider skills and have a larger remit"

"I always found the roles working with science the most interesting and wanted to continue working in interesting roles"

4.8 Many people noted how the wide range of opportunities in the civil service allows people to focus on an area that you find particularly interesting and challenging, but try out different types of roles to building strengths in a couple of professional themes (e.g. engineer and project manager in area X).

4.9 **Being 'labelled as a scientist or 'techie' is not always helpful for career development.** PhDs can be seen as a negative, and some people have been advised not to use the title "Dr" if they're trying to move into more generalist jobs in case they are viewed as being too specialised. One person said that they had been advised to drop the "Dr" and did so until they got a *"proper policy job"*.

"To be brutally honest, if I was currently actively campaigning to get promoted again, I'd minimize my science background."

4.10 However, not everyone spoken to has experienced this, or suggested that the situation has improved:

"They say that for going up in the policy world you should keep your PhD quiet… there's gossip that if you show you're too 'science-y' you're not going to go anywhere – I've not experienced that personally."

"I do now put my doctor on lots of things whereas there was a point I consciously didn't. I think it's changed but I think there's still a bit of that around."

4.11 **Scientists and engineers suffer from being perceived as unable to write or communicate effectively**. Many of those we spoke to felt they had to develop or demonstrate exceptional communications skills to succeed.

"[Scientists and engineers] have got to develop confidence in communicating what they know… One thing I have noticed is people saying over the past year, I've got more confident in doing this, in challenging people more senior and asking questions of outside bodies"

4.12 **Coaching or mentoring makes a huge difference**. Of the support available to individuals as they move towards the senior civil service, executive coaches (usually from outside the civil service) were consistently identified as amongst the most helpful. Several of the people we spoke to highlighted the benefit of posts where they had the opportunity to work closely with (and learn from) senior colleagues.

"An important factor was working with someone senior who took an interest in my development, encouraged me, was prepared to help and who I could ask for guidance."

4.13 Leadership programmes were reported as helpful to a certain extent, mainly for the opportunity to meet and **learn from colleagues from other organisations** or outside the civil service, who were participating in the course.

"I would recommend that people take a general management course every five years or so to refresh skills in areas such as presentation, communication, leadership, strategic thinking and mentoring styles. This should be done with peer groups so that everyone can learn from each other."

4.14 Geography plays a role. Many civil service science and engineering jobs are located in laboratory agencies or trading funds, which are usually based in the regions. The London-centric nature of the Civil Service, with policy or leadership roles usually based in Whitehall is a barrier to career progression. There is little incentive or support to take placements outside your home organisation.

"The Civil Service is about London and advising ministers. Engineers are predominantly outside London, on the fringes. To some extent they are viewed as not proper civil servants"

4.15 Understanding how the system, how decisions making really works and how to be influential it is extremely valuable. The fast stream provides a great basis for building a career in the civil service thanks to well planned and focused training. People who joined the civil service through other routes felt they had to take time to learn (often

through trial and error) some of the systems and ways of working for themselves. Time spent engaging with policy is valuable but some jobs won't offer this.

"There are significant glass ceilings for people outside of development streams and in the future it could become more difficult for [them] to get development opportunities."

"[Scientists and engineers] are almost certainly spending far more time managing contracts and far less time engaging with the wider policy community. And that's just an inefficient use of their time and not giving them the skills to progress."

4.13   Scientists and engineers can succeed in other professional functions but **switching between professional functions can be challenging**. When seeking to gain experience outside a specialist role, people reported several barriers:

- being 'labelled' as a scientist or engineer (and assumptions about what one may or may not be able to do),
- not being known or 'visible' to those drawing up shortlists as obvious candidates for a policy role,
- understanding the criteria that were being applied and explaining their skills and experience in the right 'language'.

4.14   Several people reported that once they had the opportunity to try a policy or project management role, they found they enjoyed it and were good at it. but the challenge was to

"*make a convincing case to persuade someone to hire you over another candidate with years of experience in that environment*".

"I didn't want to become too specialised, which led me to science journalism and then science policy, where I found I really enjoyed policy work"

4.15   **Moving back into a scientific role** after gaining wider experience can also be challenging, though some people felt that having a PhD or credible experience as a practitioner would make this transition easier. However, support is needed to help people keep their scientific knowledge up to date while out of a science or engineering function. The broader experience was thought to be extremely valuable for people moving back into a professional function. Several people highlighted the value to their career in having credible experience of the operations and policy environment, particularly for engaging effectively with 'clients' for science or engineering,

"It is hard to find opportunities to keep up engineering skills and knowledge when not in a specialist role."

"Scientific knowledge is frozen as soon as you leave science behind. It's easier to do a little bit regularly to keep up to speed – prompts from the profession would have been helpful".

Attracting and developing future leaders

4.16 **The future of the graduate fast stream** - The profession has the opportunity to work with Civil Service Resourcing to develop a new offer for fast streamers with a science and engineering background.

4.17 The **science and engineering fast stream** is currently used by only 3 departments (MoD, DECC and BIS) and only a handful of people come in through this route each year, with little tailored support for professional development once they are in. Far more science, technology, engineering and mathematics (STEM) graduates enter through the general graduate fast stream.

4.18 Discussions with individuals on routes of entry to the civil service suggest that the science and engineering fast stream is a valuable brand for attracting people with relevant backgrounds into the civil service. Those people we spoke to who came through the fast stream felt that it was a strong foundation for those aspiring to a leadership role in the civil service because of the focused training and development opportunities provided. However, our survey suggests the vast majority of our people do not enter through this route, and for them support for development and progression is harder to access.

4.19 **Opportunities for talented scientists and engineers** - Routes that some senior officials took to joining the civil service and developing their careers have since closed, been scaled back or are no longer possible. Several people noted the demographic challenge of an aging science and engineering workforce and the 'void' in experienced staff coming through.

4.20 **Leaders with operational experience** - The opportunity to gain practical experience of how science and engineering capability is applied in an operational environment was felt to be valuable but they also noted these opportunities have diminished. This chimes with the statement in the Civil Service Reform plan that, as commissioning of services becomes as important as making policy,

4.21 It will be increasingly important for departmental senior leaders, especially in the main delivery departments, to have exposure and experience outside policy development, especially in policy implementation. For example, some of the people we spoke to noted that those entering into the MoD now have less opportunity to gain practical experience because of the privatisation of many of its science functions (e.g. Qinetiq) and its shipyards. Across the Civil Service, many of the organisations that offer practical scientific experience do not routinely take fast streamers.

4.22 Consideration needs to be given on how best to support scientists and engineers who are not part of dedicated development programmes like the fast stream. Several people referred to having to make a choice between a delivery role or moving to policy roles in order to progress, effectively 'disconnecting' from the profession.

4.23 The profession has the opportunity to use new Civil Service approaches to talent management to identify and nurture individuals who have leadership potential. The profession clearly has a role to develop our own future leadership. Within our profession's pool of talent there will be those who have the potential to be leaders on a

broader Civil Service stage, who we should nurture and encourage to develop their experience while retaining their connection with the profession.

4.24   Successful scientific and engineering activity is founded on **collaboration and partnership**. The profession needs to find ways to recognise and encourage successful cross-disciplinary cross-organisation team working as well as individual 'stars'.

5   Careers workshops

This chapter summarises the aims, objectives and methods we used to explore the career experiences and aspirations of civil servants with a science and engineering background. It explores the key findings from our discussions with staff from a wide range of Civil Service organisations, including the challenges to effective collaboration across government, the appetite for learning and development and suggestions for improving systems and processes to help scientists and engineers deliver their roles more effectively.

"To support a more flexible, open and pacier culture within the Civil Service, structures need to be flatter, with less focus on whether people are the right grade for the job, and more on whether they are the right people to do it. This means having the right people in the right jobs at the right time, taking into account the varying business needs and structures of different Government departments. Departments must improve workforce planning and ensure that talented people are recognised and deployed appropriately."

Civil Service Reform Plan 2012

Aims

5.1   We developed a workshop template with the following aims:
- learn more about members of the profession and the different functions that members of the community undertake in different organisations;
- learn more about their motivations for working in the civil service, including career aspirations;
- identify barriers and success criteria to development, application and retention of expertise;
- develop and test a vision for the profession and to consider the future challenges facing the civil service and the civil service's future needs for science and engineering skills and expertise; and
- identify and discuss interventions aimed at developing a motivated and effective science and engineering community in government.

5.2   We also discussed the principles of Civil Service Reform and highlighted the support already available to GSE members in the areas of training and career development.

What we did

5.3   We ran 10 careers workshops also covering a wide spread of departments:, Met Office, Marine Scotland, Dstl, FSA, MoD Abbey Wood, BIS and 2 at DECC and HSE. The

science and engineering community in the civil service is a geographical diverse one and the workshops reflected this, being conducted in Aberdeen, Bristol, Exeter, Liverpool and Portsdown West (Portsmouth) in addition to London.

5.4   In each workshop we asked participants to introduce themselves and provide a bit of detail on their professional background as well as their current role. We then asked workshop participants to discuss the following issues (further detail on the questions and workshop exercises is available in Annex E):

5.4.1 **What do scientists and engineers offer the Civil Service?** We asked participants for their suggestions of the unique and distinctive characteristics that in-house scientists and engineers bring to the Civil Service.

5.4.2 **What motivates scientists and engineers**? We discussed the Civil Service 'employment offer' and asked participants to identify which aspects were most important to them.

5.4.3 **A vision for the profession** - We discussed a vision for the science and engineering profession with workshop participants and asked for their views on challenges and potential solutions in 4 themes[7]:

- Knowledge, skills and expertise
- Supporting resources and infrastructure
- Practices and processes
- Networks and relationships

5.4.4 What one thing would you like from your **head of profession?**

Key findings

5.5   There were several points that consistently emerged from the workshops:

5.5.1 **Scientists and engineers embody the Civil Service Code[8]**: Participants consistently highlighted the importance of integrity, objectivity and impartiality that they bring to their roles as scientists and engineers in the Civil Service, as well as their professional skills and their ability to understand the operational or policy context for their work and engage credibly with industry and academia both domestically and internationally.

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[7] The four themes were derived from scoping workshop discussions and correspondence with Professor David Oxenham (Dstl) about the components of a well functioning system of science and engineering in government.
[8] The Civil Service Code defines four core values:
Integrity – putting the obligations of public service above your own personal business
Honesty – being truthful and open
Objectivity – basing your advice and decisions on rigorous analysis of the evidence
Impartiality – acting solely according to the merits of the case and serving equally well Governments of different political persuasion

5.5.2 The **interesting and important work** in which participants are engaged is clearly a powerful motivator for scientists and engineers working in the Civil Service.

5.5.3 The perception there is a **lack of trust** in professional skills and **not feeling empowered** to apply them (identified in the survey responses) was strongly reflected in the workshop discussions.

5.5.4 There was a strong **appetite for collaboration** with colleagues in other public organisations and sense of frustration about the difficulties involved in identifying expertise and forming networks.

5.5.5 There is a clear desire for **HoSEPs to do more** to promote the value and importance of science and engineering in government and to engage with and support science and engineering staff to help them be more effective in their current roles and support career development.

What does our profession offer the Civil Service?

5.6 We asked participants to generate 3 suggestions for valuable characteristics of Civil Service scientists and engineers. We asked them to focus on characteristics that are unique and distinctive, as compared with what the Civil Service could 'buy in' from the wider science and engineering community or get from any other Civil Service professional. Figure 5.1 provides an overview of responses.

5.7 The balance of responses varied between organisations depending on the nature of the work. Several themes came out strongly in all workshops:
- Professional integrity, objectivity and impartiality
- Applying deep technical knowledge in a wide range of areas
- Understanding of the political, legislative and operational context for relevant advice
- World renown, credible and respected - gateway for dialogue with industry, academia and international expertise.
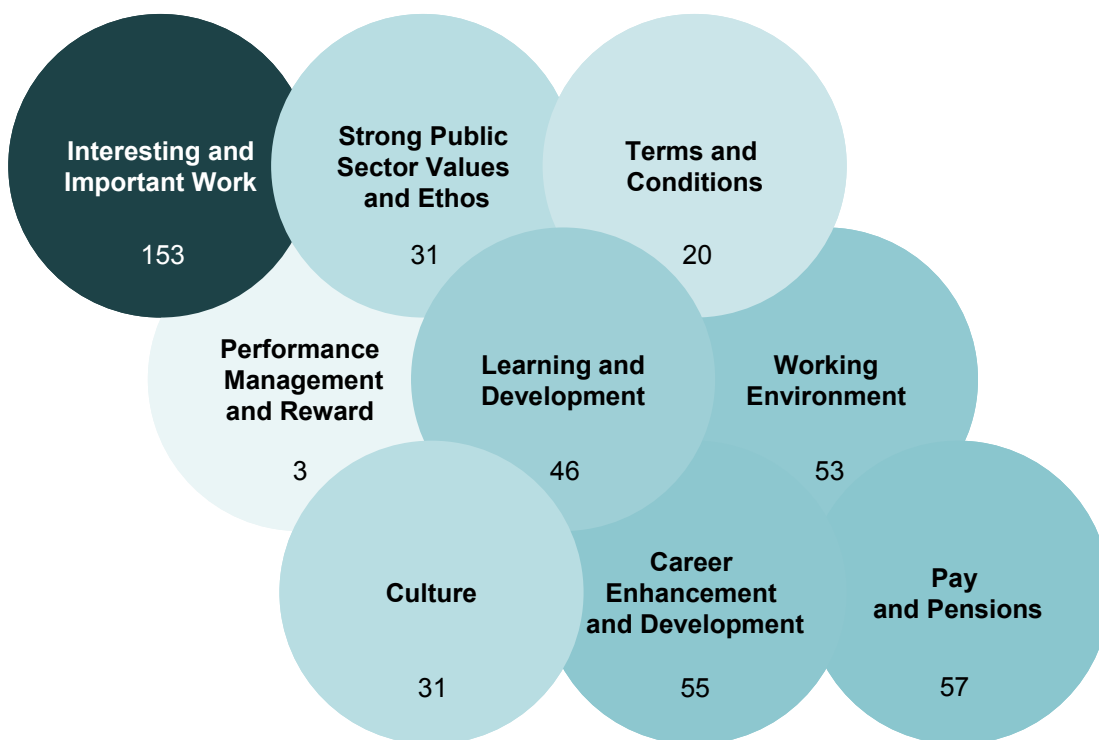
Figure 5.1 - our in-house scientists and engineers offer distinctive value to the Civil Service

Accountability

Professional integrity (speak truth to power)

Motivated by public service and intellectual challenge

Assurance of science and engineering activity

Pipeline of people with critical thinking and analytical perspective into Civil Service leadership positions

Openness

Networks with wider science and engineering community for learning, collaboration and advice

Communication of government science and engineering activity for transparency and growth

World renown, credible and respected - gateway for dialogue with industry, academia and international expertise

Unified

A professional identity emphasising collaboration, openness and transparency

Skills

Applying deep technical knowledge in a wide range of areas

Broad understanding of the political, legislative and operational context for relevant advice

Integrating evidence from multiple disciplines and analysis of implications

Influencing research agenda and policy impacts

Motivated people

5.8   We asked participants in the workshops to choose the three aspects of the Civil Service employment offer that they considered to be the most important in retaining them within the organisation. We used the employment offer published in the Civil Service reform plan. Figure 5.2 gives an overview of the responses.

5.9   Not everyone voted in the same way. Some people chose to highlight areas that they felt were important but in need to improvement, while others voted for the aspects that they felt were currently the strongest and provided the most compelling reasons to stay.

Figure 5.2 – What matters to you

Interesting and Important Work

153

Strong Public Sector Values and Ethos

31

Terms and Conditions

20

Performance Management and Reward

3

Learning and Development

46

Working Environment

53

Culture

31

Career Enhancement and Development

55

Pay and Pensions

57

[Numbers indicate total votes received across all workshops]

5.10   After voting, we invited participants to explain the reasons for their vote and discuss with other workshop participants:

Interesting and Important work – 153 votes

This was the top scoring category, receiving a vote from nearly every participant in each workshop, with some people choosing to vote for it multiple times.

Pay and Pensions – 57 votes
Pay was generally voted for as something that's important but needs improving or is a concern, rather than as a factor that people are happy with. Despite concerns over changes

to pensions, some people did consider the pension to be good relative to other employers in the wider science and engineering community.

Career enhancement and development – 55 votes

Concerns were frequently raised about the prospects for career progression in specialist scientific and engineering roles. Some people also noted that interesting work was more important, and that they had turned down promotions in favour of better work.

Working Environment – 53 votes
This was frequently interpreted as including the community of people within the organisation, and also occasionally including facilities and flexible working arrangements.

Learning and Development – 46 votes
Votes for learning and development split between people happy with it and people demanding more. In several organisations it was noted that the L&D available was much better than they had experienced at other employers. It was also noted that more support is needed to help the individual prioritise and following up on L&D undertaken.

Strong Public Sector Values and Ethos – 31 votes
This often featured in the discussion after voting and emerged as an underpinning factor of why people feel the work they do is important. Through out the course of the workshops, many people expressed pride in how their work benefits the public, particularly in areas related to public health and safety.

Culture – 31 votes
Some participants felt culture was negatively associated with processes of change within a department. Others voted for culture because of positive associations with the people in the organisation or flexible working arrangements.

Terms and Conditions – 20 votes
Some concerns were raised about the frequency with which terms and conditions can change. This was related to other factors such as pay and pensions. Participants rarely associated terms and conditions with flexible working arrangements.

Performance Management and Reward – 3 votes
Performance reward was mainly linked to 'Pay' and, where discussed, was frequently criticised for focusing on individuals rather than teams, although performance management was spoken of more positively. For example, tackling poor performance was considered important.

What is needed to achieve our vision?

5.11 Participants in the workshops provided the following comments on challenges:

5.11.1 Better communication and understanding between science and policy
- Policy pressures conflict with departmental work streams
- Policy makers need to appreciate the importance of science, even if they don't fully understand it, though some felt it is our responsibility as professionals to explain.
- More shadowing/ internships to facilitate understanding

5.11.2 Ability to collaborate effectively across organisations and identify shared research needs to avoid work duplication

- Networks are built through personal contacts – there are no systems in place to facilitate them
- Few experts in similar fields to network with
- Not enough time to network and form relationships
- More networking is needed, with other parts of the government, with industry and internationally
- Use of professional bodies to access a national network

5.11.3 Available and visible opportunities for training and promotion

- In several organisations there was a feeling that it is easier to get promoted as a generalist or that internal recruitment processes are designed for generalists
- Training opportunities are too tailored towards generalists
- Career progression without abandoning science should be possible – promotion in post, technical career path.
- Opportunity shop to advertise internal and external chances
- Time allocated to continued professional development
- More time for development in civil service than in industry

5.11.4 Retention of a diverse range of in-depth skills and knowledge

- Skills gaps created by budget-related staff loss
- Decreasing head count is placing demands on the additional remaining staff
- No external recruitment is leading to a lack of diversity and pressure to comment on areas outside personal expertise
- People are moved around internally, resulting in competition between departments for expertise
- Have to overcome civil service stereotypes when recruiting

5.12 Participants also suggested some areas where improvement would enable us to better harness our expertise:

5.12.1 IT systems suitable for specialist needs

- Specialist functions have different IT requirements. For example, some work may require specialist software.
- Government IT not state of the art because of lengthy procurement process
- Poor progress in developing new IT solutions, e.g. use of SharePoint or online platforms to support networking
- Security hinders usability and ability to communicate
- Problems with data storage and access to data; All data is kept but so much is now out of date or not accurate and there may be significant curation costs.

'Lack of support, and cumbersome IT systems mean I spent much of my time as an administrator, or doing unskilled work.'

5.12.2 Awareness of what skills and knowledge are available in an organisation

- Need for a greater breakdown of the profession – more detailed than "scientist" or "engineer"
- There's no way of identifying who knows what
- Ensure that there is a diversity of skills
- Make it easier to find who you need
- An expert directory or a database of qualifications, experience and skills.

Leadership within the profession

5.13   When we asked participants about what they would like from their head of profession, responses tended to fall into one of three categories:

- **Spearhead improvements to systems and processes** to ensure that the organisation can access or retain science and engineering capability (e.g. promotion in post) and to help scientists and engineers deliver their roles more effectively. Participants felt it was important to achieve a greater understanding of who has what skills and knowledge in an organisation.
- **Advocacy of the role and value of the profession**: Participants felt HoSEPs need to promote the value of science and engineering and secure greater recognition for the role of scientists and engineers, particularly within policy.
- **Support career development**: Participants felt HoSEPs could do more to ensure staff understand and can access opportunities for career development.

5.14   Awareness of who HoSEPs are and what they do was shown to be quite low in both the survey and in the workshops. In several workshops, participants expressed a strong desire for Heads of Profession to engage more frequently and informally with scientists and engineers in their organisation. In every workshop, the team received a positive reception from staff and, even where people had concerns or frustrations, they appeared to welcome the opportunity to discuss these issues and work together on solutions.

6 Policy Discussions

This chapter summarises the aims, objectives and methods we used to explore some of the challenges facing scientists and engineers working in a policy environment. It explores the evolution of more open and collaborative policy work and highlights key findings from our discussions with experienced policy professionals, including the skills and ways of working that help create the conditions for successful handling of evidence and analysis in a policy environment.

"There must be a clear focus on designing policies that can be implemented in practice, drawing on a wider range of views and expertise. At the same time, policy makers must have the skills and tools they need to do their jobs. And they should have a clear understanding of what works based on robust evidence."

<div align="right">Civil Service Reform Plan 2012</div>

Objectives

6.1   Our aim was to explore some of the challenges for scientists and engineers working in a policy environment and identify the conditions for success, including ways of working or skills required by the individuals involved.

Methodology

6.2   Discussions at initial scoping workshops in May 2012 suggested the following conditions for successful interaction between policy professionals and scientists and engineers:
  * Scientists and engineers understand and anticipate the needs of policy colleagues and are timely in response to emerging requirements
  * Colleagues in other professions understand the role and value of scientists and engineers in the civil service
  * Policy people bring in scientists and engineers at an early enough stage in the process (integrated as part of the team, not just 'on tap')
  * Civil service scientists and engineers are involved in work of direct relevance to their organisations policy priorities, where they can develop appropriate skills and experience and make a real difference
  * Effective communication between policy officials and specialists (can talk each other's language and challenge each other where necessary)

6.3   We spoke to 13 policy officials who had direct experience of using science or information input in policy work. Many had moved into policy from a science or engineering background. Respondents were drawn from Defra, Department for Transport (DfT), Department of Health (DH) and the Welsh Government.

6.4   In these discussions we asked people to disclose and reflect upon their experiences when working as policy development of working with science or engineering contributions. We asked questions in three broad areas:
   ● What was your experience of working with specialist input?
   ● What works well in your experience?
   ● Are there any particular issues or difficulties that arise?

6.5   Annex F provides more detail on the framework we used for discussions with policy officials.

6.6   We also ran 2 discussion workshops (DfT and Defra) which further explored some of the issues arising from the interviews. An overview of the workshop structure is available in Annex G.

Context

6.7   The challenge of ensuring successful handling of complex evidence to inform development and delivery of policy is not new. Approaches and structures for handling evidence in policy development have evolved significantly over recent history, driven by public crises related to handling evidence. There is now a significant body of guidance available to civil servants on best practice approaches[9]. The skills for handling evidence are a central pillar of the new policy skills framework[10]. The issue remains the focus of ongoing discussion in and outside government, from think tanks such as the Institute for Government[11], to academic study of the process to institutions leading the way on impact, such as the Cambridge Centre for Science and Policy[12].

6.8   Respondents highlighted the efforts made by each of their organisations to develop and embed improved approaches for use of evidence in the policy cycle:
   • DH respondents reported that closer and more collaborative interdisciplinary working between specialists and generalist policy officials has been evolving over the past ten or more years.
   • Defra reports a similar development path. Detailed guidance on use of evidence in the policy cycle is available on the intranet. The practice of working in 'multidisciplinary teams' is in development, whereas in DH it seems much more normatively established.
   • DfT respondents reported that organized and structured evidence handling has been improving since the 1960s, and was prompted particularly by road protestors of that era. Mixed discipline teams work in a number of areas and are comfortable with disciplined evidence handling.

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[9] For example the Guidelines on the Use of Scientific and Engineering Advice in Policy Making:
http://www.bis.gov.uk/assets/goscience/docs/g/10-669-gcsa-guidelines-scientific-engineering-advice-policy-making.pdf
[10] http://www.civilservice.gov.uk/networks/policy-profession/skills-framework
[11] http://www.instituteforgovernment.org.uk/our-work/better-policy-making/making-policy-better
[12] http://www.csap.cam.ac.uk/

- A respondent from the Welsh Government reported a progressive improvement in handling specialist input in the civil service although there was still a long way to go.

6.9 Open and collaborative policy making will drive continued evolution in ways of working. An ability to handle complex evidence from multiple sources, with multiple interpretations will become ever more valuable. Some respondents suggested that the issue should be classed as 'complex evidence handling' and that focus should be on building the capabilities of policy officials to work more effectively and creatively with evidence of many kinds.

6.10 The definition of "evidence" is broad and is not limited to science and engineering evidence or analysis. Some respondents suggested that evidence should include the deep experiential knowledge that for example a policy maker might have developed about a sector, industry or field. Not all forms of evidence are equally understood or taken into account. Some respondents considered that some forms (notably, economic analysis) were more powerful and influential in policy development and decision making than others, though this may vary by organisation depending on the local culture and predominance of specific analytical professions.

Ways of working

6.11 There is a range of models for analytical support within government each with their own pros and cons[13]. However, **integration of policy and evidence handling capabilities within a team** was a consistent theme when we asked participants about conditions for success. This appears to be an important evolution of policy making capability over the past few years in the two departments we have looked at in detail (DfT and Defra). Respondents reported a number of benefits from this approach:

"you get a much healthier richer discussion and exploration of ideas, and solutions, and your network is obviously much bigger than if you've got just one entry point .."

'I think having [scientists] on board in some of those discussions is really, really helpful … you end up in a situation where it's more of a virtual team ... effectively one large team working towards the same goal'

6.12 Although no single model emerged, some important principles were highlighted by respondents:

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[13] These models are described in detail in The Government Social Research 2007 report 'Structures of Analytical Support within government'
http://www.civilservice.gov.uk/wp-content/uploads/2011/09/Analytical-support-report_tcm6-4150.pdf

'I expect everybody [in my team] to be able to craft a submission, provide lines for press office, do all that kind of stuff, which is core policy stuff. '

'Within my team, policy people are integral, they deal with the evidence and are able to negotiate based on it. The policy maker is part of the team and not a customer.'

6.13   The broad principle is that specialists should be at the table early on and should have a sustained engagement with a piece of work:

' allow them to get more involved in the policy making side of the work …rather than only being able to do odd bits of analysis and sort of getting requests in, doing analysis and spewing it out again.'

6.14   It seems important not to view a multidisciplinary team as something amenable to strict specification.

'I think the best thing is to have a range of possible options and to choose the one that fits the particular purpose you have in mind for that particular occasion. And to have the flexibility so that you can change the model if you need to.'

6.15   Individuals reported benefits around enhancing their own capabilities. For example:

'I think I really started to add value when I became a part of that policy team.'

'it challenges [you] which is a good thing. It helps you think about different audiences, which is always really helpful in policy development.'

6.16   **The changing nature of policy work** - This enquiry encountered willing enthusiasm for more imaginative and inclusive policy development practices (as advocated in the Civil Service Reform plan). Some felt it was inevitable and an extension of current practice:

'The smaller we get, the more we will be forced into something like open policy making.'

6.17   Several respondents had pragmatic concerns and unanswered questions as to how this would work.

'One of the challenges of the civil service reform plan is this idea of unmediated access to Ministers. Well that's fine but how do you make sure what they're hearing is quality assured and based on something other than opinion?'

6.18   Concerns were also expressed about constraints on being 'open'

' we may go out and develop the evidence but there seems to be a rush to get some strategic direction from ministers to narrow down options. Sometimes to make work look more

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manageable or to increase confidence amongst officials who are leading on this particular initiative that we are going in the right direction. In doing that I think we still miss out on the opportunity of having the really open conversation about the alternative options.'

6.19 Others raised recurring and pragmatic concerns that 'issues are not opened up enough for debate. One said

'the policy-makers ability to be an intelligent customer can often be lacking. As I say that's not always down to being a dumb customer. It's just down to not having the time to give it that it warrants.'

'we may need to test in the real world certain kinds of intervention in order to learn how they work. '

6.20 The policy official emerges from this enquiry as someone of whom greater demands will be made, and greater capacity to handle complexity not only of subject areas, but in the participation of a wider range of contributors.

Skills for evidence handling in the policy arena

6.21 A policy official makes judgments under conditions of risk and uncertainty in a pressurized and politicized environment, where the issues may be high profile, and the consequences career limiting if errors are made. Scientists and engineers not directly engaged in policy teams do not always appreciate this.

6.22 In the context of accelerating technology development and more open and collaborative policy making, policy officials are likely to find themselves increasingly dealing with complex issues that need input from multiple experts and where the evidence base may be incomplete or open to multiple interpretations. However, convening these kinds of processes also requires advanced capabilities described below. Scientists and engineers can often play an important role where they have expertise in risk appraisal, communication of risk and uncertainty, and experience of working across disciplines and handling uncertainty or ambiguity in a policy context.

6.23 **Identify expertise needs and seek advice early** - Established processes or frameworks for policy work can make it more likely appropriate specialist contribution is sought at appropriate moments in a policy development process but policy officials may not always have the scientific understanding or numeracy to identify, interrogate and challenge complex evidence or to discern bias. Even people with a science or engineering background may fall into the trap of thinking they know a subject well enough to manage without seeking expert advice.

'It's a bit Rumsfeldian. They don't know when they don't know.. And it's just that they didn't even ask. They weren't being naughty, it just didn't occur to them.'

6.24 **Leadership and convening skills** - increasingly needed to handle complex topics are rarely found in single individuals:

'..I think there is a gap in the market for someone who can see more of the whole picture.. [to] balance those different scientific opinions on a completely new area.'

6.25   Another wanted to see much more purposeful 'conversation structuring' organized by policy makers to build knowledge so that 'strategic gaps' in evidence are more likely to be picked up.

'we need to create the opportunities for conversation to happen… both parties have to think the conversation is legitimate .. at the moment we tend to regard [those conversations] as what we do when we're not working …because work tends to get badged as the production of product rather than the build up of knowledge that went into it.

6.26   **Confidence to challenge** - There was some concern that where policy officials are not as scientifically literate as they need to be, they do not feel confident in appraising or challenging an evidence programme. One respondent said that:

'I think people's understandings of concepts like statistical significance is pretty weak in some cases …some way of refreshing that would be helpful.'

'I think it's quite easy particularly where there are long and well established programmes for people to be sucked into the fact the evidence programme carries on. Policy makers can be quite nervous in challenging this and it's a question about whether they've really got the skills to understand what the evidence is actually saying to them."

6.27   Another respondent thought that policy officials need greater help in discerning 'bias' in evidence.

'..all evidence is biased .. scientists and engineers could help policymakers to understand that natural bias…and make better decisions.'

6.28   **Understanding the implications of horizon scanning** - A related point arose what another respondent called a 'strategic gap' where a department lacks a process to absorb and deal effectively with horizon scanning, particularly where it cuts across multiple policy areas. Foresight reports, especially in high technology areas, may raise many important issues but be insufficiently digested in departments because teams focus on issues at hand and strategic questions become orphans:

'there are cross cutting opportunities and issues that get missed because individual policy teams won't look at them [where] it is not just relevant to their policy area, it's a bigger strategic issue. … you need policy mechanisms to do that but what's the potential role of scientists and engineers in that process itself ... promoting the need for that kind of thinking.'

6.29   **Making judgements** - The policy official arises from this enquiry as a person highly motivated to make the right decisions and *judgments* based upon the best possible evidence. Within this enquiry the role of the policy official cannot be understood

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without an appreciation that this person inevitably makes risky judgment calls. As one respondent put it:

I think scientists need to know what policy-makers need to take decisions or make submissions. They need to see how we manage risk and uncertainty in our discussions with ministers and our discussions with stakeholders.. the minister needs advice now and needs to know whether you are going to do it or not.'

Policy skills for scientists and engineers

6.30   **Policy literacy** - A scientific or engineering education helps develop some highly transferable capabilities for handling data and technical information, which can be extremely valuable in policy work when combined with experience and understanding of the policy environment. There are also distinct 'soft' skills that are required to be effective in a policy sphere – formal training is possible but there is nothing like working closely with or actually doing the work of a policy official. 'Policy literacy' for a scientist or engineer means experiencing the context and dealing personally with its challenges. This can take time although learning can be accelerated by mentoring. A scientist or engineer moving into policy work is making a significant personal transition that can amount to quite a departure from earlier training. There may also be institutional barriers although these may be lessening.

"if you bring such people like myself into government they find it quite difficult to begin with but eventually they learn how that works and then they can act as the interface between people out there, the scientists out there, and the policy people here."

'What is lacking is an early training or development opportunity so they can learn how to make a useful difference in relation to the advice they offer.'

6.31   **Working at pace** - Working in a pressurized and politicized environment, the policy official cannot adopt a stance that a direct facts-to-action correspondence must or can always, or ever, be applied. Work demands and deadlines can be severe and very short-term. Some respondents thought that scientists and engineers display insufficient awareness of this, and did not offer much to help in difficult situations. It should be said this is not a typical or common finding, although one respondent had experienced particular frustrations:

'One of the things which the science community seems to find difficult to grasp is, when we say a week is a long time in politics, an hour can be a long time in politics, never mind a week. And if you get a media frenzy...'

6.32   **Relevance** - Science or engineering advice always serves a policy process and does not govern it. A guiding principle should be to try to give policy makers something they can work with, which means scientists and engineers working with policy colleagues to identify objectives and establish the realities and constraints of the political and delivery challenges facing decision makers.

'being able to find out the perspective of the person you're dealing with is coming from and understand what are the influential arguments for them'

6.33 **Communicating the implications of evidence** - An important skill is to be able to explain options and underlying technical detail in clear and uncomplicated ways. People without a scientific background have no difficulty understanding technical topics if this is done with sufficient care and skill. The ability not just to effectively appraise but also communicate risks, uncertainties and their implications for policy options is particularly important skill.

"I have found that the analysts invest less, or they've had less coaching or less training in those softer skills because they're only looking for what's right, or what's correct, rather than what will run, and they're not always the same thing.'

'..it took a lot for me to accept the fact that I couldn't always put in every caveat and every single footnote explaining all the scientific nuances. Sometimes you had to keep it simple even though that represented possibly an over-simplification. And it took a while to accept that, but I did eventually.'

7 The needs of the future Civil Service

This chapter summarises the aims, objectives and methods we used to create scenarios for the future Civil Service and use these to test and develop a strategy for the profession. It explores the potential implications of these scenarios for individuals within the profession, the profession as a whole and the wider Civil Service.

"flatter, faster, more digital, more unified, with better capabilities and performance management, focused on outcomes not process, with modern terms and conditions, and which is more enjoyable to work for."

Francis Maude speaking on Civil Service Reform June 2012

Aims and Objectives

7.1   A key objective of this project (see section 1.18) was to learn more about our professional community and start to create a shared context, language and vision to describe ourselves as a profession and the value that we offer the future civil service.

7.2   We need to engage our members, the 'users' of science and engineering advice across government, and our peers in the wider science and engineering community outside the Civil Service; and we need a strategy that helps us rise to the challenges facing the modern Civil Service (as identified in the Civil Service Reform Plan).

7.3   We developed scenarios to illustrate the future challenges facing the civil service and used these to explore:
   - what kind of science and engineering skills and expertise the future civil service would need; and
   - the actions that could be taken to work towards positive change and guide our strategy development.

What we did

7.4   We worked with colleagues at GO-Science Foresight Horizon Scanning Centre and SAMI Consulting to create 3 scenarios for the future of the civil service incorporating important drivers for change and reflecting major areas of uncertainty. We sought views from members of our high level steering group and colleagues in other professions to help shape these scenarios.

7.5   To inform development of these scenarios, we used information gathered throughout the project to help us understand what is changing, where we are now as a profession and to identify important drivers and pivotal areas of uncertainty.

7.6   To help understand what is changing we looked at a wide range of sources including:

- The Civil Service Reform plan[14]
- Views from think tanks including the Institute for Government and the Institute for Public Policy Research[15]
- Key changes (political, environmental, social, technological, legal and ethical) that are likely to affect Government scientists or engineers over the next 10 years using themes suggested at the GSE conference 2012[16] as our starting point;
- Most likely needs for science and engineering expertise and functions and potential gaps, based on email consultation with HoSEPs and discussions with policy colleagues;

7.7 Based on our careers discussions with GSE members (see section 3 and 4), we created 5 characters to illustrate the range of roles and career choices that members of our profession face.

7.8 We held a workshop on 2 November 2012 to consider implications for individuals, the profession and Civil Service organisations and potential actions. Annex H shows the scenarios we developed. See Figure 7.1 for an overview of the three scenarios.

7.9 Annex I provides more detail on the workshop and the way we used the scenarios and characters we had developed. These scenarios and characters were created to help evaluate and develop our strategy for the profession[17]. The scenarios were *not* intended to be predictions of the future or recommendations for how the Civil Service should be organised.

Figure 7.1 Summary of scenarios for the future Civil Service

Summary of scenarios

No	Working Title	Summary	Use of expert skills
X	Lean Government	Continuous improvement and automation deliver year-on-year increases in workforce productivity	Efficiency through technology and cross-departmental working
Y	Slim down and divest	Slimmed down government through divesting functions and comprehensive outsourcing	Many skills and services have been outsourced to specialist providers
Z	Investment for growth	The focus of government changes to public investment.	Resourced released by Reform Plan redeployed to supporting investment programme

[14] http://www.civilservice.gov.uk/reform
[15] http://www.ippr.org/research-project/44/9627/civil-service-reform-lessons-from-overseas
[16] http://www.bis.gov.uk/assets/goscience/docs/g/12-675-gse-annual-conference-2012.pdf
[17] For further guidance on the use of scenarios, see the Foresight guide:
http://www.bis.gov.uk/assets/foresight/docs/horizon-scanning-centre/foresight_scenario_planning.pdf

Findings

7.10   Delegates discussed the impact on individuals that would arise from these scenarios and then discussed the implications for the profession and the wider civil service including the actions that could be taken now to help realise positive outcomes for individuals and for the business as a whole.

Impact on individuals

7.11   When we compared the impact of the scenarios on different characters, some common themes emerged that are relevant to all characters:

*   There is a balance to be struck between maintaining a science specialism and becoming more generalist. All individuals will have to broaden their expertise to some extent to be successful in a civil service environment, at the expense of deepening their specialism.
*   The need for specialist expertise will persist but individuals (and the organisations that employ them) need to recognise this involves effort to keep up to date. Several characters encountered a choice between moving out of the Civil Service to progress within their specialism or staying in the Civil Service but having to leave their niche to progress.
*   Transferable skills are key to being widely deployable in a range of civil service environments
*   In general it is likely in a smaller Civil Service that deep expertise will more often be found in the wider science and engineering community. The expertise of the civil servant scientists and engineers will lie in the knowledge of how to access it and translate it to the policy community. The ability to use networks could become critical for effective sourcing and deployment of GSE skills across departments.
*   Personal ambitions and preferences are important. Careers advice depends on knowing what are the goals and motivations of the individual. Protecting or serving the public may be powerfully motivational: roles which provide such opportunities may help to retain people with otherwise very marketable skills.
*   With a shrinking workforce it will be increasingly important to be agile in the way we deploy our expertise. Differences in pay and grading structures in different Civil Service organisations can seriously limit flexibility. High pay linked to a specialist post can be an incentive for recruiting and retaining scarce expertise but can also provide a disincentive to postings in other civil service organisations that do not offer the same pay enhancement.

Implications for skills and expertise

7.12   Delegates identified the following knowledge, skills and expertise (in the broadest sense) as important in the civil service of the future:
*   Specific domain knowledge and experience, and an ability to communicate it effectively;
*   Project management and delivery;
*   Understanding how government works, the objectives and culture of other civil service organisations and political acumen
*   Awareness / engagement in multi-disciplinary working. Ability to communicate and work with other analytical disciplines to develop an integrated evidence base

- Use of wide networks to access expertise. We need people who understand the limits of their knowledge, are aware of other disciplines (and can help the civil service access the right kind of expertise).
- Horizon scanning – both for immediate impacts and longer term workforce planning. With respect to emerging industries or technologies the profession will need to identify what expertise is needed within Civil Service organisations and where we can source through other routes.
- The profession will need to encourage people to be adaptable and focusing on continuous development

7.13   Participants also discussed a specific group of people who can work across operational and policy spheres, bridging the gap between policy drivers and evidence requirements and have a package of knowledge and skills that enable them to act as 'honest brokers' at the interface between supply of expertise from the science and engineering community and the needs of the business for expert advice. Broad communications and influencing skills and specific science communication skills (such as understanding and explaining evidence to external audiences) were identified as part of this package.

Implications for supply of expertise

7.14   Participants suggested the following models of access and supply of expertise will exist in the future civil service:
- Accessing expertise external to civil service – this will inevitably expand as the Civil Service contracts
- Influencing private sector and academia to contribute to government priorities and providing the training and experience to engage with government effectively at all stages their career as a scientist or engineer
- Working more closely with other governments / EU
- Multinational collaborations
- IT – multiple ways to access expertise (webinars etc.)
- Flexible deployment of people across civil service
- Use of secondees; interns – two-way / working closely with industry

7.21 Participants also discussed the following issues would be important to address:

- How we meet the need to maintain and manage the in-house science base to ensure capability in key areas
- How to encourage interchange or other approaches to ensure sharing expertise with other organisations. It was felt this should be recognised as an end in itself within the GSE profession
- How best to manage talent development within the profession
- How to maintain a pool of expertise to draw on. [This] needs to be quality assured, and made open. We will need to consider where we draw expertise from and availability in external organisations. Research investment plays a vital role here in directing scientists to policy relevant topics, and training is needed to help scientists from outside government learn how to engage with and communicate to government.

Implications for careers

7.15   Participants discussed what changes in the civil service might mean for career opportunities:
- There will need to be a clearer definition of roles and the skills required
- Flatter structure could lead to a starker choice between career progression within the profession or diversifying into wider civil service roles.
- There may be more opportunities to develop wider skills (e.g. PPM) as appropriate to science and engineering role
- Opportunities to work across teams / departments will provide multiple career progression opportunities and variation in roles.
- The future civil service should recognise and reward knowledge brokers
- The profession should seek to bring people **back** into the science and engineering profession who have policy experience. Equally, people who have undertaken interchange or secondments need opportunities to apply what they have learnt and have an impact
- The future civil service will have more of a focus on talent management but people currently have to 'plough their own furrow' and will always need to take responsibility for their own development.

Implications for systems and processes

7.16   Participants discussed what systems and processes (HR and IT) will be needed in order to develop and deploy expertise effectively?
- Consolidation of pay structures will support movement across departments
- Simplifying process of secondments / intern appointments
- Need for consistent overview and approach to Skills, qualifications and training
- IT:
    o Government intranet resource
    o Facility to share information / files
    o Open processes / systems
- HR needs to be agile. Systems to monitor people moving in and out.
- Recognise what's already working
- Skills profiling / development paths
- Immigration policy
- Flexible grading
- More travel across organisations but well planned and managed.

Implications for leadership

7.17   Participants discussed what changes in the civil service might mean for leadership in the profession or in the civil service as a whole:
- Senior managers need trust in specialists; and specialists need to earn the trust of senior managers
- Need for clear vision on outcomes / priorities and for role of specialists
- Need to promote multi-functional skills of specialists

- Open and flexible to sharing resources and potential of specialists
- Open to multiple risk taking
- Need transparency on performance management
- Still have to remain focused on public sector "ethos"
- Need for senior people with a science or engineering background to be more active and visible within the profession to inspire the next generation
- Flexibility of senior leaders to help staff develop
- Need for leaders to recognise what they don't understand
- Moving with the times / change management
- Make it attractive to be a specialist in civil service
- Accountability with officials
- Strengthen leadership skills. [These] can't be the last thing on the job description.

8 Conclusions and recommendations

This chapter summarises the key conclusions of the review and highlights the potential for tailoring what we do as a profession to better support and develop our people. It proposes actions in four priority areas (professionalism, agility, leadership and openness) as part of a strategy to help the profession rise to the challenges facing the modern Civil Service.

Professionalism: segmentation of the profession

8.1 From our survey and careers discussions with scientists and engineers we identified three distinct segments within our professional community, linked to the professional identity of the individual and the way they seek to apply their expertise. While people may move between these segments over the course of their career or have a role which spans these different identities, they offer a useful approach to tailoring what we do as a profession to support and develop our people.

- the **Practitioner**, who provides specialist advice or services and is likely to become or remain a deep expert in their field;
- the **Integrator**, who manages science or engineering programmes or works closely with researchers, and whose expertise depends on understanding both policy or operations *and* the wider landscape of science and engineering expertise and knowing how to engage with both; and
- the **Informed Advocate**, who works in policy or operations and retains a lively and informed interest in science or engineering.

8.2 In the course of discussions with our people about roles and careers, we found that experience and occupational domain knowledge were often as important as the discipline of science or engineering in which they were originally trained or the broad functions they have undertaken during their career. Understanding the nature of policy making or the context in which technologies are applied to deliver solutions requires experience to be built up over time. This experience is therefore very valuable and we need to develop means of exchanging information about its availability in the Civil Service, including through developing an appropriate descriptive taxonomy, a difficult undertaking.

Professionalism: skills and career pathways

8.3 Given the diversity of our profession, formal standards across all entry points are not appropriate or realistic. However, we can promote high professional standards by offering more tailored guidance on skills required and providing suitable benchmarks for professional standards to help people maintain and develop professional skills 57

that meet the requirements of their role in the Civil Service and are recognisable and marketable outside the civil service.

8.4   Structured discussions with people in our community suggest that career pathways are diverse. Scientists and engineers need to be adaptable and build on their broader skill sets to be able to progress generalist positions, including gaining experience of the policy environment. Currently this is not happening enough. Support is needed to help scientists and engineers maintain current knowledge when they are working in generalist roles.

Recommendations on professionalism

a. Provide learning and development to help scientists and engineers understand the policy or operational context for their work and provide more relevant and effective advice. We should also support people who choose to move into broader roles so that they can maintain their links with the profession, identify and undertake appropriate CPD if they plan to return to a science or engineering function in the future and to draw on the professions networks of science and engineering expertise available, whatever area of the civil service they end up working in.

b. We will review our professional framework to ensure it is suitable for use in recruitment and performance appraisal, aligns with the Civil Service core competency framework and key functional areas of the Civil Service (policy, project management and operational delivery)

c. To further develop capability we will work with leading experts in the civil service and academia to expand the professional development offered to scientists and engineers in communications and influencing, horizon scanning and leadership.

d. To showcase excellence we will establish Government Chief Scientific Adviser prizes for communication of government science and engineering activity and cross-disciplinary, cross-boundary working.

e. Joint with Prospect, the profession will host a careers event for scientists and engineers in the civil service to illustrate the diverse career pathways and the support available for career development.

Agility: we will promote cross-departmental working to solve challenges and share learning

8.5   In a contracting Civil Service, we face the challenge of having the right skills in place, knowing where they are and being able to deploy people rapidly and efficiently.   58

Across our professional community there is a broad range of functions and occupations, often requiring specialist and distinct combinations of knowledge, skills and experience. This diversity means that a centralised shared services model is not appropriate but also means we will need to be particularly agile.

8.6 The network of departmental Chief Scientific Advisers demonstrates how we can link up across government to give departments access to extended networks of expertise. There is a strong appetite for developing communities of practice at more operational levels to allow people to contribute across government and learn from others working in the same field, wherever they might be based. Knowing how to identify people with the right skills is the single biggest barrier to cross-departmental working.

Recommendation on agility

f. Develop an online directory to make it easy to find and access specialist qualifications, experience and skills across Civil Service organisations as and when we need them. This will provide the profession's leadership with the management information needed to identify skills gaps and spot opportunities for sharing knowledge and know-how across civil service organisations.

Leadership: strengthen the networks

8.7 Our devolved approach to management of the profession makes the role of departmental heads of science and engineering profession crucial. We must also do more to nurture those within the profession that can make a significant contribution as senior leaders in the Civil Service and we must engage more effectively with the wider civil service leadership.

Recommendations on leadership

g. Ensure that Heads of Profession are consistently recognised within departments and get the support and challenge they need, through contribution to departmental Head of Science and Engineering Profession appraisals.

h. Develop a talent management and leadership development programme specifically targeted at scientists and engineers.

8.8 Application of science or engineering expertise requires a strong understanding of the policy or operational context for their work. The Heads of Analysis group shows the power of the analytical professions working together and the segmentation of our profession described above will help us engage more effectively with the other Civil Service professions.

Openness: draw in external expertise and use science and engineering to engage widely

8.9 Government scientists and engineers are often skilled collaborators, facilitators and integrators, helping the civil service access expertise through links with academia and business, relationships with the research community and through direct commissioning of research or scientific service. Working with the policy profession, we have a major contribution to make to open, collaborative and transparent development of policy.

> **Recommendations on openness**
>
> i. Work with policy and analytical professions to develop a programme of activities on the theme of evidence and evaluation for policy to share case studies of good practice from a range of Civil Service organisations and leading thinkers in this area, and to take the next step in connecting policy and analytical leaders in government.
>
> j. Provide guidance for policy professionals on engagement with academia

8.10 Science, technology and engineering develops rapidly. While the analytical approaches and broader skills developed from having a science or engineering background can be applied across a wide range of Civil Service roles, maintaining relevant knowledge and continuing professional development requires effort. There are some roles where the need for cutting edge knowledge, broader experience or a fresh perspective means we will need to recruit or 'second' in external expertise. The Civil Service also needs to invest in developing and retaining the right blend of in-house skills.

> **Recommendation on openness**
>
> k. Scale up the exchange of skills and knowledge by developing a coordinated programme of external placement opportunities for civil servants into science and engineering employers in academia and business.

8.11 The Science and Engineering Profession has an important role to play in making the Civil Service a more open, flexible organisation, able to anticipate and tackle future challenges. Science and engineering needs in the Civil Service will no doubt continue to evolve. Few of the challenges facing the profession that are identified in this review are entirely new. Tackling them will require sustained effort, support and continued engagement from the people in our profession, colleagues across government, and the wider science and engineering community. This review provides important knowledge about our profession. It is crucial that the programme of work to build the profession remains alive to and flexible enough to respond to rapid changes in the shape of the Civil Service as a whole in the coming years.

List of figures

Annexes

Annex A - The report of the scoping workshops.

Annex B - Survey questions and overview of civil servant responses

Annex C - Detailed survey responses (slides)

Annex D - Careers discussion topic guide

Annex E - Careers workshop template

Annex F - Policy discussion topic guide

Annex G - Policy workshop template

Annex H - Scenarios for the future of the civil service

Annex I - Scenarios workshop template