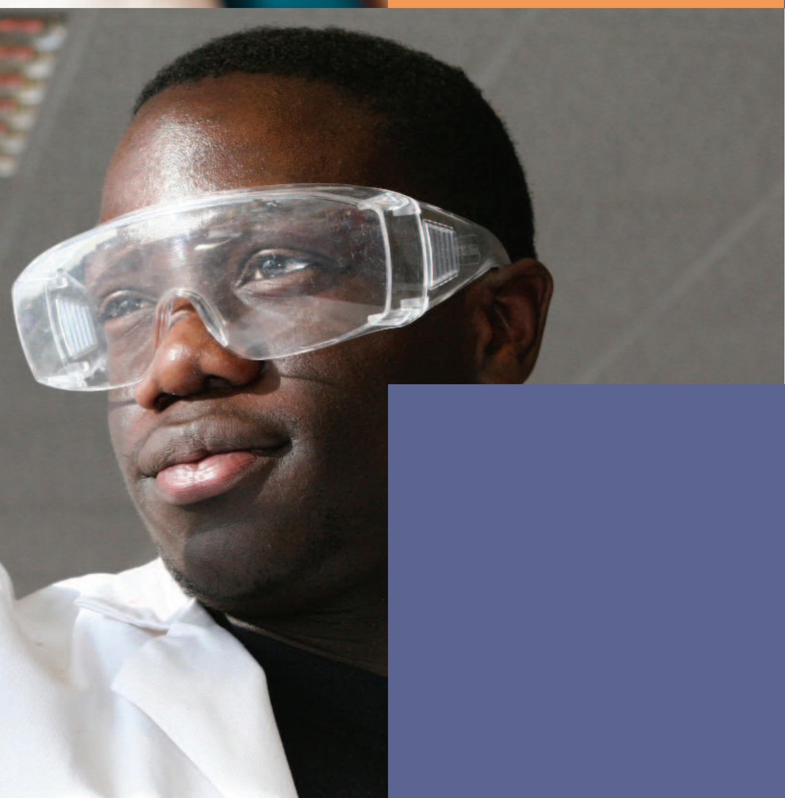
CREATING THE MODERN CLASS OF TECHNICIANS



POWERING EDUCATION
ENRICHING LIVES

STANDARDS MAPPING
Research report

March 2010

CREATING THE MODERN CLASS OF TECHNICIANS

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Research report, March 2010

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The New Engineering Foundation (NEF) is an independent and strategically focused charity (registered in England number 1112354) that works with key partners and stakeholders to support the advancement of education for the benefit of the public. It was established in 2004 as a grant awarding charity and a think-tank that supports vocational Further Education in Applied Science, Engineering and Technology through:

- Research, Policy and Advocacy;
- Programmes and Resources; and
- Knowledge and Technology Transfer.

Our mission is to achieve measurable and visible improvement through collaboration and partnership by providing a shared vision which:

- Engages all the key national and regional stakeholders;
- Enriches teaching and learning professionalism;
- Enhances and develops the capability of individuals , providers and industry; and
- Empowers change in individuals (teachers, trainers and tutors), providers and industry.

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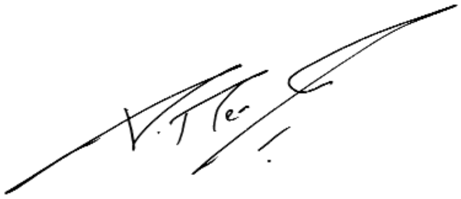
FOREWORD

The NEF has long been committed to improving the status of Technicians and their perception in education, business and the overall economy.

This report is the culmination not just of recent, focussed research – but of decades of commercial and pedagogical experience in the STEM sector. Put simply, while the role of Technicians remains misunderstood and under-supported, we are missing a huge opportunity for boosting jobs, innovation and wealth creation.

In "Creating the Modern Class of Technicians", we make a number of recommendations for raising standards and promoting recruitment, while detailing the arguments for taking such action and the evidence for its positive economic and social impact.



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We are very grateful for the invaluable contributions and feedback received from senior managers and representatives of:

- FE Colleges;
- Business and industry;
- Regional Development Agencies;
- Government Departments and Agencies
- Higher Education Institutions;
- Learning & Skills Councils (national & local);
- Sector Skills Councils;
- National Skills Academies.

We would particularly like to thank the Science and Innovation teams at the Department for Business, Innovation and Skills, for their invaluable contributions.

Finally, we would also like to thank the New Engineering Foundation Advisory Panel[1] for their continued enthusiasm and effective involvement.

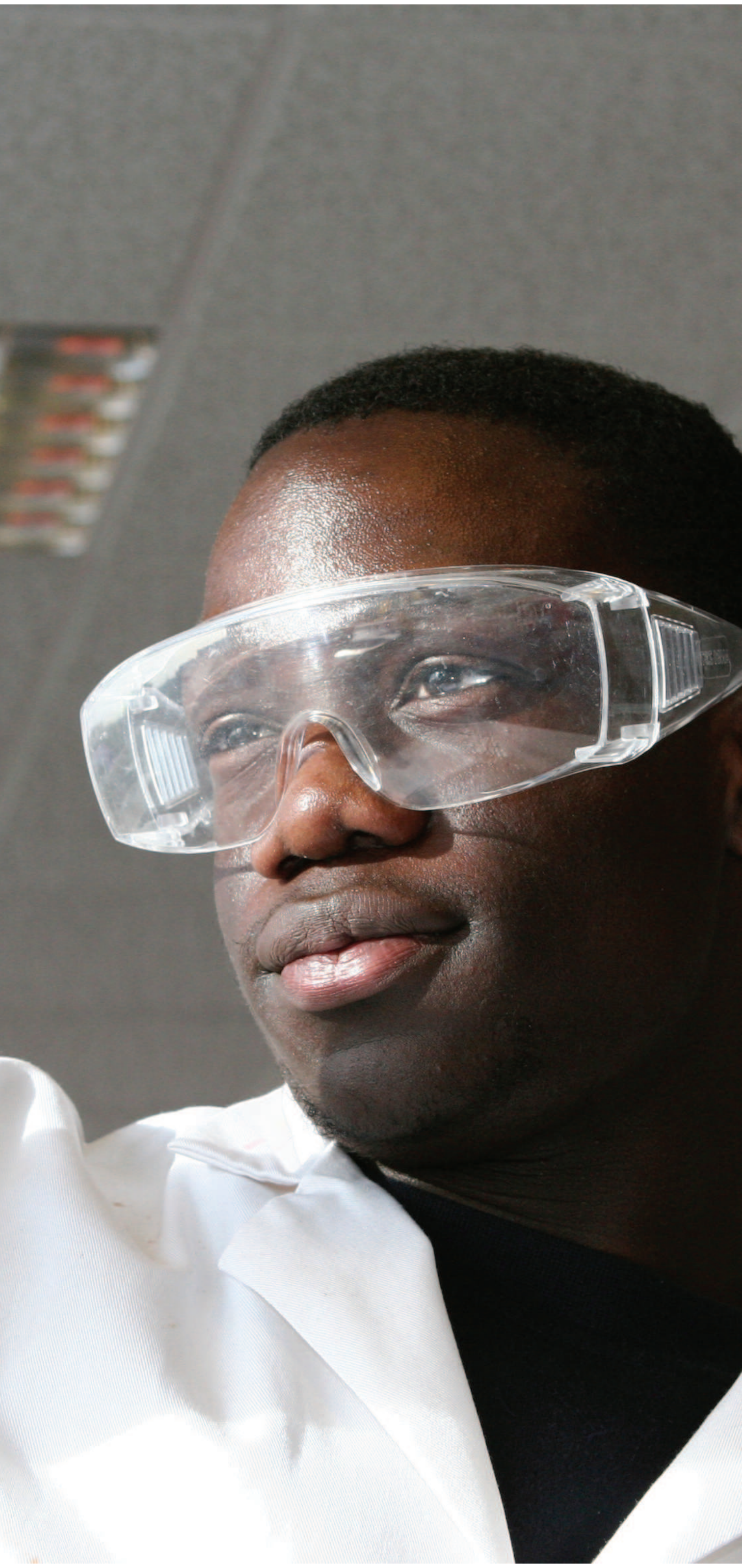
1 The New Engineering Foundation Advisory Panel consists of representatives from the following organisations: London Development Agency; Higher Education Academy Engineering Subject Centre; Learning and Skills Improvement Service; BASF; OFSTED; National Physical Laboratory; Higher Education Academy Physical Science Subject Centre; Procter & Gamble Pharmaceuticals (UK) Ltd; Royal Academy of Engineering; SEMTA; East of England Development Agency; Royal Society; Institute of Directors; Engineering Employers Federation; BBC; North West Regional Development Agency; PriceWaterhouseCoopers; Association of Colleges; National Skills Academy for the Process Industries; Foundation Degree Forward; Bournemouth University; South West of England Regional Development Agency; Cogent Sector Skills Council Ltd; Gatsby Charitable Foundation; Skills for Justice.

ESTIMATED TECHNICAL LEVEL SKILLS SHORTAGES

Nanotechnology	66,500
Medical science	68,000
Agricultural and land based services	12,500
Renewable technologies	18,000
Nuclear	11,500
Transportation	12,000
Aerospace/aircraft maintenance	12,000
Process	40,400
TOTAL	**240,900**

This table provides an indication of estimated skills shortages at technician level across a number of sectors.

1. INTRODUCTION



The critical role that science, technology, engineering and mathematics (STEM) play in driving the UK economy has been repeatedly emphasised in Government sponsored reviews.

The health of the economy can be seen as a function of productivity and there is an established link between innovation and productivity (Sainsbury[1]), research and productivity (Roberts[2]), and skills and productivity (Leitch[3]). IIf the UK economy is to remain competitive in the 21st century, scientific and technical skills have a pivotal role to play in both supporting innovation and research and improving the skills base of the workforce.

The demand for intermediate to high-skill occupations, especially technicians and associated professionals is expected to grow significantly over the next 10 years through:

- Increasing numbers of employers in new and emerging sectors;
- A growth in the size of the workforce employed in these sectors;
- Replacement demands of the sectors due to retirements.

The 'Skills for Growth, the National Skills Strategy' White Paper (Department of Business, Innovation and Skills, November 2009) in responding to this challenge seeks to bridge the gap in intermediate skills by expanding the numbers of apprenticeships to create a "modern technician class".

1 www.hm-treasury.gov.uk/sainsbury_index.htm
2 www.hm-treasury.gov.uk/5462.htm
3 www.hm-treasury.gov.uk/leitch_review_index.htm
4 EU Report-Future Skills Needs in Europe Focus on 2020, Cedefop, July 2008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2. PURPOSE AND METHODOLOGY

Purpose

Part of the initial scoping study undertaken by the New Engineering Foundation involved conducting an initial mapping of technician and technologist related roles in the engineering health ICT and science sectors. The mapping exercise suggested a lexicon of common terms which included technician and technologist across these sectors.

This brief research paper captures the key findings from the study and puts forward some propositions for consideration by the working group. It provides an insight into the potential for a generic technician standard across the engineering, health, ICT and science communities and examines the distinction between a technician and a technologist in these sectors and the extent to which these terms are in common use.

Methodology

The desk based study involved mapping examples of professional registration schemes currently in use across the engineering, health, ICT and science communities as a means by which to identify the commonly held features of such schemes. It focused on two levels – the technician and the technologist level – and where possible definitions of these levels were identified.

In addition, we recognised at an early stage in the process that it was important to map examples of:

- Professional standards frameworks (which in themselves do not lead to professional registration);
- Occupational standards which relate to technician level roles; and
- Professionally related awards.

The methodology involved:

- Designing a framework to capture data on each of the identified schemes – the framework was refined through the mapping exercise and information was placed into the following categories:

  – The lead institution or organisation;
  – The definition of technician or technologist;
  – The competence areas;
  – The accreditation process; and
  – The expectations in respect to work experience and continuing professional development.

- Undertaking a web search supported by targeted emails and telephone calls to identify and access information on relevant professional registration schemes in the UK – the search identified over 45 relevant information sources.
- Reviewing the collated information in order to populate (and refine) the framework – a total of eight registration schemes were mapped against the framework, as well as one professional standard, three occupational standards and eight awards.
- Drawing on a few international examples of professional registration schemes in 'benchmarking' established practice in the UK.

While the study was not designed to be fully comprehensive, the process provides a robust means by which to make sense of a very disparate set of information. Significant challenges to the scoping study included:

- The sheer quantity of information available;
- The variable quality and clarity of the information available;
- The variability in the level of information available.

3. THE DIFFERENCE BETWEEN TECHNICIANS AND TECHNOLOGISTS

Our research would suggest that technicians can be described as individuals who use a practical approach based on a detailed understanding of scientific and technical principles in delivering their work.

A technician accepts responsibility and exercises judgement in their particular scientific or technical field to help solve problems. By contrast technologists can be described as individuals who can apply their comprehensive understanding of the field of science and technology to make sense of results in a broader context. A technologist, therefore, usually does more complex tasks than a technician and exercises independent judgement in evaluating results, developing and modifying procedures, establishing and monitoring programmes to ensure accuracy of tests. They may also have a supervisory, project management and decision making role.

Consequently, the key differentiators between technicians and technologists include areas and levels of responsibility, qualification level (and the relative balance of knowledge and understanding as against technical skills), and the degree of technical expertise/competence.

Appendix 1 provides further detail on defining the key features of technicians and technologists.

4. KEY FINDINGS

4.1 A national policy perspective

The key findings from the study are outlined below.

There are some well established professional registration schemes which provide structured progression opportunities

As evidenced by:

- Professional registration schemes at technician level, and to a more limited extent technologist level, exist in a number of sectors with the engineering and some areas of the health sector having particularly well developed schemes at technician level – in some instances the registration scheme (e.g. for pharmacy technicians) is a legislative requirement to practice.

- There are a few examples of well established professional registration schemes which provide a structured progression from 'technician' to 'technologist' to 'chartered' status.

  – The UK Standard for Professional Engineering Competence (UKSPEC) provides progression from technician to incorporated to chartered status and would seem to be one of the more developed approaches.

- A number of gaps exist in the provision of a professional registration scheme, particularly for technicians in 'science' related fields – a significant number of professional bodies do not seem to have a professional registration scheme.

- The majority of professional registration schemes require individuals to demonstrate competence (generic STEM knowledge and skills, sector or technically specific knowledge and skills, generic skills, and professional attitudes, traits and behaviours), attain a minimum educational requirement or qualification, and have an amount of work experience.

- The range and scope of the competency frameworks associated with technician related schemes vary – it is clear that the detailed knowledge base in each industry is very specific both to role and sector.

  – National Occupational Standards (as the title suggests) are focussed on a particular job role within a specific sector, and consequently the areas of competence indentified in the standards tend to be highly technical or sector specific and do not deal with level of competence.

  – These sector or industry specific standards, in some cases, are being directly aligned to relevant professional standards and/or registration schemes.

There is a degree of consistency in the minimum qualification levels for technicians and technologists, although there is still some variability.

As evidenced by:

- Technicians, in the main, are qualified at National Qualifications Framework (NQF) Levels 3 (equivalent to A levels) or 4 (equivalent to a Certificate of Higher Education or first year of an undergraduate degree). Within our partial mapping we discovered two examples of variation:

  – Animal Technicians, who could qualify as a technician at NQF level 2 (equivalent to GCSE grades A*-C);

  – Biomedical Technicians who could be qualified to an appropriate degree level standard.

- Technologists tend to be qualified at NQF Levels 5 (e.g. a BTEC Higher National Diploma or a Foundation degree (Fd)) and 6 (equivalent to a Bachelors degree), with one exemption that we've found, Animal Technologists, who could qualify as a technologist at NQF Level 3 (equivalent A levels).

Structured vocational qualification pathways supporting career progression into technician roles and beyond are emerging

As evidenced by:

- The Apprenticeships framework requires individuals to demonstrate competence against the relevant sector's occupational standards for a particular role through achievement of the specified competence based qualification at NQF Level 3 and knowledge through achievement of a relevant qualification, again at a NQF Level 3 or above – the learning is predominantly work-based.

– In addition Apprenticeships require individuals to demonstrate they have the requisite key skills (communication, application of number, information technology) at at least NQF level 2.

- A number of Sector Skills Councils have created sector specific Advanced and Higher Level Apprenticeships and are working on sector specific Fds.

  – Cogent and Energy & Utility Skills are working in conjunction with Foundation Degree Forward (fdf) to develop Fd framework specifications: Cogent for the pertochemicals sector and Energy & Utility Skills for the electrical power engineering sector. Both frameworks provide progresstion routes for Apprenticeships to NQF Level 5 and are mapped against the UKSPEC requirements.

Language varies across the sectors and terminology can be problematic

As evidenced by:

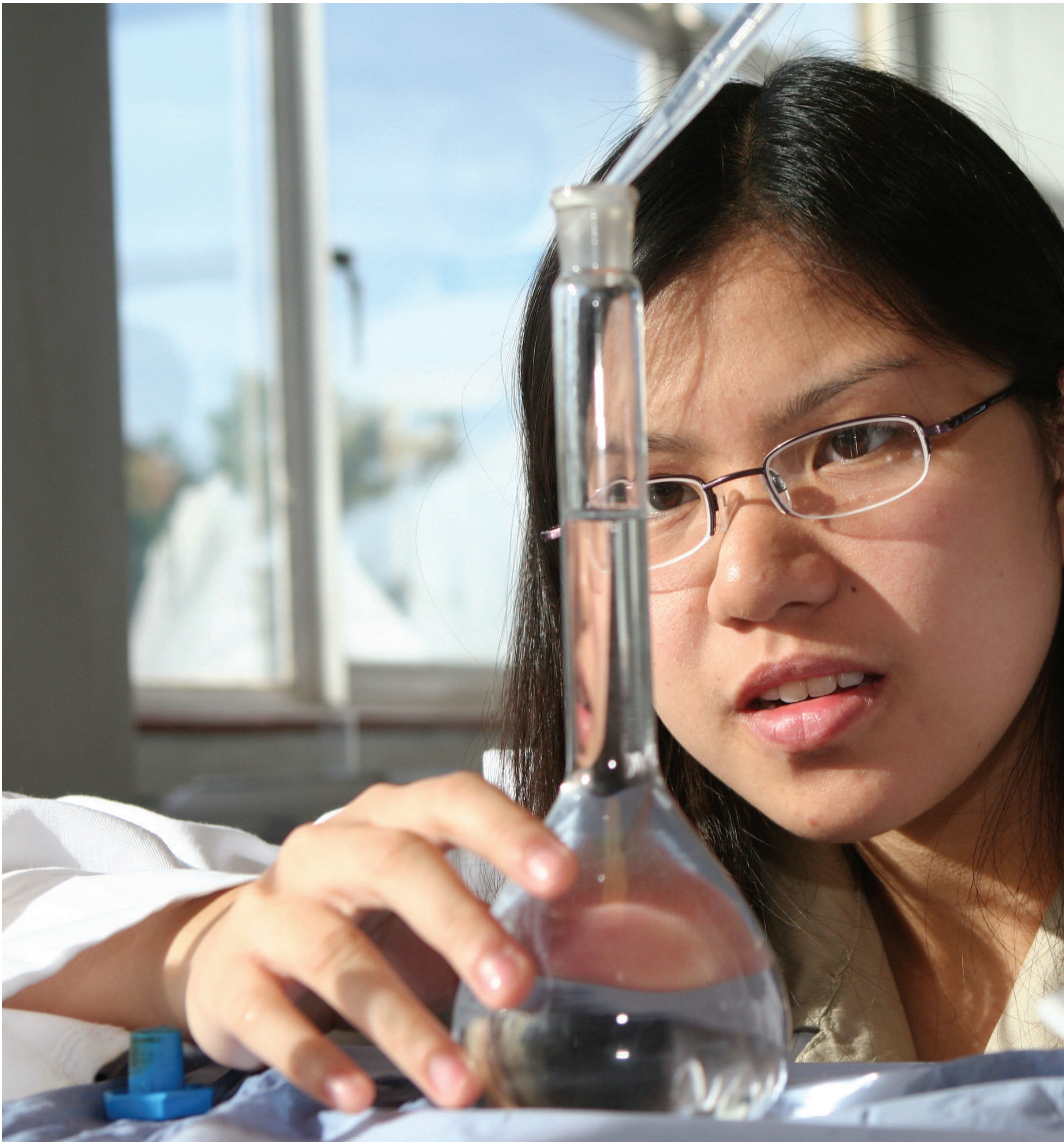
- The use of the term technician and technologist varies greatly across different sectors in terms of recognition, level, competences and status – in some instances the terms are protected by a formal registration whereas in other areas the terms are less well understood.

  – For example, the Engineering Council's Royal Charter refers to the engineering profession as 'meaning the profession of engineer or technologist' whilst also making reference to both Incorporated engineers and to Engineering Technicians and to ICT Technicians.

  – By contrast, the Royal Charter for the Science Council states that 'the profession means the profession of scientist' with no other distinctions mentioned

- The use of the term technologist is not as yet widespread in the UK, although there is growing acceptance in the health sector – in some fields negative connotations seemed to be attached to the term which is limiting its use

  – The use of the terms incorporated (engineer) or registered (scientist) would seem to be more readily accepted.



5. CONCLUSIONS

A generic professional technician standard and framework has the potential to add value by building on and consolidating existing good practice in the design and implementation of such standards (e.g. UKSPEC) and by addressing the areas where there are significant gaps (e.g. science related communities).

Developing such a scheme may also help to address:

- disparity in the roles of technicians and technologists
- varying competency requirements of different industry sectors
- different expectations in terms of level and content of qualifications and entry requirements.

The generic professional technician standard and framework would therefore need to set out:

- The competences and behaviours expected (scientific and technical principles; sector or occupational specific knowledge and skills; generic or key skills; professional attitudes, traits and behaviours);
- The exemplifying educational standard;
- The requirement for a minimal level of relevant work experience;
- The expectations for continuing professional development; and
- The commitment to complying with professional codes of conduct.

Furthermore, there would seem to be an opportunity to develop a generic technician standard which aligns existing professional standards, occupational standards across a broad range of sectors, and a plethora of awards such as advanced or higher level Apprenticeships, and in a way that meets the needs of a wide range of professional bodies. Convergence of this nature will help to demystify the 'landscape' and could lead to a better alignment of technical and vocational educational pathways to the professions and the needs of the industrial sectors of strategic importance. For instance, Apprenticeships – advanced and higher level – could provide an appropriate model for a vocational route to qualifying as a 'technician' as well as the means by which to demonstrate competence when registering through an appropriate scheme as a technician professional. Similarly Foundation degrees could provide the progression route for technicians seeking to move into a technologist's role.

As outlined in Appendix 1, the definitions of a technician and technologist alongside the defining features could provide the basis for designing a generic registration scheme for technicians and technologists based on a set of professional standards which sit across the engineering, health, ICT and science communities.

The benefits to be gained from developing and implementing a generic professional technician standard and framework include:

For individuals:

- Demonstrates commitment to initial and continuing professional development in a way that enables progression and mobility.
- Provides opportunities for career development and progression.
- Gives professional recognition, status and credibility (for those with intermediate skills – often the forgotten strand within organisations).
- Provides a structured career pathway and an overarching professional framework for career development.

For employers:

- Ensures individuals have the 'right' knowledge and skills, now and in the future.
- Helps to attract, retain and develop talent.
- Supports more responsive workforce planning.
- Promotes opportunity, equality and equity in careers.

For education and training providers:

- Provides a benchmark standard for alignment – 'a common starting point'.
- Enables education and training provision to be developed around structured career pathways.

Finally, for UK plc the standard would provide cross-sectoral consistency and ensure the development of a confident and competent workforce ready to compete. In doing so, it will support strategic planning on skills by providing a means by which to assess the size and structure of the technician profession and ensure the balance is 'right', i.e. supplying the right skills to match labour market trends.

We therefore recommend that **a generic professional standard for technicians is established.** The process of establishing the detailed standards and framework should be a role for a future Technician Council. The Council could also provide a single voice for technicians and access to, and regulation of, continuing professional development.

APPENDIX 1 – Defining features of technicians and technologists

	Technician level	Technologist level
Areas of responsibility	• Assists in the design of systems and equipment • Assists in the interpretation and preparation or modification of specifications, technical drawings or instructions • Conduct routine tests or experiments • Builds prototypes or models, • Services, calibrates and trouble-shoots equipment	• Designs processes, systems or equipment • Prepares specifications, technical drawings or instructions • Specifies tests and conducts non-routine tests • Develops prototypes • Trouble-shoots complex equipment • Complies and analyses experimental data • Prepares and presents reports
Levels of responsibility	• Supervises and coordinates the activities of others • Supervises phases of projects	• Supervises, coordinates, trains and assumes administrative responsibility for the work of others • Manages projects • Participates in short and long-term planning
Professional behaviour	• Complies with relevant professional codes of conduct	• Complies with relevant professional codes of conduct
Competences and behaviours	• Demonstrates competence through exemplifying qualifications, employer training and/or experience of: – Scientific and technical principles – Sector or occupational specific knowledge and skills related to the relevant National Occupational Standard – Generic or key skills (e.g. communication, ICT, team working) – Professional attitudes, traits	• Demonstrates competence through exemplifying qualifications, employer training and/or experience of: – Scientific and technical principles, and the wider field of science and technology – Sector or occupational specific knowledge and skills related to the relevant National Occupational Standard – Generic or key skills (e.g. interpersonal skills, commercial and technical

	and behaviours (e.g. accept and exercise personal responsibility)	management) – Professional attitudes, traits and behaviours (e.g. professional autonomy and accountability)
Educational requirements or qualifications	• Provides evidence of achieving a NQF Level 3 qualification that demonstrates part of the requisite competences • Undertakes a qualification where the academic and theoretical part of the qualification is reinforced through practical and work-based learning which comprises a significant part of the course	• Provides evidence of achieving a NQF Level 5 qualification that demonstrates part of the requisite competences • Undertakes a qualification where the academic and theoretical part of the qualification outweighs the practical and work-based learning, generally
Work experience	• Demonstrates at least 12 months of relevant work experience	• Demonstrates at least 24 months of relevant work experience
Continuing professional development	• Maintains competence through experience which includes application of and reflection upon formal, informal and non formal learning • Undertakes CPD annually	• Maintains competence through experience which includes application of and reflection upon formal, informal and non formal learning • Undertakes CPD annually

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