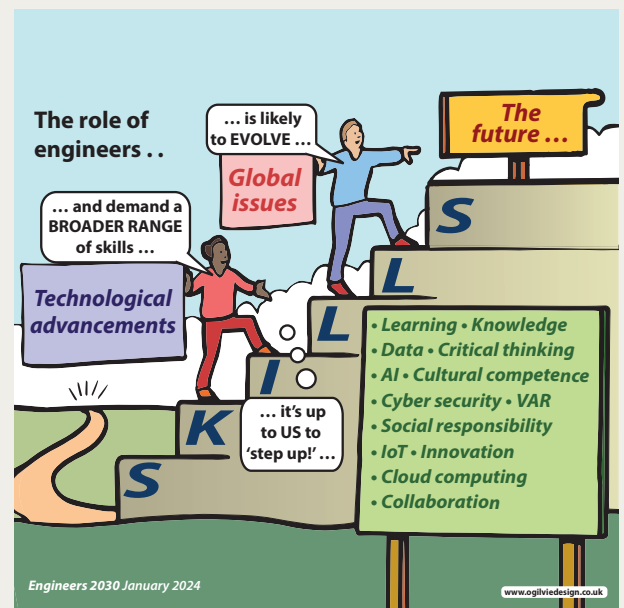


ENGINEERS 2030

Rethinking engineering and technology skills for a world in which both people and planet can thrive

Vision and principles

A consultation



Foreword

The climate emergency, along with major technological upheavals resulting from digitisation and electrification, create an urgent demand for a radically different approach to engineering. Engineers must work within planetary boundaries in a way that puts nature, and the human society it supports, at the centre of what they do.

The need to address this radically different approach to engineering is why we have embarked on Engineers 2030, a major policy initiative by the National Engineering Policy Centre, led by the Royal Academy of Engineering.

Engineers 2030 has so far set out to define a vision and principles for the foundational knowledge, skills, and behaviours needed if engineers are to meet these 21st century global challenges.

The Working Group, comprising Academy Fellows and NEPC partners, has already developed [the case for change](#). It has reviewed the [existing literature](#) on engineering capabilities needed in the future, and brought varied perspectives together in ‘futures workshops’ to understand how current and future societal, environmental, technological, and economic trends and drivers are impacting what it means to be an engineer or technician in the 21st century.

In the second phase of the project, to begin over the summer, we will work through a series of systems workshops with partners in the

engineering, education, and wider communities – including UK policymakers – to consider how those systems, frameworks, and cultures for attracting and educating engineers might be updated and/or transformed.

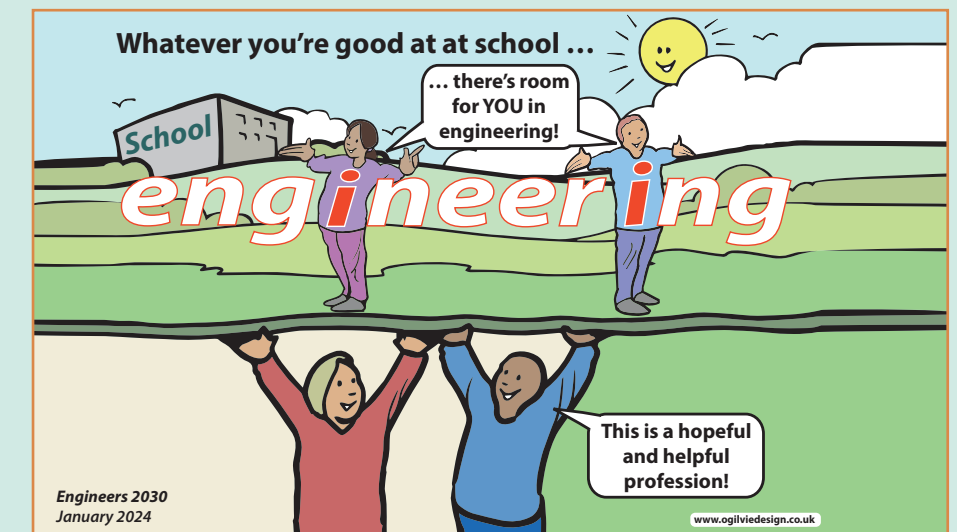
We have seen that there has been a lack of coordination and consensus on how to define and differentiate what is needed for future engineering knowledge and skills – and little to no attention on the values and behaviours we might expect from a profession that is central to addressing societal challenges.

To communicate effectively with those responsible for, and capable of, delivering the changes we need it is vital that the engineering community can speak as one. We must strive for as broad a consensus as possible for the vision and principles we will eventually finalise for Engineers 2030. It must be a consensus that reflects the views and aspirations of the entire engineering community – especially early career engineers, technicians, and young people – and it must act as a catalyst for change.

Our vision

Engineers play an urgent and pivotal role in sustainable growth and environmental regeneration and are recognised as a force for good in understanding society’s needs in reshaping the future. At the heart of this, is a revitalised engineering profession that responds quickly and effectively to rapidly evolving environmental, social, and technological imperatives.

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The outcomes of the NEPC’s initial work, presented here, have resulted in a high-quality, evidence-based ‘straw-person’ to kick-start the process of arriving at such a shared vision. The associated principles consist of three strands that interweave with the internationally recognised Sustainable Development Goals and Inner Development Goals. They are deliberately ambitious and serve to guide, align, and coordinate future work.

We must now work together to impact the future of engineering education and skills provision in the UK in response to urgent challenges that simply cannot be ignored.

This is your chance to have your say and I very much hope you will engage fully in our consultation and engagement which begins with the launch of this vision and principles.

Thank you for your insights and reflections.

Professor Bashir M. Al-Hashimi CBE FREng FRS
Chair, Engineers 2030 Working Group

Vice President, Research & Innovation and
Arm Professor of Computer Engineering,
King’s College London

Engineering from 2030: our aspiration

Engineers are at the heart of, and drive, a new definition of growth that is imperative for responding quickly to the urgent climate and environmental challenges facing humanity. Our solutions will be purposeful and sustainable because they will inspire, respond to, and activate technological change to revolutionise the way we live, work, and think in line with a new set of values. Thus, we will be guided by equity, inclusion, and globally sustainable outcomes, in addition to the more historical aims of productivity and profitability.

Engineering solutions will be widely recognised as being central to the world's transition to a sustainable and profitable net positive economy and a more just society. As a result, we will have a more prominent public profile than many of us can remember, and we will be highly valued and trusted as professionals working across multidisciplinary teams. We will interact seamlessly across biological, digital, and physical infrastructures and engage effectively across society to deepen understanding about how we are solving the big challenges of our time.

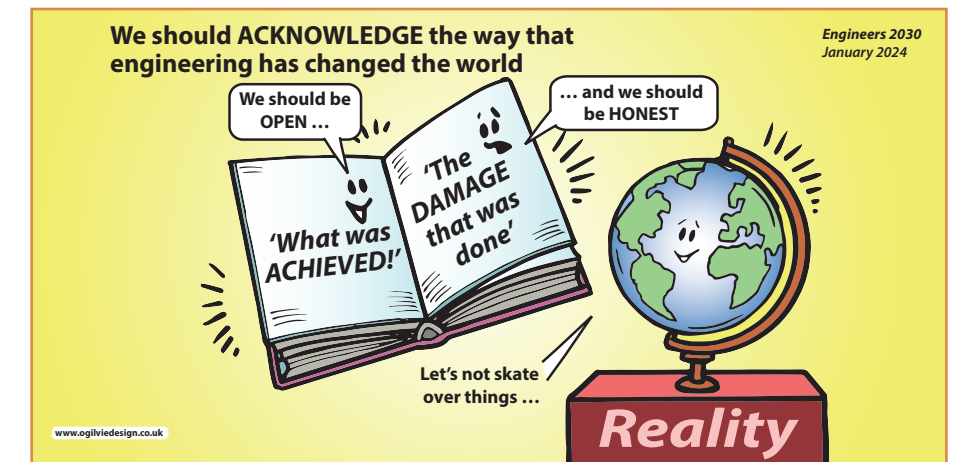
Engineers will be worthy of this trust. We will embody the values of social, environmental, and nature-driven purpose as much as economic purpose. The engineering profession's responsibility and ethical practice will attract, foster, and grow the highest quality talent and add competitive value while creating a better world for us all.

Our ability to make sense of complexity and to be architects of social, equitable, and sustainable solutions will be widely recognised and highly influential in leading government policies to tackle the climate emergency and other pressing challenges.

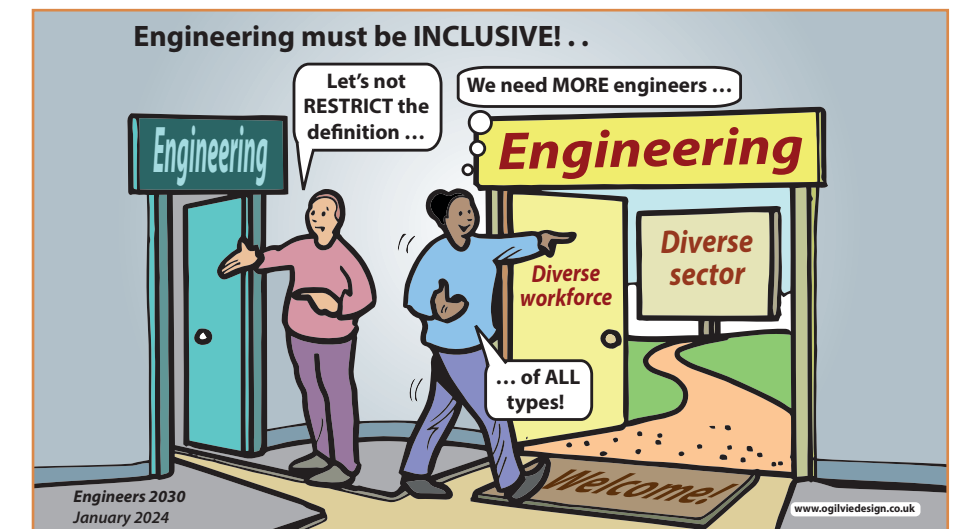
Our increased visibility and profile will overcome misconceptions about engineering and stimulate interest in engineering careers by demonstrating their diversity, inclusivity, richness, and depth. The number of children – of all gender identities – who develop an interest in engineering from an early age will have increased.

We will have come through a variety of educational routes; these both reflect and represent all parts of society and bring a wider and more diverse range of skills and experiences to the profession. This in turn will broaden the profession's capacity for empathy which is so necessary for realising our values of equity and inclusion.

We will play an integral role in civic society and provide broad and deep links across local communities and between educators and employers



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We will lead on the development of, and commitment to, internationally recognised standards of professional competence and ethics and contribute these perspectives to the government and leadership of society in general. We will play an integral role in civic society and provide broad and deep links across local communities and between educators and employers. We will ensure that both academic and vocational teaching are high quality and valued equally. This engagement will broaden the skillsets developed by both young people and current professionals.

Our personal attributes such as critical thinking to understand the challenges, problem solving (to address these), collaboration, cooperation, adaptive

working methods (to effect the solutions), and effective communication (to enable society to understand the process) will be as important to us as technical skills.

Technical subject knowledge will remain essential, but we will break down the boundaries that currently exist between different specialisms and develop our capability to take more integrated approaches.

The UK's successes following this repositioning of engineering will be recognised internationally and prove infectious. British engineers will work with commercial and civic society partners across the world to find global solutions to what are ultimately global challenges.

Six principles for engineering knowledge, skills, and behaviours

The six Engineers 2030 principles for knowledge, skills, and behaviours can be presented as three interwoven strands that align with three themes core to the UN's sustainable Development Goals¹ and the Inner Development Goals of 'being, thinking, relating, collaborating and acting'².



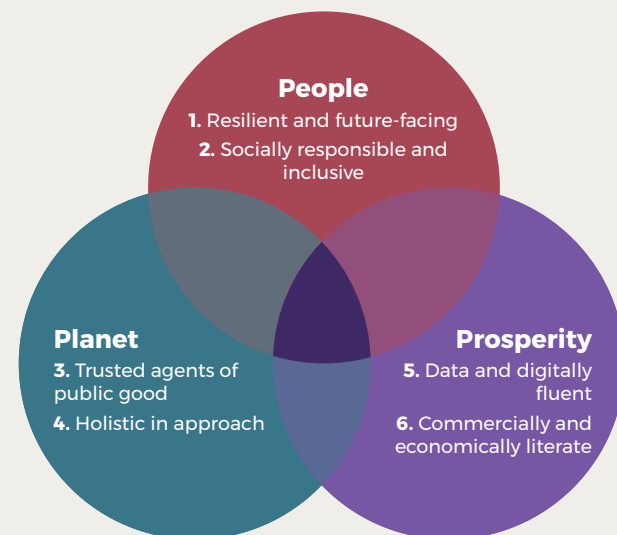
People



Planet



Prosperity



¹ The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries – developed and developing – in a global partnership. They recognise that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

² The Inner Development Goals (IDGs) framework is fundamental in the work to reach the SDG. The IDGs framework consists of five dimensions organising 23 skills and qualities of human inner growth and development. For further information, see: <https://www.innerdevelopmentgoals.org/>

People



Engineers ARE ...

1. Resilient and future-facing: we are adaptable and can evolve to respond to a world that changes dramatically over timescales shorter than our career.

Technological transformation, alongside rapidly changing social, economic, and environmental contexts, means that engineers must be flexible, adaptable, and resilient. We have an ability to learn and develop, not only as individuals, but also as change agents for the wider engineering profession and society as a whole. This requires a broader understanding of how the context in which we work is changing and how this impacts the way we must respond. And it requires us to value, actively support, and remain committed to continued and lifelong learning – both our own and for others. This includes efforts aimed at broadening the definition of what engineering is and ensuring the sector continues to be seen as vibrant, dynamic, and interesting.

2. Socially responsible and inclusive: we know how to work with people and draw upon broad-ranging perspectives to create solutions that work for everyone.

We are people first and engineers second. We are citizens of the world and part of a diverse society. We know how to meet societal needs and leave no one behind.

We recognise that a diverse workforce is an essential component of this. We can effectively connect and collaborate with the knowledge, skills, and behaviours that exist outside the engineering sector and we understand that this is essential to our work.

We understand the questions we must ask to help us define the right problems before we can deliver effective solutions. We have interdisciplinary, synthesis, and bridging skills that enable us to bring different kinds of knowledge and perspectives together to create solutions that are genuinely fit for their intended purpose. We have a deeper understanding of topics and methods traditionally associated with the humanities and social sciences (such as ethics, dialogue, cultural awareness, and embedded biases) to enable us to better understand the way our work interacts with people and society.

Planet



Engineers ARE ...

3. Trusted agents of public good: we put people and planet at the centre of our work and embody hope for a better future.

We shape the world around us and influence our society – for better or worse. It is therefore essential that we strive for the public good, and that the better use of planetary resources, safe and healthy public environments, and a new understanding of values that transcend profit alone to underpin everything we do. The population must be able to visualise a better future and recognise us as trusted leaders for the realisation of that vision.

To achieve this, we communicate effectively, lead the debate, tackle misinformation, call out public harm and harm to nature, and demonstrate leadership and persuasion at all levels. Most important of all is that we are worthy of public trust – requiring us to adopt all the ethical principles set down by the UK engineering profession and act always with empathy, integrity, accuracy, rigour, and honesty.

4. Holistic in approach: we can find creative solutions that work in the broadest contexts and understand risk in all its forms.

We understand and employ a ‘systems approach’ to easily navigate the relationship between the ‘part’ and the ‘whole’ and to align smaller, shorter-term goals with bigger, longer-term outcomes. We can apply both our creative and specialist technical skills to specific problems while understanding the impact of, and risks associated with their solutions at different scales and throughout their lifecycle. We understand circular economies, and the social and environmental impacts of technologies – especially in relation to the Sustainable Development Goals.

Prosperity



Engineers ARE ...

5. Data and digitally fluent: we are equally comfortable working in the physical and digital worlds, and at the interface between them.

As the world becomes ever more digital, the ability to find solutions within it increasingly requires the ability to manage, work with, and apply digital and data technologies – ranging from cybersecurity and coding to data models and artificial intelligence. We lead a digitalisation culture and working with data is standard practice and instinctive for us. We are at home in the digital world as we are in the physical one and comfortable operating at the interfaces between these worlds.

6. Commercially and economically literate: we generate knowledge for enterprise and develop broad-ranging skills in the pursuit of sustainable and equitable growth.

As the frontiers of science are pushed further in all directions and responses to new challenges increasingly require multidisciplinary responses, engineering practice needs more than a good knowledge of maths and science. Instead, we find and generate knowledge and skills appropriate to our purpose, which includes many topics outside the traditional engineering base. We can contextualise our technical and creative skills within a range of business or public sector environments in a way that facilitates innovation and enterprise.

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How to respond

We believe that it is vital that the engineering community, alongside many others, brings the breadth and depth of its expertise and experiences to develop a single coherent vision and principles for change. The version that we have highlighted here is designed to provide a high-quality starting point to kick-start discussion among the wider community. Now we need to hear from you.

Please respond to our consultation [here](#). It is short (only a few simple questions) and enables you to provide further comments and contacts who may be interested in engaging. The closing date for responses is **Monday 1 July 2024**.

In addition to this consultation, we will be running further **engagement activities** and there is an opportunity, within the consultation, to express your interest in taking part in these activities.

Or for further information please go to www.raeng.org.uk/engineers-2030 or email engineers2030@raeng.org.uk

We look forward to hearing from you.



Engineers 2030 Working Group

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Chairman, JJ Churchill Ltd.

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Chair following the launch event on 18 March 2024
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