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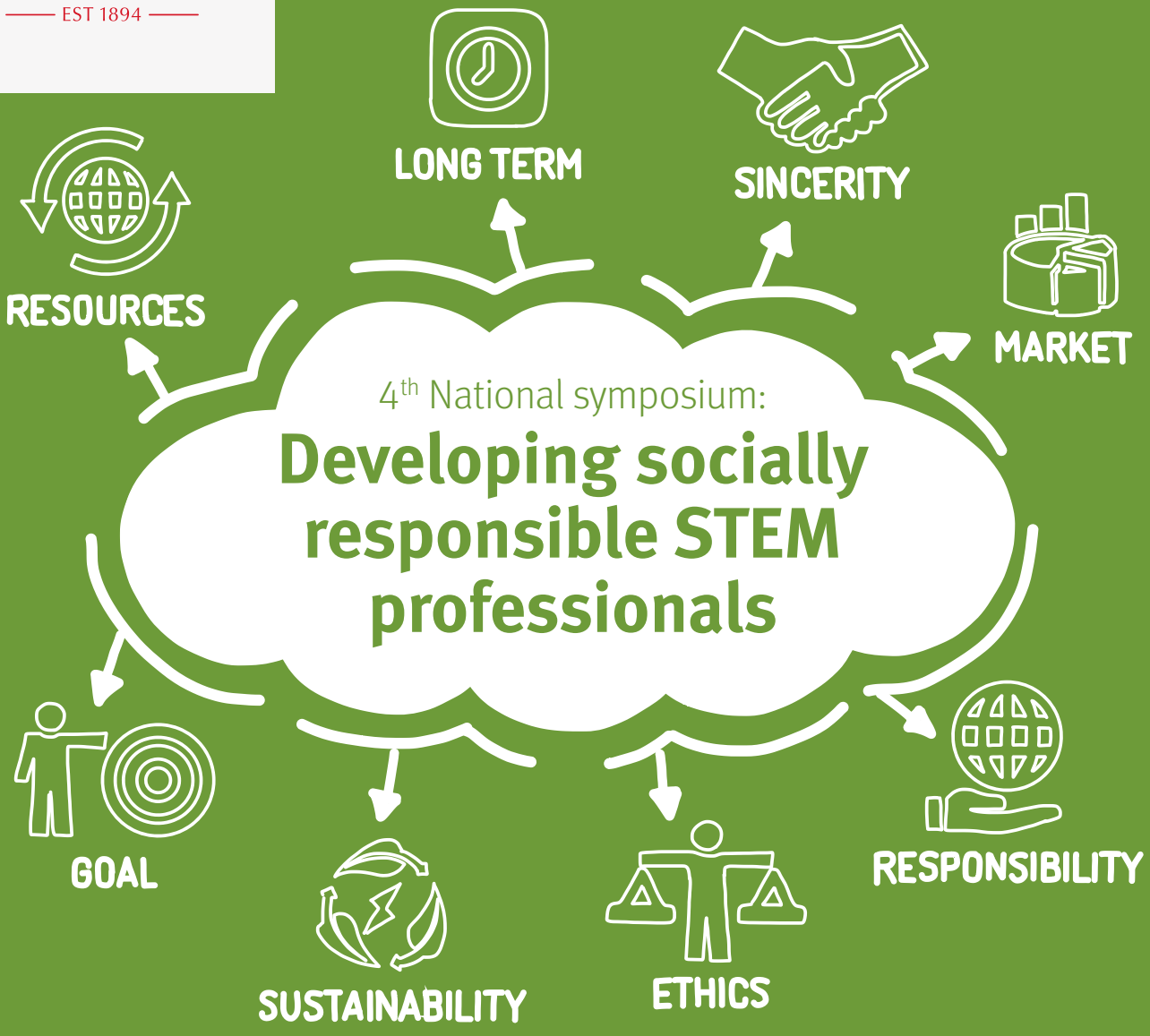

4th National symposium:

Developing socially responsible STEM professionals

Theme: Ethics and ESG

Online, 12 January 2022

Sponsored by

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UK ENGINEERS WITHOUT BORDERS

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Contents

Foreword by Professor Anthony Finkelstein

President of City, University of London

As the president of City University of London, I am very pleased to have the opportunity to host and to offer a warm welcome to the National Symposium on Developing Socially Responsible STEM professionals.

City is quite unusual amongst universities because we deliberately position ourselves as the university for business and the professions. That places a responsibility upon us to think quite hard about what exactly that phrase means.

It says something about technical skills. For certain, it says something about mindset and about attitudes towards the conduct of professional work but, above all, it says something about social responsibility.

This symposium covers a range of interesting and important issues.

One of the things that strikes me very strongly is the way in which so many of those issues, of professional conduct and social responsibility, are actually very much bound into the texture and the kinds of technical work that STEM professionals undertake.

You think about sustainability. You think about global issues. You think about privacy, about data, and about so much more. The way in which leadership is exercised cannot be seen outside of the frame of STEM itself and, for that reason, I think this symposium and its subjects are vitally important.

I am also really struck by the pedagogical challenges that these particular issues pose for us.

We have students from varying backgrounds. We have students who come with very different starting points in terms of issues of social responsibility. We have many students who lack experience of the world and, consequently, have rarely encountered many of the larger issues, in their own lives, until they're confronted with it, as part of their professional education.

For all of these reasons, educated and socially responsible STEM professionals require: not just care, but also a strongly innovative response.

I'm really delighted that we have the stellar collection of expertise we have here, both presenting and attending this symposium,

I deeply regret that I am at a tedious board meeting and unable to attend in person but I wish all of you the very best of luck and an informative, educational and entertaining cymposium.

Keynoter speakers

Sir Julian Young, President
(The Institution of Engineering and Technology)

Sir Julian Young retired recently from the Royal Air Force (RAF) after 40 years of service as an Engineer Officer. In his last post, he was Director-General Air within the Defence Equipment & Support (DE&S) organization in the Ministry of Defence (MOD). In this role, he led some 2,265 military and civilian specialists and was responsible for putting to work some £3.7 billion annually on equipping and supporting all of the MOD's fixed-wing aircraft. He was concurrently a member of the Air Force Board and the RAF's Chief Engineer and he had a MOD-wide role as the Defence Engineering Champion.

Professor Claudia Eckert, Professor of Design (The Open University)

Claudia has been Professor of Design at the Open University since 2013. She returned to the OU in 2008 as a senior lecturer rafter nearly 10 years in the Engineering Design Centre at the University of Cambridge, where she was a senior research associate and associate director. For nearly 30 years she has been working in parallel with empirical and theoretical analyses of how design processes work on developing tools and methods to support design processes in engineering, fashion and construction.

Professor Richard Ashcroft, Deputy Dean at The City Law School (City, University of London)

Professor Richard Ashcroft is Professor of Bioethics and Deputy Dean of the City Law School at City, University of London. He studied mathematics and history and philosophy of science, and was awarded a PhD on the ethics of scientific research, at Cambridge University. He has worked in medical schools and law schools at a number of UK universities, teaching medical ethics and law and publishing extensively on medical research ethics and on ethics in public health and health promotion. He was a Turing Fellow in 2018/19. He has served on a number of public bodies concerned with bioethics, most recently a working group of the Nuffield Council on Bioethics on the ethics of human genome editing.

Dr Paula Palade, Digital Manager & Ethics of Connected and Automated Vehicles (Jaguar Land Rover)

Paula Palade holds a PhD in Electrical Engineering and works for Jaguar Land Rover as a Digital Manager and in parallel researches the topic of Ethics of Connected and Automated vehicles in collaboration with Bradford University. Paula has published as part of an independent group of experts, in September 2020, a report commissioned by European Commission on Ethics of Connected and Automated Vehicles (CAVs). The report includes 20 recommendations covering dilemma situations, the creation of a culture of responsibility, and the promotion of data, algorithm and AI literacy through public participation.

Professor Mike Sutcliffe, Deputy Dean (TEDI-London)

Mike is the Deputy Dean of TEDI-London – a new engineering higher education provider that aims to broaden traditional approaches to attracting and educating the next generation of engineers, founded by Arizona State University, King's College London and University of New South Wales Sydney. He has strategic responsibility and oversight of operational delivery for the design, development and delivery of TEDI-London's academic programme as well as the student journey. Mike is also President of the Engineering Professors' Council, the representative organisation of UK engineering academics. He plays a leading role in the New Approaches to Engineering Higher Education initiative.

Mr Andrew Vautier, Senior Managing Director (Information Security Lead Technology Client Services), Accenture

Andrew is a globally experienced, innovative Accenture Senior Managing Director with broad experience in consulting, delivering transformational outcomes and cyber security. His over 30 year career with Accenture has been consistently focussed on being at the vanguard of what Accenture does.

Professor Chris White, Director (Industrial Policy Research Centre, MTC)

Chris is the Director of the Industrial Policy Research Centre (IPRC) at Loughborough University, formed in collaboration with the Manufacturing Technology Centre (part of the High Value Manufacturing Catapult Network), and was the Member of Parliament for Warwick and Leamington, 2010-2017.

Mr Rob Wirszycz, Senior Warden (WCIT, The Tech Sector City Livery Company)

Rob is Senior Warden at WCIT, the tech sector City Livery Company where he leads the Social Value Leadership Group. Outside of WCIT works as chairman for a number of scale-up businesses. He is currently Chair of Bluesource, Simeone Group, VRtuoso, Tailify and advisor to Essence Group and EQI Bank.

Dr Geoff Keeling, AI Ethics @ Google - A Philosophical Perspective (USA)

Geoff Keeling, PhD, is a bioethicist at Google researching the ethical design and implementation of machine learning in medicine. He was an Interdisciplinary Ethics Fellow at Stanford University from 2020-2021, based in the Center for Ethics in Society and The Institute for Human-Centered Artificial Intelligence (HAI). Geoff's broader research interests sit at the intersection of moral philosophy, decision theory, and artificial intelligence. In particular, disputes about ethical decision-making under uncertainty for automated vehicles, and also the application of formal models from artificial intelligence to traditional questions in meta-ethics. His teaching covers AI law and ethics, political philosophy, formal logic, and social choice theory. Geoff is also an Associate Fellow of the Leverhulme Centre for the Future of Intelligence at the University of Cambridge and an Affiliate Fellow at Stanford HAI.

Speakers and panellists

Morning session

Welcome and Opening Address
Professor Rajkumar Roy, Executive Dean (City, University of London)

Keynote addresses **(20 minutes per)**

Sir Julian Young, President (The Institution of Engineering and Technology)

Professor Claudia Eckert, Professor of Design (The Open University)

Professor Richard Ashcroft, Deputy Dean at The City Law School (City, University of London)

Dr Paula Palade, Digital Manager & Ethics of Connected and Automated Vehicles (Jaguar Land Rover)

Panel debate 1:

Ethics of STEM – UG and PG curriculum requirements
Presented by: **Mr Will Stirling**

Sir Julian Young, President (The Institution of Engineering and Technology)

Professor Claudia Eckert, Professor of Design (The Open University)

Professor Richard Ashcroft, Deputy Dean at The City Law School (City, University of London)

Dr Paula Palade, Digital Manager & Ethics of Connected and Automated Vehicles (Jaguar Land Rover)

Professor Sarah Stallebrass, Professor of Soil Mechanics (City, University of London)

Professor Susannah Quinsee, Vice-President (Digital and Student Experience) (City, University of London)

Afternoon session

Keynote addresses (20 minutes per)

Professor Mike Sutcliffe, Deputy Dean (TEDI-London)

Mr Andrew Vautier, Senior Managing Director (Information Security Lead Technology Client Services, Accenture)

Professor Chris White, Director (Industrial Policy Research Centre, MTC)

Mr Rob Wirszycz, Senior Warden (WCIT, The Tech Sector City Livery Company)

Dr Geoff Keeling, AI Ethics @ Google - A Philosophical Perspective (USA)

Panel debate 2:

Social Value and Environment, Social and Governance (ESG)
Presented by: Mr Will Stirling

Professor Mike Sutcliffe, Deputy Dean (TEDI-London)

Mr Andrew Vautier, Senior Managing Director (Information Security Lead Technology Client Services, Accenture)

Professor Chris White, Director (Industrial Policy Research Centre, MTC)

Mr Rob Wirszycz, Senior Warden (WCIT, The Tech Sector City Livery Company)

Dr Geoff Keeling, AI Ethics @ Google – A Philosophical Perspective (USA)

Professor Andre Spicer, Dean of Bayes Business School (City, University of London)

Miss Emily Davies, Head of Social Impact (Amey)

The key topics that the symposium debates

- Diversity, unconscious bias and equality
- Corporate social responsibility
- Global sustainable programmes
- Cultural differences and practice
- Legislation and regulation
- Business and research ethics
- Circular economy
- Leadership and social values
- Privacy, identity and data protection

Foreword by Professor Rajkumar Roy

Setting the challenges

Executive Dean of School of Mathematics, Computer Science and Engineering at City, University of London

The purpose of the National Symposium on Developing SRP in STEM today is to debate how to create socially responsible STEM professionals. While this is already happening at several universities and professional institutions, development has been patchy. We are looking now to scale up and create a network of like-minded people, who will be able to work together to promote these causes in their own institutions.

I am thankful to our sponsors, Accenture and Engineers Without Borders UK, for their support in developing and running this programme and the report.

We will, during the symposium, take the opportunity to discuss some of the challenges inherent in, for example, the Social Value Act and how it is implemented – or not – in various sectors.

There are common links between different constituents of STEM – the science, technology, engineering and mathematics communities – and common ground in developing a skill space for socially responsible professionals that future learners can use in professional decision-making. We must ask: "are we going to wait another 50 years before people adopt some of these ideas or are we going to take positive action to support others so that these principles can be embedded in teaching?"

The Royal Academy of Engineering published a report that defined four pillars of ethical principles: accuracy and rigour; honesty; integrity; respect for life, law and public good; and responsible leadership.

These points cannot be considered in isolation from new and emerging technologies, such as autonomous transportation and the application of machine learning and artificial intelligence, for example. We are challenged to develop ethical principles in parallel with technology, not as an afterthought. Doing so will help to develop technologies that are more friendly to ethical outcomes and, at the same time, to foster better understanding of the ethical impact of technological developments.

There is a significant, existing body of research on responsible innovation. The questions we have to discuss include: What do we mean by responsibility? what does it mean to our students? and, when researchers become professionals, what does responsibility mean to them?

I will give you a couple of examples. We are, increasingly, applying blockchain and this will significantly affect the way we manage education, in secondary schools, further education and higher education – right across the piece, from schools to colleges and universities.. What are the ethical implications?

In environmental engineering, what about solar power? Is the development of solar power the right thing to do? Is it having the right environmental impact?

We cannot train people effectively if we do not even understand the implications in the first place.

Turning to social value, the UK's Public Services (Social Value) Act 2012 became law in 2013. Things have moved on, since then, and the UK government has revised its guidance; supporting post-Covid-19 recovery is, obviously, one of the key objectives.

The main aspects are: tackling economic inequality; jobs and skills; and climate change, but the government is also talking about the importance of health and well-being. In engineering, computer science and mathematics areas, we have to focus more on producing solutions that deliver well-being to our employees, our users and our customers.

As an engineer, a manufacturing engineer, I was trained to produce economic value. The focus has been to improve performance, so that we could deliver profit. There is nothing wrong with profit and there's nothing wrong with economic value but we are, now, extending that value system to include social value – of which there are different indicators. They include common good of society; quality of life; satisfaction; and positive societal transformation.

How can we transit from only producing economic value to delivering social value as well? Whether it's data analysis, advanced mathematical algorithms or an engineering product, how can we deliver value that is more than just one-sided?

There is a concept, which originated in marketing, called co-creation. It talks of producing value WITH customers, not just FOR customers.

When we teach social value creation, then, it is the process of offering value from an activity with the user group and beneficiaries. They are not outside the process; they are not just receiving value: they do something to create value in the first place. The community also needs to take responsibility. It is about empowering people to have a life they actually want to live, to create sustainable value.

We need to provide frameworks, techniques and tools for our students to enable them to encourage communities and to take part in the social value creation process.

While we are fortunate to have the Social Value Act 2012, it doesn't necessarily address the role of beneficiaries themselves. I would like to see us doing more work to raise social awareness and to create a framework by which we engage colleagues who would like to have better services and better quality of life. About one-third of total public sector procurement is currently covered under the Social Value Act – that's about £100 billion a year in the UK. There's a big gap still to fill in the public sector and there is also the need to reach out to private procurement, too, to encourage more businesses to adopt the same principles, and to extend these ideas to quality of service support, as well.

We need to change the mindset of STEM education, so that our students can think beyond profit, to include environment, social responsibility and governance.

The Act and ESG (Environmental, Social, and Governance) are trying to do similar things and we also have the UN's 17 Sustainable Development Goals, and we have the Circular Economy as well.

But what is important here is to understand the fundamental construct and not confuse our students with too much jargon. We need to focus more on the fundamental characteristics of what we should be teaching our students. For me, it is about delivering with the beneficiaries, about values that include economic value, social good and well-being. So that's how I see these things proceed.

I would encourage everyone to make teaching materials and the curriculum more open source. I will, today, commit the City University of London to, this year, create an open source site, where people can submit their material.

I think also that more collaboration between IMechE, IET, IED, Civil ICE and professional institutions like BCS – British Computer Society – will bring more harmony in programme accreditation and drive these changes faster.

Autonomous transportation and AI Ethics

Symposium Highlights

Overview of ethics and social value in STEM professions

There is a lot of material covering the application of ethics and social value in this report. Here we summarise some of the main points, structures and entities that promote the range of social, ethical and environmental best practice in STEM professions. Most are covered within the symposium, but some were not debated but are added here.

Engineering

There are 37 professional engineering institutions, or PEIs, in the UK, representatives of which form The Engineering Council.

Each one has its own Code of Practice and each will cover recommended ethical, social and environmental best practice to some extent.

The Engineering Council administers the UK Standard for Professional Engineering Competence and Commitment (UK-SPEC) sets out the competence and commitment required for registration as an Engineering Technician (EngTech), Incorporated Engineer (IEng) or Chartered Engineer (CEng).

UK-SPEC sets out the standard of engineering competence and commitment that is required to become professionally registered. There are five competencies, A to E, of which one is Personal and Professional Commitments that includes ethics. One of the competencies listed in UK-SPEC is "to understand the ethical issues that may arise in their role and carry out their responsibilities in an ethical manner." It also refers to the Statement of Ethical Principles.

The Statement of Ethical Principles is a separate document, jointly produced by The Engineering Council and the Royal Academy of Engineering, originally in 2005, then revised in 2017 with plans to revise it again. This is a statement of what the engineering profession believes ethics looks like, as an engineering professional. People who are professionally registered as engineers commit to that standard, but it isn't available to everybody who works in engineering.

https://www.engc.org.uk/standards-guidance/guidance/statement-of-ethical-principles/

In addition, The Council and Royal Academy recently published a report called "Engineering Ethics: Maintaining society's trust in the engineering profession"

This guidance takes the existing thinking about ethical culture and asks how can we embed this further, can it be developed and improved further. It avoids the engineering professions becoming complacent about ethics.

https://www.raeng.org.uk/publications/reports/engineering-ethics-full-report

Information Technology

The British Computer Society Code of Conduct

BCS is the organisation for which the Chartered Institute for IT is the professional body.

The BCS has a Code of Conduct for members that includes a code of ethics for IT professionals.

https://www.bcs.org/membership-and-registrations/become-a-member/bcs-code-of-conduct/

Worshipful Company of Information Technologists

The WCIT is a socially responsible livery company serving the information technology profession.

WCIT has created a Social Value Leadership Group initiative to help companies in the tech sector generate social value alongside their financial value. It includes 14 technology companies.

Medicine

Current teaching in the ethics of science and technology can be too narrowly focussed on regulations; we need to focus more on the culture of science and how to support research integrity and social responsibility in science.

There are two key points from ethics taught in present day science curricula:

1. To better equip people with the skills and confidence to have these conversations.
2. To motivate people to think of ethics as essential to what they're doing.

Also covered in the report:

The Social Value Act

The Act requires that all public bodies in England and Wales to consider how the services they commission and procure that are expected to cost more than the thresholds provided for in the Public Contracts Regulations might improve the social, economic and environmental status of the area. The Act to date is responsible for delivering social value for about £100 billion of public spending out of a total of £300 billion.

Making social and environmental value accessible to a 'broad church' of STEM trainees

The Engineering and Design Institute London (TEDI-London) was established by King's College London, UNSW in Australia, and Arizona State University in the US. The objective is to train and produce socially aware, globally focused, job-ready engineering graduates, who have a distinctively strong design and entrepreneurship skill set.

Professional engineering builds ethics in as standard

Sir Julian Young
President, The Institution of Engineering and Technology
The IET is the largest professional engineering institutions by membership in the UK.

Key points

IET has launched its **"Strategy 2030"**

This has five strategic themes:

- Engineering excellence
- Skills, learning and networks
- Research solutions
- Thought leadership & policy
- Education

The strategy is intended to address five Societal Challenges where the engineering profession and the IET can make an impact. Each is inspired by the United Nations 17 Sustainable Development Goals, as well as the European Union's Horizon 2020 challenges and the UK's Industrial Strategy Grand Challenges.

- Sustainability and Climate Change
- Digital Futures
- Healthy Lives
- People-centric Infrastructure
- Productive manufacturing
- Strategy 2030 enables our IET members, volunteers and wider engineering community to all play a constructive role in its delivery
- It is adopting technology that supports the move toward a net zero carbon future to address the impacts of climate change in society and the wider environment
- Key themes include renewable and alternative energy, pollution control solutions, environmental testing, energy efficiency and sustainable resource management, linking course ware sustainability and climate change societal challenge.

Responsible investing as a PEI

From 2019 the IET reviewed the ESG credentials of its whole investment portfolio: Sir Julian said:

"In November 2020, we approved that one-third of the IET equity portfolio was to be transferred to a passive sustainable global equity fund is a level one ESG fund and uses the Paris Climate Agreement as its benchmark – the first professional engineering institution to do 'walk the talk'."

> "We believe that engineers have the skills, insights and ingenuity to help tackle climate change in ways that optimize what I argue are key engineering metrics of social responsibility effectiveness, efficiency, safety and reliability."

Ethics and values

The IET is a leading organisation to promote ethical and social standards in engineering.

Sir Julian emphasised the value of professional accreditation for ethical standards. The IET is encouraging organizations to sign up to its concordat, which was introduced by our past President Peter Bonfield. This encourages companies and organizations to support engineering employees in achieving expected levels of quality, ethical practice and compliance and professionalism within our industry.

He emphasised that one word, trust, is vital in engineering and needs to be earned.

The Royal Academy of Engineering and The Engineering Council in 2005 jointly created a statement of ethical principles to guide engineering practice and behaviour. The statement was revised and jointly produced in 2017. Thus, professionally registered engineers of all types are required in the United Kingdom standard of professional engineering competence, the UK SPEC, to demonstrate their commitment to professional engineering values, which includes ethical conduct - an integral element of being a professional and exhibiting the behaviour of professionalism.

Details of the statement of ethical principles are found on the next page.

Sir Julian advocated the power of **CPD**, continuous professional development, to encourage people to get up to date with current practices and standards and for members to be good engineers from an ethical perspective, especially new digital skills.

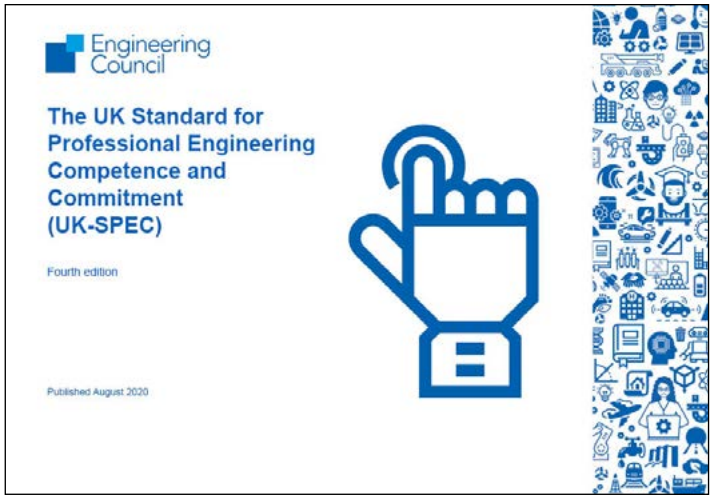
Engineering shortfall

The IET recently sent an open letter to the government alongside 150 leading engineers, scientists and other professional engineering institutions, urging them to tackle the UK engineering skills shortfall identified through our annual surveys by including engineering in the national curriculum. There is still a shortfall over have over 173,000 workers in the STEM sector.

A full recording of Sir Julian's presentation is available here: https://www.youtube.com/playlist?list=PL-fOTakP4gHbCHuZpv_qUBm1lGAFjEZF9

The Engineering Council's Statement of Ethical Principles

What does ethical conduct in engineering mean?



The Royal Academy of Engineering and The Engineering Council have authored a Statement of Ethical Principles, revised in 2017. It is available on the Council's website: https://www.engc.org.uk/ethics

This sets out four fundamental principles for ethical behaviour and decision-making, which are:

1. Honesty and integrity
2. Respect for law, the environment and the public good
3. Accuracy and rigour
4. Leadership and communication

How is the Statement monitored and enforced?

Part of the personal and professional commitment that engineers and technicians are required to demonstrate to become professionally registered is to:

"Understand the ethical issues that may arise in their role and carry out their responsibilities in an ethical manner", as set out in the UK Standard for Engineering Competence and Commitment or UK-SPEC. UK-SPEC refers explicitly to the Statement of Ethical Principles as expressing "the beliefs and values of the profession" and Competence E in UK-SPEC requires registrants to "demonstrate commitment to an appropriate code of professional conduct, recognising obligations to society, the profession and the environment".

A registrant must be a current member of one of the professional engineering institutions (PEIs) licensed by the Engineering Council. Each of these institutions has its own Code of Professional Conduct, which must place a personal obligation on members to act with integrity and in the public interest and should explicitly refer to the Statement of Ethical Principles (as set out in our Guidance for Institution Codes of Professional Conduct). Any complaint about a registrant having breached the Code of Professional Conduct should be made to their PEI, who can then review the complaint and ascertain whether they need to be removed from the Engineering Council's Register.

Measuring and policy ethical standards

In terms of monitoring or measuring ethical practice, the PEIs are licensed by the Engineering Council to monitor the conduct of registrants (as well as assess candidates for registration and monitor registrants' continuing professional development) and the Engineering Council's Annual Registration Statistics Report includes the number of registrants removed from the Register for conduct reasons. This was 0.01% of all removals from 2018-2020; statistics for 2021 are not yet available.

One of the actions that the joint Engineering Ethics Reference Group (EERG), established in 2019 by the Engineering Council and the Royal Academy of Engineering, is currently taking forward is a programme of research designed to better understand current ethical practice in engineering. This will establish a benchmark from which the profession can audit and report on ethical culture and practice.

Path dependency and ethical decision making

Prof. Claudia Eckert, The Open University

Claudia's talk covered:

- The evolution of Complex Products
- Engineering change propagation and margins
- Decision dependency
- Implications for different stakeholders

Claudia discussed the importance of understanding how the design processes of complex product work for making them more sustainable.

Key points

- Fundamental decision decisions are taken very early in product development processes and ethical implication need to be considered at this point.
- Decisions are highly constraint through the interconnection of products.
- It can be impossible or very expensive to ethical consideration late in a development process, because of change propagation.
- An example: **Overdesigning hospital building services**. The boiler house is essentially over-designed by about 300%, uses vastly more energy than it really needs in a year because all suppliers wanted to over insure their liability. In the study it was difficult to track down the decision process that specified this equipment

Evolution of complex products

- Complex products develop over a long period of time. Designers have to make sure that we work around the things that we don't want to change
- Example: **Volkswagen Golf**
- Each generation shared many components from the previous generation. They will always share a lot with the predecessor. What can be changed is quite limited.
- Products are also linked with each other a through common applications and common product platforms
- Example: **Diesel engine deployed in many different products**. When an engine platform changed, many vehicles that take that engine had to change.

Products are linked through supply chains, applications and customers. These constrain their design. Existing infrastructure that locks us into particular design solutions, like petrol stations which are difficult to retro fit as cars become electrified.

> "We need to think very carefully what is actually still in our control to modify when we're trying to make ethical decisions."

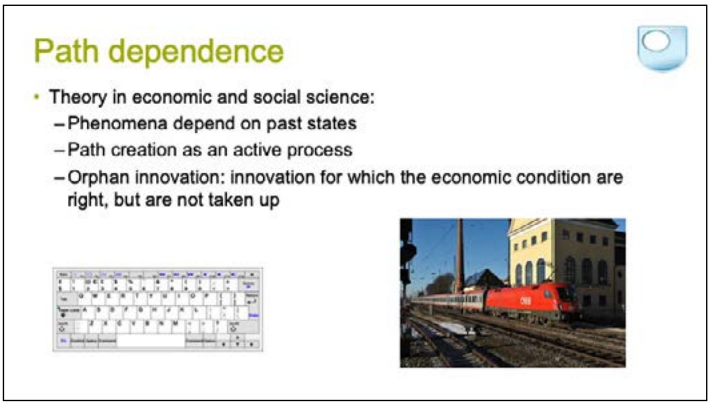
Path dependency

In path dependency, each phenomenon depends on the state in the past.
Example: **Why is the QWERTY keyboard the way it is**?

In a competition to design the best keyboard several people had more sensible layout, but the group who used the QWERTY keyboard were the only group that could do touch typing, They won the competition then QWERTY keyboard stuck.

Change propagation

Change propagation can occur instead of is where every time designers make a change to an existing system, it is very likely to affect other



elements of the system. The later a change occurs in a product development process the more expensive a change becomes. But changes are also a potential opportunity to innovate, improve and save money.

Design margins are the over-design that a particular system or element is given so that it can absorb changes. If a component or system has a margin that can absorb the change in requirements, it does not need to be changed. Redesign generates margins for future generations, but who pays the opportunity cost?

Sustainability and recycling: Recycling decisions cannot be taken when 90% of the product is fixed. If you want to change the recyclability of a product designers have to think about this at a very, very early point.

Ethics: Claudia said training must be changed to allow engineers to recognise when they make decisions with huge ethical implications.

Ethical design champions

Companies probably need champions for ethical decision making. About 30 years ago, companies started to introduce manufacturing people who really could inform the designers about what is possible. In the future we will need ethical people to inform the design process from the very beginning.

A full recording of Claudia's presentation is available here: https://www.youtube.com/playlist?list=PL-fOTakP4gHbCHuZpv_qUBm1lGAFjEZF9

Medical ethics

Prof Richard Ashcroft, Deputy Dean at The City Law School

Medical ethics has been discussed for the last 2,500 years, at least since the Hippocratic Oath. But ethics in science has been much less discussed. And yet, because they design and make products, Richard argued the case that engineers think about ethics all the time. His key points were:

In science, it is seen as the job of society to think about ethics, leaving the scientists to just do the science as well as they can. But scientists are part of society. Laboratories are very social places.

Four principles comprising the ethos of modern science

The American sociologist, Robert K. Merton, in the 1930s devised four key social norms in scientific inquiry: communalism, universalism, disinterestedness and organised scepticism. He argued that scientists learned these norms as part of their induction into the working practices of science, in the process becoming full members of the scientific community.

However, later researchers have been more sceptical about the idea that there is one grand theory of what science really is. And in practice, Merton's approach doesn't help all that much: rather, we need to think more about conduct, character, culture and behaviour in a more nuanced, careful way.

Teaching ethics in science

There are two current approaches to how people are trained to do science in the right way; Research Ethics and Research integrity.

The problem with research ethics is it can be complex and bureaucratic. The National Health Service has its own system of research in ethics, that has become seen as a set of procedures. Students talk about "getting through ethics" as an ordeal, which misses the point about engaging in the human dimension of science.

Research integrity

In the last 20 years, because of the risks of "the Replication Crisis" more attention has been paid to good (an ethical) research practices.

Research integrity today is how you train people in knowing what is ethically acceptable in how you behave as a scientific worker, how collaboration is meant to work, how to share data ethically, and allow others to run a reanalysis of your datasets to make sure that the claims in your publications are valid.

Research integrity covers everything from employment law to good laboratory practice to guidance from the professional bodies in a way that is difficult to pull together and understand.

There is a risk that scientists focus on the negatives, about what you should not do, rather than embedding ethics into practice because it is a positive addition.

> "In the pure sciences, it's less obvious to people that there's anything ethical to say about these things."

Code of conduct and further ethical development

There are codes of conduct in medicine as well as science. Those codes of conduct can be rather thin, formulaic, abstract = not about achieving the intention.

There is room to improve the ethical formation of scientific workers as they progress through undergraduate into doctoral studies and beyond.

Richard highlighted two key points from ethics taught in present day science curricula:

1. To better equip people with the skills and confidence to have these conversations.
2. To motivate people to think of ethics as essential to what they're doing.

A full recording of Richard's presentation can be found here: https://www.youtube.com/playlist?list=PL-fOTakP4gHbCHuZpv_qUBm1lGAFjEZF9

Medical ethics key reference: https://www.bma.org.uk/advice-and-support/ethics/medical-students/ethics-toolkit-for-medical-students

Key reference on ethics in science: https://wellcome.org/what-we-do/our-work/research-culture

Ethics of Connected and Automated Vehicles

Dr Paula Palade
Digital Manager & Ethics of Connected and Automated Vehicles, Jaguar Land Rover

Paula is member of the IET The Automotive Road Transport (ARTS) Network and in parallel researches the topic of Ethics of Connected and Automated vehicles in collaboration with Bradford University.

Why ethical considerations for connected and automated vehicles matter

Can we follow the existing rules for developing CAVs? Unfortunately technology is not neutral; designers and engineers shape the technology with their own values. Some humans that are empowered are not ethical. CAVs can be hacked by cyber attack and present a risk. We need to ensure that all our engineers are ethical and empowered.

In the UK in 1865 the Locomotive Act or the Red Flag Act stated that motor vehicles had to have a person walking 60 yards ahead of the vehicle carrying a red flag. This led to the first speed limits for cars. The act was lobbied by train companies and carriage makers who wanted to protect their investment. Societal acceptance of a new technology can dictate the progress of this or any technology.

The Trolley Dilemma asks whether you would switch points for an oncoming train to save the lives of five workers on the original line, when the new route would certainly kill one person. Other interventions could also save lives but mean the effective murder of one person. The dilemma is applied now to CAVs: would a computer make the right decision to save the most lives and is this ethically the correct decision?

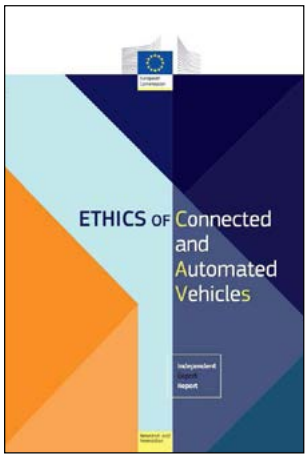
How would or will engineers program self-driving vehicles to choose between different categories of people and animals. There would be Western and Eastern world differences in how people would prefer to save the young versus the old for example. With CAVS the situation is much more complex, so you have to be guided by ethical principles throughout the programming and driving decisions as well.

Dr Palade was a member of the expert group that produced the European Commission report **Ethics of CAVs**, published September 2020, to produce a full picture of this decision-making.

> "Unfortunately technology is not neutral and designers as designers and engineers, we do shape it with our own values."

Reference frameworks for CAV behaviour

The group looked at recommendations on road safety, privacy, fairness, "explainability" and responsibility. There are other references such as the Statement on Artificial Intelligence, groups commenting on trustworthy AI, and the Artificial Intelligence Act published by the European Commission in April 2020.

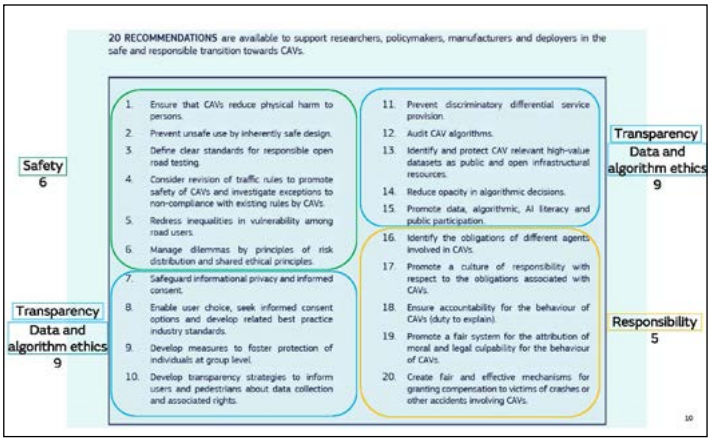


The Ethics in CAVs report focuses heavily on safety where you must ensure that you know vehicles will behave ethically and all the outcomes have been included and considered in the design process.

Ethics of Connected and Automated Vehicles – EC report

The report made 20 recommendations dividend among three main categories:

1. Road safety
2. Data, artificial intelligence and algorithms and
3. Responsibility



Some of the 20 recommendations are:

1. Safety covers points like ensuring that CAVs reduce the physical harm to persons, prevent unsafe use by using inherently safe design and define clear standards for responsible open road testing. It also looks at the ways where new automated technology can re-address the historical inequalities in vulnerability among different road users, and managing dilemmas by the principles of risk distribution, and shared ethical principles.
2. Transparency, data and algorithm ethics look to safeguard informational privacy and informed consent, preventing discriminatory differential services, develop strategies to inform users and pedestrians about data collection and rights, auditing these algorithms while promoting data algorithms, AI literacy and public participation.
3. Responsibility includes identifying the obligations of different agents involved in CAVs, promoting a culture of responsibility and promoting a fair system of attribution of moral and legal culpability for the behaviour of this direct cause.

Paula organises events with the IET ARTS Network on the topic and is working with the University of Bradford on ethical CAV development in the UK.

A full recording of Paula's presentation is available here: https://www.youtube.com/playlist?list=PL-fOTakP4gHbCHuZpv_qUBm1lGAFjEZF9

Panel debate 1 – The Ethics of STEM – undergraduate and post-graduate curriculum requirements

Presented by: Will Stirling

Key:
The speaker's initials are given after the comment attributed to them. The panel was joined by Professor Susannah Quinsee and Professor Sarah Stallebrass from City University. Most honorifics have been dropped to compress the text.

The role of public participation

The public contribution to medical ethics is underestimated. It has improved both the trust and confidence in the medical profession, but also the openness of the medical profession to a wider range of issues it does not always confront. (RA)

The Grenfell Tower disaster has enabled a larger public debate about the professionalism of engineers and people making decisions that can impact on other people's lives directly.

We must broaden the debate and ensure that ethics and social responsibility thrive in all other aspects of media as well; social, TV, radio, articles, webinars.

Professor Susannah Quinsee, Vice-President (Digital and Student Experience) City, University of London

Susannah Quinsee said it's important that universities respond to events like Grenfell and let their responses and learnings feed into the curriculum which can inform future decisions and teaching models.

Paula Palade said for connected automated vehicles, as well as her group's work with the IET, The Law Commission (England and Wales) has launched public participation through free consultations in recent years. This has gathered a huge volume of responses from organisation and members of the public.

Accreditation bodies

Delegate Patricia Xavier said that ethics is often covered in (engineers') accredited courses, but it is a low bar to reach, and often taught by engineers and accreditation panel members.

In medical ethics there is an important shift from teaching ethics that focuses on technologies that 95% of the medical professional will never use, to situations that are about actual bedside clinical medicine on the wards. Richard Ashcroft said he is seeing more co-teaching between ethics specialists and clinicians, that works well.

Sarah Stallebrass said the Engineering Council has recently upped the requirement to address ethics and develop socially responsible engineers, and this was not being held back by the accrediting bodies.

Professor Sarah Stallebrass, Professor of Soil Mechanics, City, University of London

She said the focus for trainees must be on real things in their career: even comparatively modest design projects will have ethical issues that you need to consider.

She said some students think health and safety is a bolt on, that can be fixed with hard hats and bright PPE and do not understand that their design must be created so that it's easy to create, it's safer, uses less material.

Continuous Professional Development

Sir Julian said CPD is essential in deriving social responsibility. Older engineers receive education and training at the beginning of their career, but then struggle trying to keep up with new technology. The professional engineering institutions have a responsibility here to make offerings at all at the appropriate levels for all types of engineers.

The Engineering Professors Council and the Royal Academy of Engineering are in the final stages of providing a set of case studies to facilitate the incorporation of ethics into the (degree taught) curriculum, and they will produce a toolkit to help educators include ethics in the curriculum.

Julia George, a board member of the WCIT, quoted the case of the Manchester bus driver who lost her job because she was judged too short operate a new bus design safely. Is this where the design process fails?

Panel debate 1 – Ethics of STEM – undergraduate and post-graduate curriculum requirements

Claudia Eckert said this represents a dual failure of the users and the customer organization to really understand their own employees. The designers are partly to blame for not accounting for height. But she said no matter what the rhetoric around inclusive design, you cannot include everybody. The question is whether the bus company communicated this accordingly. In the event, the bus driver's job was reinstated.

Dr Colin Brown, formerly CEO of the IMechE asked: How do we create an attitude that recognizes best efforts (as low as reasonably practicable) rather than only accepts zero tolerance?

Errors happen and things go wrong, education should ensure that you don't just assume that everything you do is going to be perfect and consider what might happen if it went wrong, said Sarah Stallebrass.

Engineering is not always black and white, and some is subjective. Students like the idea of right and wrong but you have to train them to assess risks and how they cope with them, Sarah said.

Sir Julian said follow the substitution rule: In a given situation would another person with the same level of training and experience in the same context make the same decision? He said largely we are regulated by our peers.

Richard Ashcroft said consider how far we are looking at individual conduct judged against "the professional standard" or are we looking at the proper functioning routine? There is also an element about patient safety approaches for example, which has common ground with the aviation industry.

He suggested that we break down the ethical issues into the things that must be applied on pain of failure. And here are things where this is about development, growth.

Ethics in Artificial Intelligence

Delegate Esther Mondragon asked what can researchers do to guarantee that our work is ethically treated across AI processes?

Paula said this relates to the principle of trade-offs we do in engineering design. As well as safety by design, we have responsibility by design, ethics by design, privacy by design, cyber security by design etc. is a design engineer includes these principles in the design from the beginning, at each stage is we should have an ethical process to assess its ethics.

Claudia said it is important to really get into this subject, because if people say they want to make things extremely safe, that might mean that simultaneously the product is extremely overdesigned and therefore has a huge environmental impact.

Sir Julian said refer to the 2022 Reith lectures on AI in society by Prof Stuart Russell, especially episode four.

Raj Roy asked how ethics and the value system evolve with time, saying we are debating ethics as if it is a well-defined, static perspective, but it evolves – therefore what is the time dimension of ethics? Is there absolute ethics that never changes?

What role can CPD play here?

A video of this panel debate is here: https://www.youtube.com/playlist?list=PL-fOTakP4gHbCHuZpv_qUBm1lGAFjEZF9

The Engineering and Design Institute London (TEDI-London)

A new higher education provider designed for training future engineers.

Professor Mike Sutcliffe, Deputy Dean of TEDI-London

TEDI-London was established by Kings College London, UNSW in Sydney Australia, and Arizona State University in Phoenix, Arizona.

The objective is to train and produce socially aware, globally focused, job-ready engineering graduates, who have a distinctively strong design and entrepreneurship skill set.

At TEDI-London, real-world challenges such as those in the UN Sustainable Development Goals (SDGs) are placed at the centre of the educational programme. Engineering is required for all 17 of these goals to succeed. Engineers need to find solutions that balance a range of factors including design, economics, society, and global environmental needs.

Scale of the challenge: Engineering UK says there is a 50,000 annual shortfall in trained and graduate engineers yet UK universities produce just 30,000 engineering graduates a year.

So TEDI-London is a supply-side solution that produces engineers that solve the needs of society. The IET says that of all the engineering firms within the UK that have a sustainability strategy, only 7% of them feel that they've got the skill set to address and deliver that sustainability strategy.

Engineering also needs to exhibit creativity and innovation and access a broader pool of thinking.

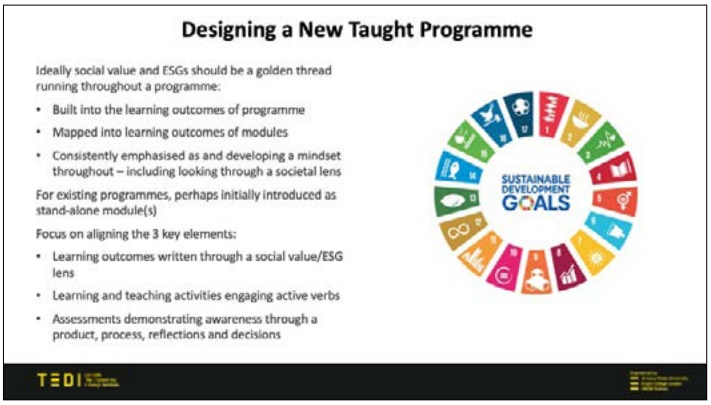
Students typically want to make the world a better place, but engineering graduates can often fall short in the softer skills. TEDI-London's aim is to produce graduates with the right interdisciplinary, problem-solving mindset within their DNA, where they do this work out of instinct.

Having engineers who think in a broad range of different ways can enhance risk mitigation. Part of TEDI-London's remit is that it brings inclusive design, innovation, equality, diversity, sustainability and ethics into our learning outcomes.

Learning providers work within the overall requirements for the Accreditation of Higher Education Programmes in engineering 4th Edition (AHEP4). Although this has been updated only recently, Prof Sutcliffe asked: Do we need a AHEP5 now that sets a higher baseline for social responsibility, sustainability and soft skills? Do Professional Engineering Institutions need to agree common set of competencies?

Building new curricula

TEDI-London has developed a brand new, taught curriculum, with ESG and social value at the core – a golden thread running through the program.



Whether developing a new programme or redesigning an existing one, Prof Sutcliffe advised focussing on 3 core features:

1. The learning outcomes need to be written through a social value ESG lens
2. Learning and teaching activities need to use engaging and active verbs
3. Assessments that need to demonstrate an awareness of the impact the products and the processes that they design have.

The TEDI-London courses embrace creativity, design, innovation and hands-on learning that mirrors the job they will get do when they leave.

The learning outcomes are mainly through real life projects, co-delivered with industry.

There are no lectures but master classes, where experts come in and discuss their experience and perspectives.

TEDI-London currently offers a 3-year BEng degree and a 4-year MEng (integrated masters) in global design engineering.

Diversity: About 50% of students are female. TEDI-London courses remove some of traditional educational barriers to study engineering; physics, chemistry, and maths A levels are not necessarily important, but the courses value attitude, aptitude and all-round ability.

There is growing momentum – coupled with an increasingly urgent need – to put social value and environment, social and governance at the core of engineering higher education.

A full transcript of Mike's presentation is available here: https://www.youtube.com/playlist?list=PL-fOTakP4gHbCHuZpv_qUBm1lGAFjEZF9

Rotate to the new

Andrew Vautier, Senior Managing Director (Information Security Lead Technology Client Services), Accenture

Accenture, which now has 674,000 employees globally, is committed to being a net zero carbon company by 2025. It pledges to power its offices from 100% renewable energy by 2023 and have zero waste by 2025.

Accenture has always made big bets on technology trends. About 10 years ago, it placed big bets in "rotating to the new", i.e. digital, cloud and security services. These have paid dividends' those three service lines now represent 70% of its global revenue and took the company from over $12 billion to one with >$200 billion market cap.

The new megatrends for investment are sustainability and digital transformation.

Bank of America has modelled that $6 trillion will be invested every year between now and 2030 in delivering SDGs, the UN's Sustainability Development Goals. A similar amount will be invested in digital transformation.

> "Social Value Act. Our employees have taken that as being a catalyst and it's galvanized them to action and they're really doing some interesting things."

Andrew made several observations about business, recruitment and ESG:

360 Degree strategy

Sustainability and digital will drive earnings and Accenture is wrapping that into a campaign called "360° Value".

This means partnering with clients on their sustainability journeys, on their inclusion and diversity journeys, reskilling their teams and delivering sustainability goals

It means creating meaningful employee and consumer experiences and demonstrating value to all stakeholders, including the planet.

Tracking performance of 360° value

Accenture's CEO now analyses where the company stands relative to those expectations in every Global Leadership Council (formed of the firm's senior leaders), thereby taking the step of moving from "bolt-on" to "built-in" activity.

Sustainability value promises

This includes embedding sustainability by design, and providing differentiated sustainability services. It is embedding in your decision making about products and services, sustainability, social responsibility and ethical principles, so the downstream execution have those things built in from the outset.

Recently Accenture bought and will plant 674,000 trees, one for every employee – is one example of turning mission statements into tangible concrete actions.

Being a responsible citizen

Accenture is accelerating its foundation programme called Skills to Succeed, a global capability to help people into work. To date (February 15 2022) 780,000 people have been through Skills to Succeed. The company has supported Afghanistan evacuees and indeed two Afghan refugees have recently started as Accenture systems analysts in the last month

Sustainability Services Group (SSG)

The new SSG intends to mirror the growth of the firm's security practice, which grew from a couple of 100 people to about 10,000 people and $6 billion in revenue.

UK focus – The Social Value Act

Accenture has supported the Social Value Act in its and its clients' procurement, and this was "turbocharged" in 2021.

Andrew said it is notable how much our employees engage with that concept. The Act has galvanized them to action and they're really doing some interesting things for social benefit. The youngest talent, tend to have the best ideas, the best strategies and the best communication around this topic.

Graduates now and the future

Gen Zed and Millenial employees have passion and expectations about making a difference that are more important drivers for them than compensation.

Accenture is one of the world's top 10 graduate recruiters and probably the largest single STEM recruiter. Graduates from courses that weave that "golden thread" (ref. to TEDI's Mike Sutcliffe) of ESG, sustainability and digital transformation through their curriculum, that is seen as built-in, not bolted-on as elective modules, will appeal to Accenture highly.

A full transcript of Andrew's presentation is available here: https://www.youtube.com/playlist?list=PL-fOTakP4gHbCHuZpv_qUBm1lGAFjEZF9

> "$6 trillion a year, will be invested every year between now and 2030 in delivering SDGs."

The Social Value Act

Professor Chris White, Director, Industrial Policy Research Centre, Loughborough University

The Public Services (Social Value) Act is 10 years old in 2022.
The bill was presented to the House of Commons in 2012 as a private members' bill by Chris White when he was MP for Warwick and Leamington. It was first reviewed by Lord Young in 2015.

The Act requires that all public bodies in England and Wales, including local authorities, and NHS organisations to consider how the services they commission and procure that are expected to cost more than the thresholds provided for in the Public Contracts Regulations might improve the social, economic and environmental status of the area.

Prof White said he was impressed with the Act's progress, and that being engrained into the work of organisations like HS2 and King's College London made him proud.

It was intended to be a very light touch piece of legislation. It was based on the pillars of social, environmental, and economic benefit for all and its principles were to change an existing culture, perhaps one where decisions were made on which was the lowest cost tender, rather than considering any other criteria.

Lord Young's 2015 review said "The Act has a positive effect, encouraging a more holistic approach to commissioning which seeks to achieve an optimal combination of quality and best value. Importantly, encouraging commissioners to think about securing value through procurement in highly innovative ways, which have generated significant cost savings and demonstrate a much more responsive way of delivering better public services."

In 2017, Social Enterprise UK, a charity, said the Act was influencing £25 billion of public spending. The collapse of contractor Carillion in 2018 accelerated the roll-out of the Act.

Today, in 2022 it accounts for £100 billion of total public spending budget. This is still only a fraction of the government's public spending budget, over £300 billion in 2021.

The objective of the Act in the next 10 years, to influence all public spending and to have a similar impact on the private sector; the FTSE-100 has several 10s of billions of pounds each for procurement leverage.

> "Post Brexit and post-COVID, how do we see our domestic policy helping to reshoring domestic production? We saw how fragile these global supply chains have been over COVID so how do we build resilience into the system?"
>
> "With social value procurement we can unlock billions of pounds of investment focused on net zero, facilitate "Levelling Up" and create thousands of jobs in public and private sector organisations to make and purchase socially, environmentally and sustainable products and services.""
>
> Chris White

The act still has differing amounts of awareness and adoption across local authorities, but we are coming to a tipping point, where now, in a post-Brexit, post-Covid environment and national priorities such as levelling up and net zero, are beginning to accelerate wider adoption.

Digital transformation can help "track social value provision" across the UK through different organisations and programmes to make it easier to compare and measure the benefits.

We can help increase spending in disadvantaged areas. Supply chains can be more mixed in terms of bringing in SMEs, social enterprises and the wider third sector. Accessing these can be critical in delivering the levelling up agenda.

It is important that the government as well as the private sector, and universities too, use their purchasing power to realize the full potential of social value for communities, the environment, and our quality of life, to help become a more values-led society.

A full recording of Chris's presentation is available here: https://www.youtube.com/playlist?list=PL-fOTakP4gHbCHuZpv_qUBm1lGAFjEZF9

Social Value Leadership in the IT community

Rob Wirszycz, Senior Warden of WCIT (Worshipful Company of Information Technologists)

The WCIT is a socially responsible Livery Company – known as a modern livery company (formed after 1927).

WCIT has a philanthropic focus – on charity, education, industry and all the issues around the IT industry.

It has 800 members including individuals from the broad tech sector and it sponsors two schools in London.

WCIT recently created a Social Value Leadership Group (SVLG) initiative to help companies in the tech sector generate social value alongside their financial value. It includes 14 technology companies, some are on the London Stock Exchange, and has arranged for speakers from the Cabinet Office, the stockbrokers Stifel, London Business School, SOCITM among others.

There are three main observations of the SVLG forum:

1. External demands are driving ESG activity. An example is that a supplier had to complete a 100-page ESG questionnaire to win a £100,000 contract with a bank.
2. Social value creation is complementary to the creation of financial value. Supporters have to persuade the naysayers in finance that this is not just box-ticking.
3. Social value is the outcome of doing ESG well. Rob said "ESG starts with governance and ends with governance. Making a commitment to get involved is the start"

An aspirational state of social value leadership / practice is that we can create social value consciously without needing money and resources every time.

The WCIT wants corporate boards to make declarations of social value in their governance alongside other value targets. He noted that the tech sector seems to be less concerned with the 'E' in ESG than other sectors, as a general observation (although Scope 3 Emissions are key concerns).

There are many **ESG assessment tools**.

The WCIT wanted to create one that was fit for purpose for technology companies.

The WCIT SVLG created the Social Value Capability Improvement Model to look at the internal capability of an organization to create social value. Its eight dimensions are: environment, deployment, community, education, governance, diversity, well-being, customers and supply chain

The model uses 5-step planning – like Tesla's business plan, showing where you are and where you still need to go.

Each dimension passes through five stages to create more social and environmental value.

For example the Environment strand goes from position 1. Purpose (defining your purpose) through 2. Baseline, 3. Act, 4. Improve and 5. (achieve) Net zero

In each case the five steps help the company move from the state 'as is' to the state 'to be', towards a net zero and social value state.

For deployment, the ambition is for employees to do the actions willingly and not under duress.

Community focuses on how you engage the employees, including things a company can do like providing work placements, expanding on what you can build and how you can embed it.

Governance is about embedding that purpose into your daily actions and owning these.

Appointing an ESG champion into the workplace, protecting privacy, deploying audits, risk registers, and clear accountabilities. Without this trust disappears.

Diversity – assess where the business is with diversity. Sign up to the "Tech Talent Charter" and rest recruitment products for fair accessibility.

Well-being – during the Covid lockdowns many people have been challenged mentally, physically and spiritually. WCIT says that is critical now for organizations to understand better employee wellbeing, and create organisational awareness of health issues.

Customer and Supply chain – the tech sector has a complex supply chain of suppliers and locations. This dimension helps firms assess their customers, and choose suppliers that are socially responsible.

WCIT now has a partnership with City University to evaluate the various ESG assessment frameworks that exist and attempt to standardise or improve them.

A full transcript of Rob's presentation is available here: https://www.youtube.com/playlist?list=PL-fOTakP4gHbCHuZpv_qUBm1lGAFjEZF9

Teaching AI ethics

Geoff Keeling PhD, Bioethicist, AI Ethics at Google

Geoff formerly worked as a research fellow in the Institute for Human Centered AI at Stanford University. Here he taught a course on the ethics, law and politics of artificial intelligence.

Engineering students and STEM students have technical understanding and a lot of enthusiasm for engaging in ethical work, but they don't have the kind of softer skills that humanities students tend to have, such as the ability to construct arguments, or to respond to objections or to write in essay form. But humanities students lack the technical understanding to participate in meaningful AI ethical discussions.

Idea: the students could come together to participate in meaningful discussions, and bridge those skills gaps. The new course was called **PHIL 78E: Ethics, Law and Politics of AI.**

The course looked at contemporary disputes in AI ethics, covering these topics:

- AI Safety
- Explainability
- Machine learning fairness
- Recommender Systems
- Autonomous Systems

Course would take a dispute in AI ethics, explore it from a philosophical legal political policy lens, and then try to have a technical discussion involving both the computer science / engineering students and the humanities students.

An example: **Machine learning fairness debate**

Began with moral philosophy, then reviewed the ProPublica article about the compass recidivism prediction model in the United States. Then it explored fairness impossibility theorems, questions about the ethics of predictive policing, and ultimately rounded up with some broader social questions about race and criminal justice.

The course was built with a clear structure covering Delivery, Assessment (with a minimum 50% participation rate), an account of the skills and knowledge they learned and testimonials.

Outcomes

One STEM student said the course taught him "how to think critically, how to speak critically, how to read critically, how to make arguments support and tackle arguments, and be smart."

It shows that somebody who's clearly from a hard computer science background has embraced those soft skills from the humanities and they know they have embraced those skills.

A humanity student commented: "I came here with no knowledge of artificial intelligence, and I'm walking away confident in my ability to talk about the ethics of AI. That is exactly what I had hoped for."

Geoff agreed with other speakers that there is great enthusiasm and interest among Gen Z and Millennials to understand AI and make it work for society.

> "If ethics is an add-on to your curriculum, then the students will think that ethics is an add-on in general, which it shouldn't be."

Conclusions

The course concluded that:

1. Computer scientists are naturally good at philosophy. The educational task was taking their formal skillset for computer science and showing them how that might apply in a novel domain. In philosophy, for example, formal logic is taught so that students can construct valid arguments and know what it means for an argument to be valid.
2. What really matters is how to participate in discussions about AI ethics, not their knowledge of ethical theory. The course intends students go into the workplace and have critical deliberative discussions with their colleagues about AI such that the outcome is much better than it otherwise would be.
3. Don't be afraid to cover technical concepts with humanities students. If the problem is interesting, and the concept is explained well, they will take the formalism in their stride.

After working at Google, Geoff said that research ethics courses that equip STEM students with an understanding of informed consent, risk/benefits trade offs, return of results, etc., would help to address many of the moral dilemmas that come up in AI industry work but aren't covered in AI ethics

A full transcript of Geoff's presentation is available here: https://www.youtube.com/playlist?list=PL-fOTakP4gHbCHuZpv_qUBm1lGAFjEZF9

Panel debate 2 – Social value, Environment and Governance

Presented by: Will Stirling

The panel was joined by Professor André Spicer of Bayes Business School (formerly Cass) and Emily Davis, Head of Social Impact at Amey. Some honorifics have been dropped to compress the text.

Hard skills vs soft skills and the need for both

Delegate Dr. Colin Brown (ex-CEO of the IMechE) asked if engineers might diverge in the future: traditional engineers who can do fluid dynamics and write code, and socially responsible engineers who cannot? He asked how can we ensure that all engineers can do at least some or both?

Chris White asked why the two had to be mutually exclusive?

Mike Sutcliffe saw it as an "and", that we must educate the "new type of engineer" to also interact with the traditional type of engineer. A key point of some of these soft skills is about engineers being able to work across different disciplines, and beyond the traditional into areas of social sciences, humanities, and policymaking.

Andrew Vautier referred to in the SRP in STEM event in 2021, that the Royal Academy of Engineering's Dr. Rhys Morgan from presented research that showed what engineers learn at university and what they use at work were very different (in general). Mechanical engineers learn materials, mechanics, fluid mechanics, and thermodynamics, but they use these formulae relatively little in their work, rather they use systems thinking, critical thinking, teamwork, communication, and increasingly sustainable skills more in their work.

Mike Sutcliffe said it's about creating space in the traditional curriculum to also generate generating the new type of engineer.

Colin Brown said it's important to get the balance right, so students are prepared for the reality of work.

Mike Sutcliffe said the TEDI-London industrial advisory board were given a first year 'A' level maths paper and were asked how much of it was relevant to what they do at work, and how much of this would you expect graduate engineers to know. They expected students to know just 10% of that maths paper content. He asked, what do engineers need to know in 2022?

Curriculum revision, Interdisciplinary research

Raj Roy said universities should focus on the type of technology we need to teach to best deliver the knowledge.

He said the way students calculate answers and the level of application theory has moved on over time. We should be using more of the technology available in society as a whole and create that space in the curriculum to introduce new concepts as society moves on, and also remove things that we don't need anymore.

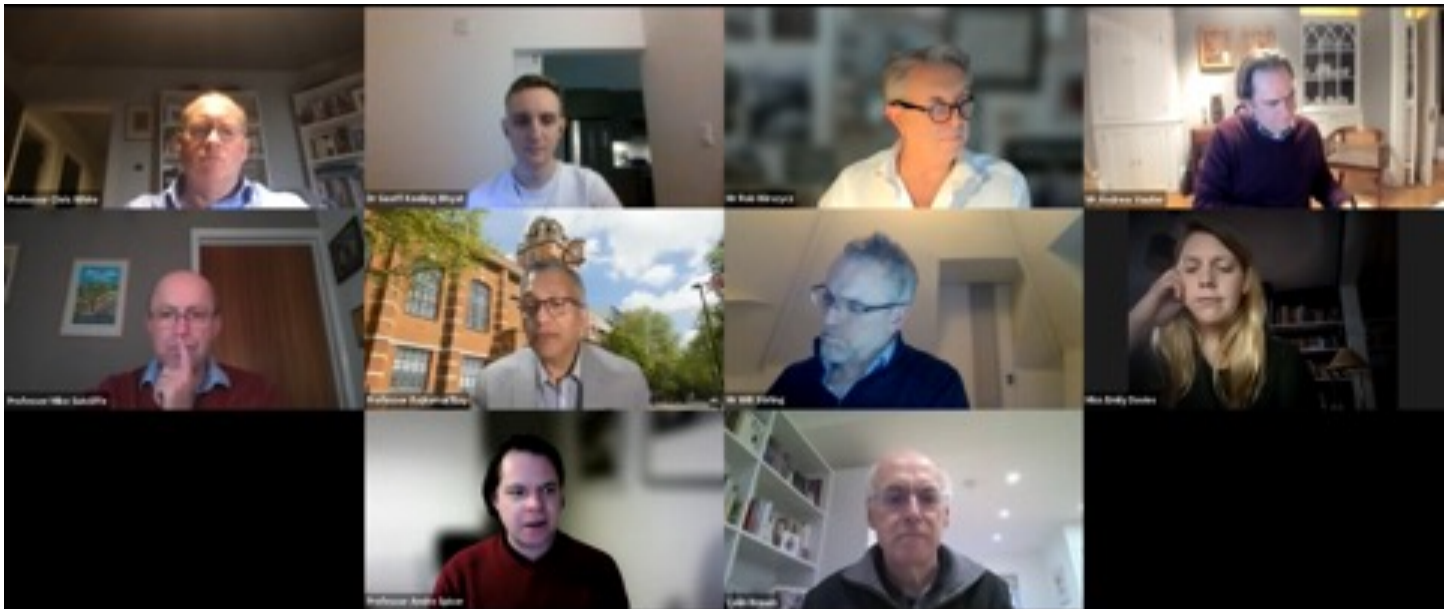
Delegate Patricia Xavier liked Geoff Keeling at Google's point about the lack of teaching of argumentation in engineering as a barrier to ethical practice. What concepts have been most powerful in persuading engineering academics of the value of teaching ethical theory in the curriculum?

Geoff said Stanford University has the Institute for Human Centered AI, which is co-led by a philosopher and a computer scientist. They have created this interdisciplinary hub where people engage in genuinely interdisciplinary research. In Geoff's time there they assembled pre-frame models with 111 different authors from philosophy to computer science to economics. If this works it will trickle-down, in which the faculty will want to collaborate on interdisciplinary courses and the students will want to take them because they're novel and they're at the forefront academic research.

Geoff also said the background is changing, where Gen Zed students and employees are motivated by such questions and will select universities based on their provision of these questions.

Mike Sutcliffe said it comes back to students understanding the why and then understanding the context in which the ethics is being applied, and how it has been applied.

> "The highest value jobs are in the interface of high interpersonal plus high analytic skills."



The discussion covered further subjects including governance structures including B Corps, and employee ownership.

Business schools as a bridge

Business schools are good for promoting interdisciplinary research, said André Spicer, as they were initially designed around interdisciplinary approaches. A business school like Bayes would have psychologists, economists, operations people, researchers, and engineers collaborating. Since then, many schools have become increasingly narrow in their focus but they are trying to broaden out more, one way is to focus on the Grand Challenges.

Andre said research on the best teachers shows that they typically don't deliver a prescriptive framework; just "learn it and use it", instead they introduce students to "knowledge discovery and the application process" and involve people from very different disciplines.

He said in a matrix with analytical skills in one axis and interpersonal skills on the other, the highest value jobs are in the interface of high interpersonal plus high analytic skills.

At Bayes, in the first term of the first-year students are trained in critical thinking and in problem-based learning, which they applied to business problems.

Essential Skills Framework

Emily Davies, Director of Social Impact at infrastructure company Amey plc, said the focus around these wider collaborative skills is increasing. Amey applies the **Essential Skills Framework** to the recruitment of its early career employees via apprenticeships and graduates, and when they have joined the organization for their onward development.

For each skill there is a level of competency for planning, from 1 to 15, which allows for self-assessment, mentoring, life skills, personal development skills etc.

Emily is also observing the pattern of recruiting for attitude and behaviour and then training the hard skill, this has become a real focus for Amey. The focus around some of these wider essential skills are ever increasing, such as teamwork, problem solving, and creativity.

> "What I like with social value is I think it's moving ESG from risks, and what can we do less bad into doing what are organizations doing to generate add value to communities and to society."
> Emily Davis, AMEY

Climate change, social value, and economic value

A delegate asked what is the role of regulation like the 2008 Climate Change Act? Apart from some early devotees, can social value really rival economic value in industry without some sort of government pressure?

Chris White, author of For the Social Value Act, said the Act is not expanding because of a government edict or regulation, but because there is an appetite from within the economy, from SMEs to the third sector to the primes and OEMs. It's not about the government saying you will do social value, its organic.

"Social value" will provide economic value, it will take cost out of the system, work better for communities, shorten supply chains. It has been proved time again that adopting social value principles will provide savings.

People increasingly want to work for organisations that have a purpose that consider and understand what their environmental, social, economic risks and impacts are, said Emily at Amey. Organizations must show that they care and are credibly and authentically doing something to improve society and the environment. Emily liked the Social Value Act because it's moving ESG from risks and what doing less bad things into what are organizations doing to add value to communities and to society.

For assessing a project's impact versus cost, there are many parameters in the project design, for what impact it will be on the environment, society and pure cost is one element of it, but we assess how those all come together and what the balance is, Emily said. The lens is more focused than ever on these impacts in a project decision.

Colin Brown remarked that government procurement is often based on lowest short-term costs, less on the holistic impact.

André Spicer said at business schools there has been a huge movement move away from CSR – corporate social responsibility – as a risk factor or philanthropic ideal towards a value proposition. He identified three drivers for doing CSR (that might be called ESG today) now: 1. employee value, 2. Customer value and increasingly 3. investor value. On the latter there are increasing investment into ESG funds that is looking for somewhere (socially responsible) to go, and there are several metrics which are tracking ESG performance. He said engineers will increasingly play an important role in measuring that.-

A video of this panel debate is here: https://www.youtube.com/playlist?list=PL-fOTakP4gHbCHuZpv_qUBm1lGAFjEZF9

Links

Government's Essential Skills Framework
https://www.gov.uk/government/publications/essential-digital-skills-framework

The Social Value Act
https://www.gov.uk/government/publications/social-value-act-information-and-resources/social-value-act-information-and-resources

Calls to action

This programme of events is all about how to build more social value, ethical practice, environmental consideration, and good governance (call this ESG) into STEM education and professional training.

The PEIs and professional STEM institutions have a great deal of influence. They help design taught curricula, at universities and in further education. They define the accreditation standards in STEM learning. They need to give guidance on how to find the space for in the education programmes, covering ESG, of all STEM subjects; maths, computer science and IT, engineering, and science.

This symposium makes recommendations for these actions:

We – the professional institutions and STEM curricula planners – should:

- Embed social value creation and impact into the STEM curricula.
- Provide guidance to lecturers and teachers on how these subjects should be taught. What does social value mean in practice? How do you embed it into what you do?
- We need to shape our education system boldly to reflect and incorporate some of these ideas and actions rather than organic evolution with no intervention
- This should also apply to apprenticeships and further education courses like "T" levels with clear guidance for teachers

Anyone with an interest in these topics are invited to contact City, University of London with suggestions and content to help shape these actions, and for our next symposium.

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HOLD THE DATE:

National Symposium on **"Developing Socially Responsible STEM Professionals" (SRP-STEM)**

Website: **www.city.ac.uk/socially-responsible-professionals**

Wednesday, 11th January 2023

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