CITY
UNIVERSITY OF LONDON
— EST 1894 —

RESOURCES

LONG TERM

SINCERITY

MARKET

National symposium:
Developing socially responsible STEM professionals

GOAL

SUSTAINABILITY

ETHICS

RESPONSIBILITY

A symposium and new research community

launch at City, University of London

Hosted on 14 January 2020

Sponsored by

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Contents

Our objective

This report and City, University of London's work in this field considers how the training and work of STEM professionals can be shaped by and contribute to:

- Corporate social responsibility
- Sustainability
- Diversity, unconscious bias and equality
- Data protection and data usage for public service
- Environmental respect in engineering design
- Ethics
- Sincerity
- The real needs of the market
- Global sustainable programmes

City, University of London School of Mathematics, Computer Science and Engineering wants to collect evidence that the STEM professions are recognising these topics and that they are reflected in the training and jobs of engineers, scientists, computer scientists and technical professions.

Key:

BCS = British Computer Society

RAEng = Royal Academy of Engineering

S&Es = scientists and engineers

SRP = Socially responsible professionals

STEM = Science, technology, engineering and mathematics

STEAM = Science, technology, engineering, arts and mathematics

SVA = Social Value Act

Executive summary

Professor Sir Paul Curran, President of City, University of London opened the debut symposium in January 2020

This event took place before the Covid-19 virus global pandemic. This would certainly have influenced some of the participants' presentations and conclusions.

This symposium intended to show several different applications and views of developing socially responsible professionals in STEM professions. The keynote speakers, panel of experts and participants were drawn from industry, academia, government and professional institutions.

IBM has a strong corporate reputation for doing social good. Paul Jagger, from IBM Global Business Services, explained how IBM's career progression in technical and non-technical fields is structured. As a rule, to progress to more senior levels all management-level staff must demonstrate examples of "giveback" in addition to the normal performance criteria. Giveback here means doing something positive for society. The Royal Academy of Engineering's Dr Shabana Haque OBE previously led a government programme to place STEM careers at the heart of the civil service. Its aim was to better connect the 30,000 scientists and engineers in the civil service to policymaking. Shabana has used her experience here to help the Royal Academy's new programme, the National Engineering Policy Centre, which aims to let engineers influence policymaking.

"What are the conditions under which we might be socially responsible professionals?" "Does our environment influence how people practice social responsibility in STEM?" These questions were posed by Dr Alex Taylor, a sociologist at City, University of London. He suggested that rather than STEM professionals start by trying to solve a problem within SRP, the normal approach, they should imagine what it is like to be inside the problem, for example to imagine being homeless when considering building social housing. Society needs to understand engineering and STEM better for the professions to become more socially and ethically responsible. The image of engineering needs to change, and be modernised, according to Dr Colin Brown, CEO of the Institution of Mechanical Engineers.

London has more than 9.3 million residents, 15 NHS Trusts, 32 boroughs and 48 universities. City Hall is trying to run these institutions in a digital age and promote socially responsible practices. Theo Blackwell, chief digital officer at City Hall, talked about how London is becoming a "smart city", capturing and using data more intelligently while protecting people's data privacy, learning from other cities and providing value for the taxpayer. Theo says programmes like the Good Work Standard, Cities Coalition for Digital Rights and Local Digital Declaration help City Hall to deliver this responsibly. The Public Services (Social Value) Act 2012 is designed to help companies and organisations procure work by employing local and disadvantaged people, which can save companies money long term and reduces councils' social security bills. The SVA's original architect, Chris White, now head of Industrial Strategy at Kings College London, explained how it can support jobs and communities.

Professor Kieran Arasaratnam, Associate Director (Societal Engagement), Imperial College Business School, told the symposium the remarkable story of his life from relative poverty in northern Sri Lanka to City, University of London, a career in investment banking and now to Imperial College and leading the Gandhi Centre for Inclusive Innovation which provides internships at the best companies for candidates that can show their work will deliver social good. Like most engineering companies, Megger, a large electronics business with premises in 40 countries, struggles to find the specific skilled people it needs. CEO Jim Fairbairn discussed the drivers for attracting applicants to engineering jobs, including experiential development and intergenerational communication. "Companies need to be more flexible about organisational design and hierarchy," he said.

As the world digitises more and more to realise efficiency, there is a danger that people are being forgotten. Nancy Lu, a sustainability strategist, asked how do we bring people back into STEM equations and codes to create sustainable development? She concludes that sustainable development can only be possible if STEM and social science work together. Finally, Braulio Eduardo Morera, who works for Resilient Cities Network funded by The Rockefeller Foundation, is researching new ways for cities to grow and operate that are socially and environmentally optimal. The organisation captures data about people movement and behaviour, architecture and geography.

Calls to Action
A list of calls to action from the event are on page 13.

Introduction

Professor Sir Paul Curran, President of City, University of London opened the debut symposium in January 2020

He remarked that STEM professionals have a changing role of greater responsibility in society in areas like human safety and environmental protection and pro bono activity. The professions are now moving into subjective areas like ethics, social justice and community engagement. Therefore, education and training are needed to give STEM the social context.

"It is said that grappling these social issues does not match well with STEM professionals that tend to be more task-focused," Sir Paul said.

Why promote SRP in STEM?
What is the goal of this symposium and report?

When an engineer designs a bridge, a car or a mould tool, is he/she considering the environment and society in the design? The materials to be used, the impact on society it will have in its lifecycle, the people in the supply chain it will affect positively or adversely, and its risk to human health beyond its stringent safety specs?

Is there a benefit to society that is considered when the product's design is assessed? Or, in the year 2020, is the product still entirely driven by the customer's tastes and the economics of the design?

No. The COVID-19 pandemic has brought the role of science into the living rooms of everyone. It will help more people to value the work of doctors, nurses, scientists, pharmaceutical researchers as well as engineers and analysts working in virology research and manufacturing vital goods like food, medical equipment and the new 4,000 bed Nightingale Hospital, built in just nine days. One of our symposium panellists, James Morgan a structural engineer, said most job candidates ask about the social and green credentials of the practice's work, and generally shun climate-harming projects like airports.

This annual symposium and report run by City, University of London, will show how metrics for social responsibility are applied to careers in STEM and STEAM – science, technology, engineering, the arts and mathematics.

In this report we show that big employers like IBM and BOSCH expect their employees to consider society in their work and give back to society. The government recently ran a project to bring all its STEM professionals together and to devise better communications channels to let central government use STEM knowledge in their policymaking. The Royal Academy of Engineering has created a National Engineering Policy Centre to connect policy makers with engineering expertise to inform and respond to policy issues of national importance and give policymakers advice across the whole profession.

Sociologists ask can the skills of STEM professionals help them to experience problems in society, like homelessness. A City lecturer here asks us what it means to be socially responsible. The Institute for Mechanical Engineers' CEO argued that better social responsibility and communication in the profession is required to improve the public's perception of engineering, which tends to notice engineering a lot more when it goes wrong. Public STEM projects, like the work of the London Mayor's Office in making London a smart city, must be aware of the risks of data privacy breaches when collecting personal data to improve areas like transport.

With a world population of 7.8 billion people, global society needs engineers and scientists to create the solutions to our mega-challenges like climate change and carbon-free energy. But when STEM learners study and train, should elements of social responsibility like data protection and ethics be taught alongside chemistry, mechanics and finite element analysis?

I would like to see two clear actions come from this work on SRP in STEM.

1. Identify the common ground across the STEM professionals on social responsibility and let them share best practice.

and

2. Develop a skills base for SRP that future learners use in their future decision making, that accounts for socially responsible needs.

For the second we need to develop tools that engineers, scientists and computer scientist can use to evaluate their decisions more holistically, using a measure for society effect.

Several universities, in the UK, Italy, Germany, the US and elsewhere, are working on SRP in STEM for their education programmes. The Open University and Imperial College are doing research in this area. We need to come together to collate evidence, then devise and codify these tools and encourage educational institutions to use them in their courses.

Professor Rajkumar Roy
Dean of School of Mathematics, Computer Science and Engineering
City, University of London

Evidence of Social Responsibility in STEM
Summary of some projects, challenges and media coverage to date

The engagement of SRP in STEM is mature and growing. Now there is an opportunity for the UK and City, University of London to provide global thought leadership in this field.

There is increasing media coverage of the role that STEM plays in a fair and just world. Hannah Fry, a UCL mathematics professor, is featured in several media articles promoting that students take an oath in mathematics, similar to the Hippocratic Oath in medicine. Raj Roy said we need to consider adopting a similar quality of behaviours in the STEM professions. "In mathematics in the UK, ethics is still a new subject for research."

> "In medicine, you learn about ethics from day one. In mathematics, it's a bolt-on at best. It has to be there from day one and at the forefront of your mind in every step you take."
> **Hannah Fry, Associate professor in the mathematics of cities, University College London**

Responsible STEM and the government
Matt Hancock MP, then Secretary of State for Digital, Culture, Media and Sport, launched the **Data Ethics Framework** in 2018, looking at the ethical issues of using the public's (private) data for public service and how to manage that.

There is also the **Social Value Act,** that then MP Chris White tabled and was approved by parliament – see section 10.

Good practice in data science: Prof. Roy said we should take more interest in how data science students and analysts use data science techniques and whose data they use. The literature shows a lack of progress in this area. See section 8 on page 8, on making London smarter through data.

Social responsibility versus innovation: Will pursuing SRP inhibit innovation? There is investment in new technology to support social needs, for example robots to support elderly care and in medical and surgical technology such as rapid vaccine development – Covid 19 and others – and robots to kill viruses in hospitals. This field will grow further with an aging society.

The Royal Academy of Engineering and The Engineering Council have published ethics where they highlight the importance of honesty, being accountable and leadership.

This proposes that the profession "ensures" they are trained to do the job properly, and not make critical decisions when they are not fully trained. The Academy has also set up the **National Engineering Policy Centre** to provide STEM information and advice to policy makers – see page 5.

The IMechE is a strong advocate of **sustainable engineering** and has an Energy, Environment and Sustainability Group to promote this work and to reduce the environmental impact in engineering solutions.

British Computer Society also has its own ethics groups for computer science.

Universities in other countries are studying the role of SRP in STEM.

The diagram below illustrates the components of developing socially responsible professionals.

Proposed integrated framework for SRP
(City, University of London, 2020)

Developing Socially Responsible STEM Professionals		
Diversity, unconscious bias & equality	Corporate social responsibility	Global sustainability programmes
Cultural differences & practice	Legislation & regulatiom	Business & research ethics	Circular economy
Leadership & social value	Privacy, identity & data protection	

But Prof Roy summarised by asking: "With so much happening in this area, why do we not see an undergraduate module on social responsibility in engineering courses, or an MSc course in Ethical STEM or engineering? The general interest is not translating into skills development."

> "In mathematics, ethics in STEM is still a new research subject. The UK is behind the US and other countries in this field."
> **Prof. Rajkumar Roy, City, University of London**

Content of the National Symposium

Professionalism in STEM careers and the need for 'giveback'

Paul Jagger PgDMS, MSc, FBCS, CITP
Senior Managing Consultant – IBM Global Business Services (Talent & Transformation)
Paul Jagger talked about professionalism in STEM, linking to ethics and CSR.

He believes ethics are integral to being a professional and exhibiting the behaviour of professionalism. He believes the acid tests of 'being a professional' are, in order:

1. Are you a member Chartered professional body?

2. Do you abide by the professional bodies' code of ethics / conduct?

3. Do you hold a professional qualification awarded by that body?

4. Is your professional competence regularly re-assessed?

5. Do you routinely undertake Continuous Professional Development?

6. Do you regularly give back to your profession and to society?

Professional pathways in IT at IBM

IBM has developed career pathways from apprentice / graduate up to Distinguished Engineers and IBM Fellow grades. IBM has established a link between professionalism and all of the profession characteristics above, linking with the IET, BCS and other bodies; mapped career progression. Employees have to provide portfolio evidence of including 'giveback' among other factors.

 IBM has mapped its technical career progression to external professional qualifications. Employees may join a relevant professional body and undergo independent external validation of competence that mirrors internal competence assessment. Employees are encouraged to engage in giveback such as giving regular coaching sessions to fellow IBMers or external voluntary projects.

STEM and our responses to society

Dr Alex Taylor, Reader in Human Computer Interaction, City, University of London Sociologist

Dr Taylor has a sociological perspective on STEM. He asked: What does it mean to be socially responsible? What worlds do we want to live in?

" Responsibility is about paying attention to a response in an environment like study or work. Responsible people also have a concern for the world we are interacting in."

What are the conditions under which we might be socially responsible professionals?

Taylor said there is a clichéd idea of an engineer, who is engaged in work that reduces the world to a set of problems and solutions. We realise the world is not like that, but even this year there are references that engineers have a reductive idea that everything must be a problem and a solution.

There are specific conditions that people are operating in, with different responses to those conditions – ours and others. The output to these responses is a cyclical activity, to be responsive and responsible. How do we attune ourselves to the conditions, an unfolding set of relations where new possibilities that might emerge?

In an experiment, Taylor asked students to imagine the smart city that worked well. But he invited students to think about an issue, like homelessness, and not to approach it in a solution to a problem way but be more observational. What is being homeless like?

Students spent time with homeless people, designed tools to record their experience of being homeless, and asked what conditions they are subject to. What conditions might be redesigned to let them to be different, to act differently in our society. There was no quick fix for this issue

The role of government in socially responsible STEM

Dr Shabana Haque OBE, Head of Engineering Policy, Royal Academy of Engineering

Dr Haque's former job, working in the Government Science Office (GO-Science) under Professor Sir Mark Walport, was to deliver a massive transformation programme for the Government Science and Engineering (GSE) profession, and to place STEM careers at the heart of the civil service.

There are 30,000 scientists and engineering working in the civil service. The objective was to bring them together and raise the profile and communicate their work more clearly, to ensure that science and engineering advice underpinned decision-making over a five-year period.

The science and engineering community in government was asked about what they wanted from their profession and what help they needed to do their day jobs.

Shabana found that the community could be quite tribal and stuck to their disciplines. The unifying force that got people engaged was to encourage the community to get involved in STEM activities to inspire the next generation into STEM.

> "Scientists and engineers in government are profoundly proud about what they do and want to tell people about the impact of what they do. How can we harness and build on that pride, to develop SRPs for the future?"

She said:

Four key learning points that emerged from the programme:

1. **Importance of a strong evidence base for decision-making**
   Policy makers often don't know where to access the scientific advice. There is an important role for S&Es in government is present evidence for the SRP-related subjects like sustainability and environmental damage, to help civil servants and politicians make the right decisions.

   She added that the roles of experts in society is being called into question at the moment. A challenge to us that we present the right data, in the right format in an accessible way and to be clear about the added value and impact.

2. **Communications to policymakers**
   Evidence must be presented in the right format in a timely way. S&Es are typically not very good at presenting easily understandable versions of their research findings in a way that policy makers can understand. We play an important translation role.

3. **Collaborate better across disciplines**
   Tribalism exists within the government S&E community. When we try to convey a specific message, is there a better way for SRPs to collaborate and work across professional boundaries to present a stronger message in a more unified way to government?

4. **Policy and science parallels**
   Shabana saw parallels, that testing policy with different methods are inherent to how STEM professionals work. She saw a great opportunity of cross-pollination between these skillsets. It could help navigate policy better in STEM careers.

Shabana is now Head of Engineering Policy at the Royal Academy of Engineering, where she has been involved in setting up the National Engineering Policy Centre, a partnership across 40 professional engineering organisations. The Centre connects policy makers in the civil service with critical engineering expertise to inform and respond to policy issues of national importance, giving policy makers a route to advice from across the whole profession, and the profession a unified voice on shared challenges.

The ambition is that the National Engineering Policy Centre will be a trusted partner for policy makers, enabling them to access excellent engineering expertise, for social and economic benefit.

Engineering response to coronavirus (COVID-19): can you help?
The Royal Academy of Engineering has rapidly started various initiatives to leverage its expertise and networks both nationally and internationally to help solve critical challenges and assist the public health response.

> "An important role for scientists and engineers in government is to present evidence for the SRP-related subjects like sustainability and environmental damage. The key role for scientists is to help policy makers make the right decisions."
> **Dr Shabana Haque OBE, Royal Academy of Engineering**

Public perception and the role of SRP in engineering
How engineering can improve society with a better image

Dr Colin Brown, CEO of the Institution of Mechanical Engineers

Colin Brown started by saying that society is changing rapidly and there is an opportunity for engineers to improve people's interaction with society, improving its own public perception which is still outdated. The society has a relatively narrow perception of what engineers do and this limits the good engineers can do for society = the "hard hat" stereotype.

Safety is a big factor in perception.

Society has a good idea of the negative things that engineers do, more so than the positive, referencing a photo of a train crash. "Nothing upsets people more than if engineers kill people who are just walking by," Dr Brown said.

Autonomous cars, for example, are safer than human-operated cars, but accidents will still occur, and engineers will be blamed despite progress in the overall safety of transport.

"In order to have trains, power and cars, we will design systems that will still do damage to society at some point. "SRP in STEM is not about being perfect."

What do the institutions do?

80% of the public have never heard of the engineering and STEM institutions.

The Chartered Institute of Building conducted a survey on what construction professionals should do. This says you need to have "professional commitment" and then lists what this comprises. If you complete the check list, there is a sense that you have done your job. But ticking boxes will not stop engineering from going wrong, he said.

Dr Brown said when we create new codes, such as ethical codes, there is a risk that no-one will read them t or abide by them. He liked Dr Taylor's approach to examine the role of STEM in society as not having to solve problems, but having a more nuanced role and place.

The opportunity

The world is changing; society wants jobs but there is more automation. The 4th Industrial Revolution – digitalisation – will create new jobs. Tackle climate change but people want energy; the direct link between how much energy we consume, and quality of life is made possible by engineering.

Dr Brown said: "The world is not dying out; it is becoming a world that is desperate for engineers. We can accept failure; we just have to show that we are trying not to be a failure."

The IMechE made 2020 the "Year of Values" and many of these values are based on SRP.

It has also developed a professional **Code of Conduct**. This tests whether people behave differently when they are not being watched, a measure of SRP as it tests are totally natural behaviour.

As a profession, he said, engineering is not the best exemplar of applying Continuous Professional Development (CPD) to keep its skills up-to-date and it could introduce socially responsibility as part of that CPD.

> "Society is changing. There is an opportunity for engineers to improve our interaction with society and better explain what we do."
> Dr Colin Brown, IMechE

Trusting the engineering profession – ImechE report comparing total road deaths in UK vs deaths involved autonomous cars globally.
https://www.imeche.org/docs/default-source/1-oscar/reports-policy-statements-and-documents/public-perceptions-driverless-cars-2019.pdf?sfvrsn=8

Smart, safe cities and building trust – City of London
Digital Rights and Standards

Theo Blackwell, Chief Digital Officer, Mayor of London Office

Mr Blackwell's work is involved in making London a smarter city. This is a huge challenge: City Hall is a regional authority looking after >15 NHS Trusts, 32 boroughs and 48 universities.

The digital team must consider the emerging technologies in the city: in the transport system, the boroughs, the impact of these, and new tech on our streets like e-scooters.

The Mayor's office has been set London several big challenges, including becoming a zero-carbon city and that 80% of journeys should by walking, cycling or public transport by 2041. This will not happen without data and the mobilisation of people and experts

Data usage and AI is growing. With 5G it brings in a new era of machine learning and AI, and cities are where these technologies will be tried and tested

Theo said: "The CIO for Helsinki recently said there will be no AI without public trust."

Risks with data and ethics

As data capture in cities proliferates, there are real concerns about technology usage, data and in-built bias interpretation. Concern about misinformation and fake news. Job displacements, privacy, transparency. Autonomy and control – where is the human being in the decisions?
And will it lead to the centralisation of power?

The City of London has developed some tools to manage this.

There is a **Good Work Standard,** that calls for extra rights and benefits for workers in the gig economy. It also aims to make the technology workforce more reflective of the diversity in London.

It has joined a **Cities Coalition for Digital Rights** with other European cities with high standards of privacy protections for citizens.

And there is a **Local Digital Declaration**, signed by 150 local authorities, that affirms the city's collective ambition for local public services in the internet age, and our commitments to realising it. This includes challenging the technology market to deliver services London actually neds.

The City of London has devised Five principles in its Smarter London Together Road Map.

1. **Putting the user first**
   150 local authorities that will go further to redesign our services around the needs of our citizens. Change from solid, inflexible local government to way based on user-led design.

2. **We will build trust with data**

3. **Fixing the plumbing**
   London's approach to solving problems needs to recognise that most people don't have full knowledge of the technology. It will build trust with data.

4. **Digital leadership**

5. **Creating an open culture**
   This moves away from the idea that the public only sees the final consultation paper through the cabinet or the Mayor.

Further information related to the Digital Rights and Local Declaration could be found at: **https://localdigital.gov.uk/declaration/**

Social Responsibility though Social Value
The Social Value Act

Chris White, Director for the Institute for Industrial Strategy, King's College London

Formerly Member of Parliament for Warwick and Leamington, 2010-17.

As an MP, Chris was successful in the Private Member's Bill ballot. His PMB received cross-party support and gained Royal Assent in 2012. Now known as the Social Value Act (SVA), this legislation now influences somewhere in the region of £26bn (10%) of Government spending, a figure which is set to grow.

How does the concept of SRP works in practice? One vehicle for making SRP work, Chris suggested, is through the principles behind the Act. Commissioners, whether in local or national government, will look at the additional value attached to the contract; the social, environmental or economic value – its 'Social Value', such as how the contract will, for example, provide support for people who have been in long-term unemployment, have mental-health conditions or deliver a sustainable community-based project.

The concept of Social Value is gaining traction, and is finding an increasingly receptive audience, not least as we see a 'values based' society receiving an increasing level of attention, including at our universities. City University is playing its role, not least by promoting the idea of 'Socially Responsible Professionals' and hosting similar themed such events.

> "Sometimes there is still a reluctance to adopt the Act – there are fears that such contracts can be more expensive. But this is short-termist. Over the long-term, such contracts will be beneficial to communities, and society more widely. And by addressing some of our more complex challenges, our public services will also benefit."
> Chris White

Chris said that universities have a major role to play in the delivery of social value: 'their spending power has the potential to positively influence behaviours, and crucially, procurement departments have a good knowledge of the communities they serve. He looks forward to the level of interest in policy areas, such as the Social Value Act and the Social Enterprise sector in general, increasing steadily in both awareness and understanding.

> "You don't always enter [structural] engineering for the money. You do it to leave a positive mark on the built environment."
> Dr Colin Brown, IMechE

For more on the Social Value Act from Chris White, visit
https://www.gov.uk/government/publications/social-value-act-information-and-resources/social-value-act-information-and-resources

An Industrial Proposition for Developing Socially Responsible Professionals
Industry perspective

Jim Fairbairn, CEO of Megger

Megger is a Eu250 million instruments and electronics business with offices and operations in 40 countries.

He said engineers have come so far since he graduated; we can now detect cancer and heart conditions with wearable technology, and crop optimisation by using weather data.

Megger is looking at asset health and AI diagnostics.

He advocated CPD because some of what he learned in the 1990s has been replaced by technology. The business opportunities now for good engineering companies are exciting.

Megger has a talent challenge. The traditional talent management programme in industry has changed. This route is to develop people, reward them and retain them, but now we have to change because the traditional retention influencers don't work.

Megger is looking at the drivers, including **experiential development and intergenerational communication**. People now want to leave within 1-2 years if they are not getting the career opportunities. We need to be more flexible about organisational design and hierarchy.

In the past many graduates were single dimension, with a degree but little else or experience. Now companies need multi-dimensional people with experience, or a sandwich course. Are universities offering this?

Megger hosted a non-STEM round table. They put 10 graduates together and told them to list their top three attributes, what they wanted from an employer and why they would be an asset.

The results revealed that 1. Megger has a lot of gaps in what it could offer. 2. No-one rated SRP as a desirable feature of the company and 3. cultural diversity scored well and that is one of their values.

Megger has given three main areas for its HR leadership teams to focus on:

1. Relevance today and tomorrow – What do we need to look like in 5-10 years as an organisation?

2. Diversity – More than people alone, it's about the diversity of opportunity and thought

3. Investment – how best to invest effectively in these areas

Job-sharing: In an environment of core skills shortages and an ageing workforce, can creative action like job-sharing make a difference?

Sustainable relationships in sustainable development: Bringing the People Back In
Winning people's trust

Ms Nancy Nai-Huei Lu, Sustainability Strategist

Nancy Nai-Huei Lu, Co-Founder & Director, Briidge Sustainability Strategist & Policy Researcher, MSc International Social and Public Policy, LSE

Ms Nai-Huei Lu (Nancy) studies human interaction and ways societies organise themselves. She says learning about society has strong parallels with learning about STEM.

Nancy looked at the relationship between society and STEM specifically,

- What can happen when equations and codes are seen separately from human behaviour and interaction?

- How to bring people back into the STEM equations and codes to create sustainable development?

Using a metaphor, social scientists perceive STEM as a mirror that reflects our society. However, STEM is not a regular mirror, but a "funhouse mirror" that distorts the images slightly, so whatever is reflected is not the reality but an approximation of it.

In 2009, the Indian government introduced a biometric identification system to keep track of demographic information and to cut the costs of administration. More recently, it became apparent that there were some glitches in this cutting-edge innovation.

An example is Mr Maghi, who lived in one of the poorest states in north-east India and who survived on government subsidies. When the biometric system was introduced, his ID was not recognised, and he stopped receiving support. He was never able to correct the situation because he lived too far from a state ID centre. As a result, several months later Maghi starved to death.

Nancy said, "the distorted and simplified reality of the funhouse mirror ignored the intersectionality that Mr Majhi bore." STEM can be described as accurate, ethically neutral, predictable, reliable, systematic and so on. Yet vulnerable people in our society live in a parallel reality that is volatile, uncertain, complex and ambiguous.

The Indian biometric identification system by many accounts can be considered successful, but from a social responsibility point of view, it failed because it didn't ask who the people were that they were trying to help. Who was Mr Majhi? What was his everyday life actually like? What kind of neighbourhood did he live in? What did Mr Majhi care most about in his life?

The conclusion is that sustainable development can only be possible if STEM and social science start working together. Apart from developing skill sets, a multidisciplinary mindset is needed for next-generation STEM professionals to achieve greater social responsibility. This is what **Briidge**, the start-up that Nancy recently launched, aims to do: bringing people and citizens back into the equation of innovation, bridging rationality and incentives to achieve sustainable development goals of our society.

Professor Kieran Arasaratnam, from the Imperial College Business School described his personal experience to uphold social values within major conflicts.

The power of STEAM
Science, Technology, Engineering, Art and Mathematics

The symposium and panel debates mentioned that STEAM – incorporating art into the technical subjects of STEM – is just as important as STEM in adopting social responsibility.

Camden Council, a sponsor of the conference, in partnership with the Knowledge Quarter, has created a STEAM Commission, a STEM Hub and Camden's 21st Century Talent Pledge, to bring more of the borough's scientists, engineers, artists and school students together.

The Commission is chaired by Dinah Caine CBE and highlights Camden's significance as a centre for the creative, digital and scientific industries. It's aims to improve career opportunities for young people, and ensure businesses are able to benefit from the range of talent in the borough.

Commissioners representing educational, industry and community bodies produced a report that identifies actions for employers, schools and parents to help develop young people's skills and opportunities in the STEAM sector.

Responsible STEAM is also essential for Resilient Cities. This is highlighted by Mr Braulio Eduardo Morera, Director, 100 Resilient Cities (Rockefeller Foundation) during his keynote on 'The Future of Cities: where to start'.

Panel debate
The symposium ran two panel debates.

Panel debate 1 – Social challenges for the STEM professionals
Presented by: Will Stirling

Dr. Colin Brown, CEO, IMechE

Mr. Paul Jagger, FBCS, IBM

Dr. Lara Silvers, Associate Dean, City, University of London

Mr. Alastair Johnstone, MD, Bosch Rexroth Ltd

Mr. Sudip Trivedi, Head of Data and Analytics, Camden Council

Professor Claudia Eckert, Professor of Design, The Open University

Mr. James Morgan, Director, Heyne Tillett Steel (HTS)

The moderator (Will) asked:
- Was it challenging to apply social responsibility requirements to products and services, while keeping to a budget and at the required professional standard?
- Does a good CSR (corporate social responsibility) policy attract better candidates?

- Whether customers understand that social responsibility requirements must be applied in estimates and in work.

And more

- With 400,000 employees and a foundation structure, surplus money is dispensed by the foundation to causes supporting health, humanities and education. Social responsibility is in the DNA and in the values of the business (Alastair, Bosch)

- Before the centenary (2011), IBM's CEO launched a "values jam" to recalibrate the values of the business and find what made IBM great. All employees took part. It produced three core values of the company, one was Trust, another personal responsibility in all relationships, and society (Paul, IBM)

- SRP in our portfolio is very important; job candidates are now more socially and environmentally aware. They demand that we work on correct projects, questioning whether we work on airports and big polluting projects. If we do it must be done in the most sustainable way (James, HTS)

- Bosch agrees with the generational aspect; new people are coming in who are challenging us, and they have higher CSR principles (Alastair, Bosch)

- Climate change has made us question our own green credentials and that we comply with the Engineers Declare and Architect's Declare Initiatives. Your competitors are forcing you to do this too (James, HTS).

- Engineers understand they are part of a bigger machine, with good and bad parts. In order for us to ensure that car engine emissions are as small as possible, you cannot take a pariah view and only make "good" products. Many members tell the IMechE they are under pressure from society, for example oil & gas. (Colin, IMechE)

- STEM needs to work with the arts sector and embrace their skills, within "STEAM" initiatives. And research suggests that 40% of jobs in the future will be jobs we don't have yet (Sudip, Camden Council)

- Camden established a STEAM Commission, to identify good STEAM teachers in the borough to support. Some companies have employed local students to help them become STEAM employees. (Sudip, Camden Council)

- SRP supporters must focus on where the job is. Universities tried a technical qualification in Sustainability; one difficulty was the shortage of jobs where these students could go (Raj Roy, City)

- Social responsibility is a good way to attract more girls into STEM subjects. It's important to show to them that they can make a social difference rather than just make or use a crude technical device (Claudia, Open University).

Panel debate 2 – Social responsibility skills requirements
Presented by: Will Stirling

Mr. Jim Fairbairn, CEO, Megger

Professor Kieran Arasaratnam, Assoc. Dir (Soc. Eng.), Imperial College Business School

Mr Chris White, Director for the Institute for Industrial Strategy, King's College, London

Dr. Tatyana Micic, Associate Dean, City, University of London

Mr. Alastair Johnstone, MD, Bosch Rexroth Ltd

Mr. Sudip Trivedi, Head of Data and Analytics, Camden Council

Professor Claudia Eckert, Professor of Design, The Open University

The moderator (Will) asked:

- Should there be modules on social responsibility in STEM FE and HE courses?
- How to build SRP into the STEM curricula as new technology changes?

And other questions.

- SRP could be a pathway for some but not all STEM and design courses. They should be distinct (Claudia, Open University)

- There could be both a fixed and a modular system, for different courses and students. In the 1990s-2000s engineering education was a "push" approach; we need a "pull" approach. SRP can help (Jim, Megger)

- Everyone [in business and academia] should be engaged with social responsibility. We have to start at primary school then keep engagement up. Schools struggle with engineering engagement projects, some stick and many don't (Chris, Kings).

- International Baccalaureate (IB): To develop SRP in STEM and modernise STEM in primary and secondary education, look at the IB. It assesses what a course should but then, using different strategies, a group decides how it is taught, and implementing critical thinking and problem-solving (Amalia Petrova, delegate).

- Social Responsibility should not a be a module. Each course component should have values built-in to it (a delegate).

- There should be more CPD (continuing professional development) on social responsibility for academic staff (a delegate)

- HE and employers should work on culture and building qualities like perseverance. "No-one should be allowed to 'do bad', or not do good, make the organisation somewhere where members want to do social good." Make avoiding unconscious bias compulsory (Sudip, Camden Council).

- 25-years ago City trading floors and banking was all about getting the job and money and nothing about regulation or CSR / SRP, people would wait for a crisis to occur and then apply a "force field" response. Technology was only used to make money. Today blockchain, artificial intelligence and computer science are performing social good (Kieran, Imperial).

- The Gandhi Centre for Inclusive Innovation went on the "milk round" to find the best companies whose new recruits had social awareness for their projects. Few candidates were suitable (Kieran, Imperial).

- The academic world is inert and slow moving to adapt to digital needs (Tatyana). Since the symposium in January, the covid-19 pandemic has pushed universities to adapt to a digital business model. There is a need to better understand the social impact of the digital model.

- Do people have the right skills to negotiate the contradictory requirements involved in social responsibility and doing business? These are specific skills (Chris, Kings)

- Bosch tries to understand how young people think and work. Most of the young are more socially aware than businesses. We require many bright people, but we are also looking for attitude and application, which puts the heat on academia to do better to prepare people for business (Alastair, Bosch and Jim, Megger together).

- "It's not about educating students but about educating teachers and lecturers. They need career development courses on ethics and regular "sandbox" meetings to swap best practice. (Ahmed, delegate)

- Don't develop skill sets, develop "mindsets". The next generation of STEM professionals would prefer to do their own diagnoses than be given prescriptions (Nancy Lu)

Summary
Calls to action

What conclusions should we take from this report?

1. **Professional institutions should work together.**
   The formation of the National Engineering Policy Centre to improve communication between the engineering community and policy makers is a good start. But the boundaries of these professional STEM organisations is getting blurred and institutions need to work together more on the SRP agenda.

2. **Establish the need and the will to get social responsibility into course curricula**
   Should socially responsible topics be covered in every formal STEM qualification? What does the Department for Education, the STEM institutions and examination boards think? Is there enough time in the syllabus to add more SRP content?

3. **Data ethics: set standards**
   Data ethics is equally valid now for engineers and mathematicians as for computer scientists = there is no difference in the need for ethics for each.

4. **Assign leaders to drive the SRP and ethics agenda**
   We need leadership here. The government should take a lead in ethics, and make the next generation of STEM leaders with social responsibility training and culture at the core. A more ethical STEM market will make the UK more attractive to work in.

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