Data visualisation / Immigration detention law / Employee-owned business / Middle Eastern politics / Quality of life in older people / The European Social Survey / Biomedical engineering / Food policy / Cavitation in fuel-injection systems / Early detection of glaucoma / Impunity and the rule of law / Eyewitness testimony and autism / Treating aphasia / Criminal evidence / The dangers of overworking / Measuring populations / Geotechnical engineering / Digitising touch, smell and taste / Predicting life expectancy / The law of evidence / Adolescent speech and language / The largest-ever telemonitoring study / Collaborative mental health nursing / Tax havens and offshore finance / The fabric of space-time / Financial crises / Iranian music
City is a leading global university (among the top five per cent of universities in the world) and the only university in London to be both committed to academic excellence and focused on business and the professions. The December 2014 Research Excellence Framework (REF2014) results were exceptionally important for City. In less than three years the University made a greater improvement in research quality, per Funding Council research pound, than any other UK university.

This leap has moved the University to a position where 40% of academics are now producing research that is world-leading or internationally excellent, up from 20% in 2010.

The REF2014 results show a significant improvement in City’s research standing. Some 75% of City’s submission was rated as being of world-leading 4* (23%) and internationally excellent 3* (52%) quality. This strengthens the University’s position in the sector and represents a marked increase compared to the last Research Assessment Exercise (RAE) in 2008, when 51% of research at City was rated as 4* (15%) and 3* (36%) quality.

Some 20% of the criteria for assessing REF2014 were based on impact, with the submitted impact case studies being assessed for their ‘reach’ and ‘significance’.

The aim of this publication is to give a flavour of the outstanding work that City academics are producing and the wide-ranging impact this is having beyond the institution. The majority of research featured here was submitted to REF2014 in the form of impact case studies that played a key role in the University’s outstanding results.

I hope you enjoy reading Research Impact.

Professor Paul Curran
Vice-Chancellor

“A welcome from the Vice-Chancellor

Welcome to Research Impact, a special publication that profiles the wide range of research being produced by City University London academics, in particular the impact their work is having on wider society.

City is a leading global university (among the top five per cent of universities in the world) and the only university in London to be both committed to academic excellence and focused on business and the professions.

The December 2014 Research Excellence Framework (REF2014) results were exceptionally important for City. In less than three years the University made a greater improvement in research quality, per Funding Council research pound, than any other UK university.

This leap has moved the University to a position where 40% of academics are now producing research that is world-leading or internationally excellent, up from 20% in 2010.

The REF2014 results show a significant improvement in City’s research standing. Some 75% of City’s submission was rated as being of world-leading 4* (23%) and internationally excellent 3* (52%) quality. This strengthens the University’s position in the sector and represents a marked increase compared to the last Research Assessment Exercise (RAE) in 2008, when 51% of research at City was rated as 4* (15%) and 3* (36%) quality.

Some 20% of the criteria for assessing REF2014 were based on impact, with the submitted impact case studies being assessed for their ‘reach’ and ‘significance’.

The aim of this publication is to give a flavour of the outstanding work that City academics are producing and the wide-ranging impact this is having beyond the institution. The majority of research featured here was submitted to REF2014 in the form of impact case studies that played a key role in the University’s outstanding results.

I hope you enjoy reading Research Impact.

Professor Paul Curran
Vice-Chancellor

“City has made a greater improvement in research quality, per Funding Council research pound, than any other UK university.”
The Research Excellence Framework 2014 in review

An evaluation of City University London’s rapid rise to its post-REF2014 standing.

What is REF?
The Research Excellence Framework (REF) is the successor to the Research Assessment Exercise (RAE), a method of assessing research quality at British higher education institutions. It took place during 2014 and considered research published from 2008 to 2013. The results were released in December 2014.

REF2014 was conducted jointly by the Higher Education Funding Council for England (HEFCE), the Scottish Funding Council, the Higher Education Funding Council for Wales and the Department for Employment and Learning, Northern Ireland.

A significant distinction between RAE and REF is that the new system gives weight to the ‘impact’ of research, which HEFCE defines as encompassing impact upon “the economy, society, public policy, culture and the quality of life”. A large proportion of research at City is focused on having an impact beyond the institution, with HEFCE’s focus on impact meaning greater recognition for the University’s output.

Research at City University London
The University is proud of its research pedigree which spans more than a century. During that time, it has made notable contributions through basic and applied research to a wide range of fields.

Today, City’s research and enterprise activities are more exciting and diverse than ever and staff are passionate about the vital role that research plays in exploiting and disseminating new ideas. City's research activity is guided by excellence, creativity, innovation and interdisciplinary collaboration.

Importantly, the research outlook is truly global: to work to international levels of research excellence and cultivate a network of international research partnerships. Academic staff engage with their subjects through high-quality research and enterprise. They use the up-to-date knowledge and enthusiasm generated by their research to enrich the education of their students.

Groundbreaking research takes place within City’s Schools and Departments, in specialist Research Centres and in strategic Interdisciplinary Centres. Since 2011 the University has invested in research-excellent academics whose work has a wider impact on society. Throughout this publication readers will appreciate the extensive impact that City research is having beyond the institution.

City and REF2014
City University London submitted to REF2014 a total of 1,592 academic outputs (such as journal articles) and 49 impact case studies from 378 academic staff (full-time equivalent) in 12 subject areas, referred to as Units of Assessment (UoAs). This represented 5.3% of eligible academic staff compared to 49% in RAE2008. As a result, while 25% of eligible academic staff were assessed as producing 4* and 3* research in RAE2008, this increased significantly to 40% in REF2014.

Increased quality of research
The following table shows the increase in the proportion of 4* and 3* research in City’s submissions to RAE2008 and REF2014 across the University’s five Schools and the various UoAs.

Grade Point Averages
The results of the REF are often presented as Grade Point Averages (GPAs) which range from a minimum of zero to a maximum of four. The graph below shows how City improved in 10 UoAs compared with RAE2008 (there was no comparable UoA for Politics in RAE). The most substantial increases are in Business, Health and Mathematics.

In summary, City’s performance in REF2014 has demonstrated that it is now a university whose research has strength and breadth. Many of its Schools and Departments are now in the top 20 or 30 in the UK, with Cass Business School rated sixth for 4* and 3* Business and Management research and seventh overall.

The effects of City’s research are felt around the world and this impact is a major contributor to its excellent REF2014 results.

For more information visit: www.city.ac.uk/research/ref-2014

The Research Excellence Framework 2014 in review

An evaluation of City University London’s rapid rise to its post-REF2014 standing.

What is REF?
The Research Excellence Framework (REF) is the successor to the Research Assessment Exercise (RAE), a method of assessing research quality at British higher education institutions. It took place during 2014 and considered research published from 2008 to 2013. The results were released in December 2014.

REF2014 was conducted jointly by the Higher Education Funding Council for England (HEFCE), the Scottish Funding Council, the Higher Education Funding Council for Wales and the Department for Employment and Learning, Northern Ireland.

A significant distinction between RAE and REF is that the new system gives weight to the ‘impact’ of research, which HEFCE defines as encompassing impact upon “the economy, society, public policy, culture and the quality of life”. A large proportion of research at City is focused on having an impact beyond the institution, with HEFCE’s focus on impact meaning greater recognition for the University’s output.

Research at City University London
The University is proud of its research pedigree which spans more than a century. During that time, it has made notable contributions through basic and applied research to a wide range of fields.

Today, City’s research and enterprise activities are more exciting and diverse than ever and staff are passionate about the vital role that research plays in exploiting and disseminating new ideas. City’s research activity is guided by excellence, creativity, innovation and interdisciplinary collaboration.

Importantly, the research outlook is truly global: to work to international levels of research excellence and cultivate a network of international research partnerships. Academic staff engage with their subjects through high-quality research and enterprise. They use the up-to-date knowledge and enthusiasm generated by their research to enrich the education of their students.

Groundbreaking research takes place within City’s Schools and Departments, in specialist Research Centres and in strategic Interdisciplinary Centres. Since 2011 the University has invested in research-excellent academics whose work has a wider impact on society. Throughout this publication readers will appreciate the extensive impact that City research is having beyond the institution.

City and REF2014
City University London submitted to REF2014 a total of 1,592 academic outputs (such as journal articles) and 49 impact case studies from 378 academic staff (full-time equivalent) in 12 subject areas, referred to as Units of Assessment (UoAs). This represented 5.3% of eligible academic staff compared to 49% in RAE2008. As a result, while 25% of eligible academic staff were assessed as producing 4* and 3* research in RAE2008, this increased significantly to 40% in REF2014.

Increased quality of research
The following table shows the increase in the proportion of 4* and 3* research in City’s submissions to RAE2008 and REF2014 across the University’s five Schools and the various UoAs.

Grade Point Averages
The results of the REF are often presented as Grade Point Averages (GPAs) which range from a minimum of zero to a maximum of four. The graph below shows how City improved in 10 UoAs compared with RAE2008 (there was no comparable UoA for Politics in RAE). The most substantial increases are in Business, Health and Mathematics.

In summary, City’s performance in REF2014 has demonstrated that it is now a university whose research has strength and breadth. Many of its Schools and Departments are now in the top 20 or 30 in the UK, with Cass Business School rated sixth for 4* and 3* Business and Management research and seventh overall.

The effects of City’s research are felt around the world and this impact is a major contributor to its excellent REF2014 results.

For more information visit: www.city.ac.uk/research/ref-2014
Shaping policy

The political, societal and economic challenges facing local and national governments and international bodies are becoming increasingly complex. City academics have been called upon to contribute to political debate and share their expertise with political leaders, ultimately informing public policy.
The ever-changing political situation in the Middle East is complicated and has no easy answers. But thanks to the research of academics such as Professor Rosemary Hollis at City University London's Centre for International Policy Studies (CIPS), policymakers have access to a depth of information, insight and knowledge of the region’s complexities as they identify their policy options.

Political, business and military leaders in the UK, the EU and beyond can look to City academics to help them consider the implications of different policy approaches and the impacts they will have. This is particularly the case in the context of the Arab uprisings of 2011 and the associated war in Syria, renewed conflict on the Israeli-Palestinian front and the challenge posed by Islamic State (IS) to the future of Iraq and its neighbours. The purpose of CIPS is to enable purposeful interaction between academics and practitioners in a format more commonly identified with policy think tanks than with academia.

Professor Hollis, the founding director of CIPS, worked for two leading British think tanks, the Royal United Services Institute for Defence Studies and the Royal Institute of International Affairs (Chatham House) over a period of 18 years before she joined City in 2008. Her research since joining the University formed the basis of a REF-submitted impact case study titled: Challenges for and Assessment of British and EU Policies in the Mediterranean Neighbourhood (Relating to ‘Arab Spring’ and Syria Crisis in particular).

The research underpinning the impact involved the investigation of documentary and media sources covering a 20-year period, interviews with decision-makers and practitioners and workshops with fellow academics, politicians, business leaders and armed forces. It is research that has informed and shaped media coverage and civil society debate, particularly with regard to Arab uprisings during the period 2009-12.

Sharing expertise

Drawing on its expertise in international politics and related disciplines, CIPS provides an umbrella for City academics to share the findings of their work with practitioners interested in exploring issues. Based on her experience, Professor Hollis knew that by inviting decision-makers working in different sectors to discuss contemporary global issues with each other and leading academics, a deeper level of understanding of complex political, economic and social trends could be attained. This ethos defies the notion that academics are divorced from the real world and recognises that practitioners will not necessarily listen to experts just because they know their subjects. Decision-makers want pointers and insights and are more likely to embrace them when they share in the process by which they are identified.

Forecasting scenarios

Professor Hollis has concentrated on three areas of interconnected research: contemporary UK policy in the Middle East, EU policies in the Mediterranean and international involvement in the Israeli-Palestinian conflict. In keeping with the CIPS approach to engagement with practitioners, when she was asked to write a paper on the potential for humanitarian intervention in Syria in 2011, to brief EU practitioners, she formulated options based on an outline of three scenarios for developments in Syria and their implications. The value of this approach was demonstrated when her scenarios were used as the basis for broader discussion among policymakers and humanitarian aid workers with UN officials. The verdict at the UN was to pursue a diplomatic initiative headed by Kofi Annan to deal with the Syria crisis, an approach that academics cannot always foresee. As Professor Hollis’s scenarios foresaw.

Commenting on her work, Professor Hollis says: “Academics cannot always publicise those instances when they are asked to contribute to policy discussions because officials want to be able to ‘think out loud’ and explore options without fear of attribution.

While academics can and should be ready to speak openly and substantiate their insights and recommendations with scholarly published research findings, if they want access to policymakers they may well have to forgo receiving recognition for the influence they have.”

Impactful investigations, essential advice

Nonetheless, Professor Hollis believes she can claim credit for her input to a series of bilateral British-Turkish consultations on Middle East issues known as Jtil Di. At one such forum in October 2011, she presented her research findings on the UK’s response to the Arab Spring to complement those of a Turkish academic on Turkey’s response. By telling it as she saw it, she triggered a vigorous debate among the British parliamentarians at the meeting that contributed to franker and more productive bilateral engagement. On a separate note, when the UK government invited written evidence on the ‘balance of competences’ between the UK and the EU with respect to foreign policy, Professor Hollis’s contribution on the impact of UK and EU policies in the Mediterranean region was quoted in the final report. Professor Hollis’s research has influenced policymakers at an international level and has led to requests for her to provide commentary for The Guardian, The Sunday Times, LA Times, International Herald Tribune and Reuters. With instability in the Middle East likely to continue for the foreseeable future, it is clear her research expertise and City’s ability to lead the way in crucial, specialist and impactful investigation will be called upon for many years to come.
Food under the microscope

The academics at the Centre for Food Policy (CFP) have spent much of their careers driving home the message that food matters. A growing awareness of its impact on public health and the environment suggests that both the general public and policymakers are now ready to listen and change.

Professor Tim Lang, Professor Martin Caraher and Dr David Barling are major players in UK and international food policy conversations.

They sit on advisory boards, work with government, industry and NGOs to establish policy frameworks and give speeches about their research at international conferences. As Professor Lang notes, “there are only three of us, but we are noisy; we have an impact bigger than our sum”. Indeed, the trio had not one but two impact case studies submitted to REF 2014.

The first, titled Food Citizenship and the Public Interest, used applied research to develop ‘public interest’ approaches to understanding the relationships between food and health, social justice and the economy.

They were invited by Oliver and the Prince of Wales to a stakeholder meeting on cooking and food skills, prior to the publication of a School Food Plan, on which the CFP were consulted and which was presented to the Secretary of State. The second impact case study, Integrated and Sustainable Food Systems: Influencing Policymakers, analysed the dynamics of the food system and how policy shapes and addresses its challenges, with CFP’s influence taking two forms: injecting high-level policy makers. By way of an example, media coverage of the 2013 horse meat scandal illustrated how much the contents of our plates have become part of the public debate. The CFP’s three lead academics had crucial roles to play in advising the major players, including NGOs, small-scale growers, government agencies and major suppliers. For the latter group the academics serve as what Professor Lang describes as “firm but acceptable critics”.

David Croft, former Director of Quality and Technical at Waitrose and now Director at Diageo agrees about the impact the CFP is having: “By discussing important subjects with passion, commitment and intelligence and in ways that are relevant to their audience, Tim, David and Martin influence people very effectively.”

The Centre for Food Policy researches and educates on how policy-making processes work and how they reflect and shape the nature of food supply and consumption. It is interested in the place of food policies in society and their impact on health, environment, social justice and the economy.

Telemonitoring in healthcare

With people living longer, society is presented with significant healthcare challenges. City University London has helped to deliver the largest-ever telemonitoring study to overcome some of these challenges.

City academics led the largest randomised control trials of telehealth and telecare in the world, working alongside colleagues from Imperial College, Manchester and Oxford universities, London School of Economics and the Nuffield Foundation. Involving 250 GP surgeries across three sites in the UK and around 6,200 patients, the study examined whether using assistive devices to monitor patients remotely could make a significant difference to health.

Launched in May 2008, the Whole System Demonstrator (WSD) Evaluation investigated the effects of two broad classes of telemonitoring technologies, telehealth and telecare, on a comprehensive range of outcomes in regions of England with integrated services. The study was commissioned and funded by the Department of Health.

Telehealth involves the monitoring of physiological data, for example, blood pressure and blood glucose levels, which requires the active participation of patients, while telecare uses a combination of remote sensors and alarms which monitor the person’s state automatically. Usually established in a home environment, telecare equipment can enable people to live more independent lives as any sudden changes such as a fall or sudden rise in temperature can notify people at a control centre nearby.

Lead author Professor Stanton Newman, Professor of Health Psychology and Dean of the School of Health Sciences at City, says: “Telehealth and telecare have the potential to make a significant difference to people’s lives and to healthcare delivery. Hopefully this large series of studies will shed greater light on the challenges and opportunities present in telemonitoring, enabling us to deliver more effective healthcare in the future.”
Success that’s working for the workers

The traditional idea of how businesses are run may be changing. No longer is the economy reliant principally on private and shareholder-owned businesses. Research by City University London has come to the attention of senior politicians. With more and more companies becoming owned by their staff, the age of the employee-owned business is coming.

In 2007, two Cass Business School academics, Professors Joseph Lampel and Ajay Bhalla, began researching the impact that ownership structure has on decision-making and company performance. A year later they designed and undertook a study for the John Lewis Partnership, which proved to be the starting point for research into employee-owned businesses (EOBs) that has changed the perception of their advantages.

Employee-owned businesses are worth an estimated £25 billion in annual turnover, or around 2% of the UK’s GDP. It covers a range of sectors including retail, manufacturing, engineering and financial services. EOBs are also service providers in public sector areas such as health and community care.

The story so far

Before the global recession of 2008, EOBs were already enjoying greater employee growth than conventional businesses. In fact, between 2005 and 2008, EOBs saw an average employment increase of around 7.5% a year, compared with less than 3.9% in non-EOBs. After the recession this rate grew, with EOBs increasing employment numbers by more than 12.9% compared with 2.7% in non-EOBs.

Real value to employees and the economy

Research shows that EOBs create jobs faster and nearly 75% of EOBs feel strongly that gaining employee commitment is a big advantage of the employee-owned (EO) model. EOBs are critical to long-term economic sustainability, while recruitment and retention of their staff are crucial to economic recovery. Because they’re less concerned with short-term efficiency and costs, EOB workers tend to have a longer-term view of their involvement and the financial success they’ll be part of, compared to those in non-EOBs. There is also evidence that EOB profits have a direct connection to employees having been given greater independence in decision-making.

The research also shows that employees with a stake in where they work are more committed to providing high-quality service and are more flexible in responding to the needs of the business. This increased flexibility in the workforce helps encourage new initiatives and improves productivity. Employees also want to stay (and stay longer), they get more financial rewards through sharing profits, have greater job satisfaction and feel happier. The surrounding communities benefit too, by receiving more personal service and through charitable activities and volunteering.

EOBs’ performance tends to be more stable than that of non-EOBs, with revenues less affected during a recession. This was clearly shown by the difference in EOB sales growth of 11.08% compared to non-EOBs’ paltry 0.61%, when the economy was in recession between 2008 and 2009.

Growing gains

However, it’s not all plain sailing for EOBs. The Cass research shows that while EOBs that adapt their structures and give their employees more decision-making powers may be more likely to sustain their performance as they grow, they must constantly find new ways to keep their staff involved. So it is vital that managers continually seek new ideas from staff and involve them in key business decisions.

Professors Lampel and Bhalla found that EOBs with high numbers of staff experience lower levels of employee involvement when it comes to new product decisions and company strategy. As the distance between front-line employees and senior managers increases, the EOB grows in size and complexity, they face significant challenges in how they manage themselves. The advantages of employee ownership when a business is small are challenging to replicate when it becomes as big as John Lewis, for example. It is more difficult to maintain inclusive decision-making without becoming slow and inflexible, because the businesses introduce more controls and structures that reduce the advantages of employee involvement and participation. Management must therefore balance the need to increase control with maintaining their flexibility to make sure they retain their employees’ interest and involvement.

Professors Lampel and Bhalla’s research shows that EOBs that take steps to adapt their organisational structures and empower their front-line employees are more likely to sustain their performance as they increase in size.

Into the future

The research makes political news. It has been mentioned in the House of Lords as an alternative to the reliance of the UK economy on private and shareholder-owned businesses and an alternative to privatisation. The findings were also cited in a report by Cooperative Development Scotland and another by the Wales Cooperative Centre’s Bevan Foundation.

In a speech on responsible capitalism in January 2012, Deputy Prime Minister Nick Clegg talked about City’s research, saying that EOBs “have lower absenteeism, less staff turnover and lower production costs. In general (EOBs) have higher productivity and higher wages. EOB firms weathered the economic downturn better than conventional businesses”.

In February 2012, the Department of Business, Innovation and Skills initiated the Nutsall Review of Employee Ownership and invited Professors Lampel and Bhalla to contribute. This research provided even more evidence in support of the EO model.

In March 2013, Nick Clegg supported a call from the Employee Ownership Association for a tripling in the contribution of EOB firms to the UK’s GDP by the year 2020.

The evidence put forward by Professors Lampel and Bhalla on the resilience and flexibility of EOBs and the obstacles facing them played an important part in new government policy in July 2013. The government is now committed to investing £50 million each year to help support EOBs and to make it easier to establish new ones. It is also considering how to use the research in policies affecting the public sector, especially in health and social care, where encouraging the EOB model could prove beneficial.

In 2014, Professors Lampel and Bhalla released a follow-up study and hosted Treasury Secretary Danny Alexander at Cass to speak on EO in the 21st century. And in 2015 they presented their policy-shaping work at the Hans Böckler Foundation in Dusseldorf, Germany.

In summary, the research has had a substantial impact on government policy and has given employees of EOBs confidence that they can take control and reap rewards, it is evidence of the vital part City plays in research that affects wider society.

Professor Lampel now holds the Eddie Davies Chair at the University of Manchester, while Professor Bhalla is Professor of Global Innovation Management at Cass.
The 2007/08 financial and economic crisis highlighted the importance of interconnectedness among financial institutions and markets as well as the inadequacy of pre-crisis supervisory regimes. These regimes monitored financial stability at the level of individual financial institutions and neglected regulation which would target systemic instability by focusing on the interconnectedness of the system.

A strict objective of maximising stability at the level of individual institutions can have the unexpected effect of decreasing systemic stability.

The crisis led to calls from policymakers for new models to be developed that were better equipped to deal with financial connectedness and interdependency than those which had been used in the past. In a famous address shortly after the crisis, Jean-Claude Trichet, then President of the European Central Bank, said: "In the face of the crisis we felt abandoned by conventional tools." He advocated an interdisciplinary approach for studying financial-economic crises that would combine complex system analysis with agent-based modelling approach (ABM) used by some economists.

Olivier Blanchard, Chief Economist at the International Monetary Fund, blamed standard economic models for failing to describe the financial-economic crisis because they did not pay attention to "the dark corners where the economy can malfunction badly". Blanchard stressed the role of nonlinearities and how small shocks to nonlinear systems can have large effects and lead to crises.

In November 2011, along with City University London colleagues in the Economics Department, I joined an EU interdisciplinary collaborative project, the Complexity Research Initiative for Systemic Instabilities (CRISIS), whose aim is to develop a complementary, network-oriented research programme built around agent-based complexity models with nonlinear feedbacks that can explore the dark corners of the economy. Unlike conventional macroeconomic models, which stress forward-looking behaviour by farsighted and rational, often representative, agents at the expense of the ‘plumbing’ (i.e., the interconnections) of an actual economy, ABMs have the advantage of simplifying behaviour at the individual level. They assume that agents follow their set of interconnections in far greater detail. In particular, ABMs can follow the behaviour of agents in rapidly evolving dynamic settings and see how this both determines and is determined by the emergence of crises and collapses.

Well before the 2007/08 events, my colleague in the Economics Department Saqib Iafary and I had studied the role of the interbank market in both promoting and undermining the systemic stability of the banking system. Because banks operate by issuing liquid liabilities (such as chequing accounts) and investing the funds in illiquid assets (such as mortgages and business loans), individual banks may not always be able to meet all their liquidity needs from their reserves and the interbank market is a source from which banks facing liquidity shortfalls can borrow funds from other, liquid banks.

In our 2006 paper (published in the Journal of Economic Behaviour and Organization) we showed that, when banks are homogenous in size and risk characteristics, the interbank market acts as an effective shock absorber for individual fluctuations in liquidity needs. The interbank market is a source from which banks facing liquidity shortfalls can borrow funds from other, liquid banks.

But when banks are heterogeneous, contagion effects may arise, particularly following the default of highly interconnected banks: the so-called ‘too connected to fail’ syndrome. Direct contagion driven by creditor defaults, while increasing with connectivity, explains only a small percentage of the overall failures. Rather, simultaneous defaults arise spontaneously as the system reaches a critical state as a consequence of its own intrinsic dynamics.

Much work remains to be done in order to develop a generation of macro-financial ABMs ready to assist policymakers in managing and preventing extreme events and monitoring crises. These ABM models are likely to provide policymakers with a deeper understanding of key relationships in the economy and the ability to more accurately assess the impacts and risks of interconnections options.
Huge steps towards better care for older people

City University London is helping to lead the way to better futures for older people. In 2006, Help the Aged (later merged with Age Concern to form Age UK) in collaboration with the National Care Forum (representing the not-for-profit care sector) commissioned research that would improve quality of life in care homes for older people. City's Professor Julienne Meyer CBE was invited to take charge of the project and My Home Life was born.

The My Home Life (MHL) study findings help policymakers at local and national level have a better understanding of the issues facing care homes for older people, provide them with a framework for 'best practice' and give older people more choice and control over their lives. Across the UK there are over 18,000 care homes, providing housing with care for approximately 400,000 older people, including some of the most vulnerable citizens in society today. Care homes have long faced a host of complex challenges. They must deal with difficulty in securing investment; problems with staff recruitment, retention, training and wages; negative public perceptions; older and sicker residents; and increased public expectations. Care homes are also having to cope with significant cuts in public spending and cuts in the health and social care system.

Clearly the care home sector will play an ever-increasing role in supporting older people with complex health and social care needs, so we all need to better support them to do this.

The continuing MHL study was based on working with successful care homes to discover how they promote the well-being and independence of residents and develop effective leadership and management. With government and the healthcare sector needing support to improve standards of care, MHL focused on the best approaches to give older people a better life. The aim for MHL was to share the lessons learned and become a recognised voice in the sector. The University's secondment (and subsequent recruitment) of Tom Owen from Help the Aged as MHL's Co-Director was key to this aim.

Research that is changing lives

Despite significant levels of disability and frailty, residents were mainly being cared for by low-paid, poorly qualified social care workers, not healthcare professionals. Given the limited status and pay of staff working in care homes and the physically and emotionally exhausting nature of the work, it is understandable that staff problems were identified as a key obstacle. Through MHL, managers can be effective in supporting staff to ensure care revolves around the choices of older people. This way staff are more able to connect with older people as individuals and understand and respond to their interests, opinions, aspirations and needs.

Positive relationships were found to underpin much of the good practice observed in the MHL study. Where these relationships are absent, residents are at risk of being unseen, unheard and treated as 'objects of care' rather than active participants in decisions that affect them. Where there is a community that supports older people, relatives and staff, a greater connection is developed. Therefore MHL aims to strengthen relationships between care homes and the wider community.

Research showed the importance of helping older people to have more voice, choice and control about what happens to them. This means helping to maintain their identity, involving them in decision-making and positively connecting them with others.

MHL found that volunteering in care homes is in many ways a forgotten area and could help residents lead more meaningful lives as well as help the public be less fearful of care homes and the end stage of life.

Outside the care homes themselves, those in charge of policy should encourage or require care home owners to give managers regular access to external sources of support and practice development and consider the value of partnership programmes such as MHL. So far MHL has sustained 700 care home managers across the UK through its Leadership Support & Community Development programme (LSCD). Feedback revealed that changes in leadership style have led to better relationships between staff and residents and their relatives.

Managers argued strongly for a reduction in the volume of paperwork to give them more time to work with their staff to improve practices. Care home providers and statutory agencies should consider how unnecessary paperwork reduces the capacity of care homes to respond to the needs of older people.

It is also important that MHL partner organisations help to promote care homes as a positive option for older people by identifying and sharing good practice through their websites and other communication, to encourage a more balanced and fair reporting of care homes in the media.

Evidence: what MHL research has achieved

MHL research has provided a framework for improvement in care homes by highlighting issues affecting the sector, testing new ways of working and creating leadership training initiatives. The influence of MHL has had a significant impact across the UK and further afield. The government highlighted MHL as a 'recognised quality scheme' in its Caring for our Future white paper while internationally, MHL has influenced policy in care homes in Austria, Germany, Italy, Luxembourg and the Netherlands.

MHL has become the recognised voice for quality in the care home sector. It has helped to improve relationships in care homes and afford residents more dignity, respect and fulfilling lives. Professor Meyer and Tom Owen's research is also having a significant impact influencing government policy and informing practice improvement around the world.

In recognition of her work as the driving force behind My Home Life, Professor Meyer was awarded a CBE in the 2015 New Year Honours list for her services to Nursing and Older People.
Tackling glaucoma

City University London research is demonstrating that early detection and management of glaucoma can help prevent patients losing their sight.

City academics have been exploring new ways to improve assessment, awareness and treatment of glaucoma, since uncertainty and inconsistency in clinical practice often mean that some patients fail to receive the best possible care.

Glaucoma, a group of eye diseases which cause progressive damage to the optic nerve, affects around two per cent of people aged over 40 and almost 10 per cent of those over 75 and leads to more than a million hospital visits every year. Once somebody loses sight through glaucoma it cannot be restored, so early detection and appropriate management are absolutely critical.

City's Professor David Crabb has highlighted the limitations of standard techniques to detect glaucoma, leading to the jointly developed Moorfields Motion Displacement Test (MDT). The MDT won the Medical Research Council’s Translational Research Innovation Award 2008 and was one of Research Councils UK’s Big Ideas for the Future in 2011.

Professor Crabb’s work with the University of Aberdeen has changed how the NHS monitors patients at risk of glaucoma, while his videos of driving simulations have been used by the BBC and the International Glaucoma Association to raise awareness. More recently published research in The Lancet has explored the advantages of different monitoring intervals for glaucoma and proven the effectiveness of modern treatment.

Glaucoma-related hospital visits are a major burden on the NHS and making greater use of community optometrists could create significant savings. With this in mind, City’s Professor David Edgar and David Parkins from Bexley Care Trust collaborated on a project encouraging community optometrists to conduct repeat measurements on patients with suspected glaucoma before referring them to hospital.

The results were dramatic. After repeat measurements, 76 per cent of patients no longer needed referrals, meaning major cost savings for the NHS of up to £10 million per year. Based on this, NHS London has rolled out a repeat measures scheme across South East London which has been adopted in schemes across England.

City's research has enhanced the understanding, diagnosis and care of glaucoma. It has enabled National Institute for Health Research funding to contribute directly to award-winning, globally adopted technology, shape guidelines and training, set standards, create cost savings and, crucially, improve services for patients.

Setting a new national standard

Another project led by City’s Professor of Clinical Visual Science Professor John Lawrenson has drawn on his expertise in developing competency frameworks using the Delphi consensus technique, a structured communication technique originally developed as a systematic, interactive forecasting method which relies on a panel of experts. Guidelines produced by the National Institute for Health and Care Excellence recommend that healthcare professionals involved in glaucoma care should have a specialist qualification so the College of Optometrists commissioned Professor Lawrenson’s team to develop a competency framework and curriculum for specialist training, which is now the national standard.

City’s research has demonstrated that early detection and management of glaucoma can help prevent patients losing their sight.
Reducing the consequences of aphasia

Aphasia is a language disorder that is usually caused by stroke. It affects 250,000 people in the UK, with 20,000 new cases each year. The condition can virtually eliminate speech and deprive the affected person of reading, writing and comprehension. Research at City University London has had a major impact on the assessment and treatment of aphasia, while approaches developed at City have been adopted all over the world and recommended in national and international clinical guidelines.

Better treatments for aphasia patients
City’s research into aphasia, led by Professor Jane Marshall, has generated novel therapies that significantly enhance the language and communication of those affected. Treatments have targeted a range of skills including word finding, sentence building and compensatory strategies such as the use of gestures. The work continues with innovative new projects that engage technology to reduce the effects of aphasia. A striking example is the EVA Project (Evaluating the effects of a Virtual communication environment for people with Aphasia) funded by the Stroke Association. This has created a virtual communication environment in which people with aphasia can practise their speech and enjoy the companionship of other stroke survivors and support workers.

Better insights from aphasia patients
Further research led by Dr Katerina Hilari and Dr Madeline Cruse is responsible for big steps forward in measuring the impact of aphasia and its treatment on people’s lives. For example, healthcare professionals all over the world have adopted the Stroke and Aphasia Quality of Life Scale-39 (SAQOL-39) as a valuable assessment and outcome measure for people with aphasia. Developed from City research, SAQOL-39 enables patients to report the consequences of aphasia, which gives clinicians invaluable insights into individual experiences. This means that treatments and therapies can be targeted more accurately to people’s needs. Perhaps this is why over 100 practitioners around the world have requested SAQOL-39 and why it has been translated and culturally adapted for use in over 30 countries.

Better insights from aphasia patients
A striking example is the EVA Project (Evaluating the effects of a Virtual communication environment for people with Aphasia) funded by the Stroke Association. This has created a virtual communication environment in which people with aphasia can practise their speech and enjoy the companionship of other stroke survivors and support workers.

Better insights from aphasia patients
Further research led by Dr Katerina Hilari and Dr Madeline Cruse is responsible for big steps forward in measuring the impact of aphasia and its treatment on people’s lives. For example, healthcare professionals all over the world have adopted the Stroke and Aphasia Quality of Life Scale-39 (SAQOL-39) as a valuable assessment and outcome measure for people with aphasia. Developed from City research, SAQOL-39 enables patients to report the consequences of aphasia, which gives clinicians invaluable insights into individual experiences. This means that treatments and therapies can be targeted more accurately to people’s needs. Perhaps this is why over 100 practitioners around the world have requested SAQOL-39 and why it has been translated and culturally adapted for use in over 30 countries.

Better insights from aphasia patients
A striking example is the EVA Project (Evaluating the effects of a Virtual communication environment for people with Aphasia) funded by the Stroke Association. This has created a virtual communication environment in which people with aphasia can practise their speech and enjoy the companionship of other stroke survivors and support workers.

Better insights from aphasia patients
Further research led by Dr Katerina Hilari and Dr Madeline Cruse is responsible for big steps forward in measuring the impact of aphasia and its treatment on people’s lives. For example, healthcare professionals all over the world have adopted the Stroke and Aphasia Quality of Life Scale-39 (SAQOL-39) as a valuable assessment and outcome measure for people with aphasia. Developed from City research, SAQOL-39 enables patients to report the consequences of aphasia, which gives clinicians invaluable insights into individual experiences. This means that treatments and therapies can be targeted more accurately to people’s needs. Perhaps this is why over 100 practitioners around the world have requested SAQOL-39 and why it has been translated and culturally adapted for use in over 30 countries.

Our impact in context
Before City’s research on aphasia, people with the condition were typically (and ironically) excluded from stroke outcome studies because of their language difficulties. City has helped to show that people with aphasia can self-report and do so consistently with the current emphasis on patient-reported outcome measures.

City’s research is helping people with aphasia give academics, medical experts, policymakers and healthcare practitioners far clearer information with which they can treat the condition more appropriately. And, of course, the research has significant direct benefits for those affected by aphasia who take part. As one of them said: “I’ve found the whole experience extremely positive… I don’t think I would be reading if I hadn’t attended.” Family members also appreciate the help the research brings. One said: “Apart from the completely obvious, such as face-time sessions helping John’s confidence and word finding, there have been other motivators as a result of the research. Last week, John was practising what he’s going to say at a wedding and he can read and recite quite a long speech, which is amazing and so uplifting. That’s life changing for our family.”

Professor Marshall sums up the ambitions of City’s research: “Aphasia is a common and devastating condition. Its effects are felt in every aspect of the person’s life, including employment, leisure and personal relationships. Our research at City aims to make a difference. Our treatments aim to restore communication and our measures aim to give those affected a means of reporting their experiences. We can see (and measure) the benefits for those who are directly involved. We hope that our research will change the lives of those who come after.”
Professor Victoria Joffe on supporting language and communication needs.

You could be forgiven for thinking, when listening to your teenage son or daughter grunting a one-or-two-word reply to your request to clean their room, or when observing the group of silent adolescents on the train, immovably absorbed in their smartphones, that language ceases to develop during adolescence, or perhaps even regresses.

Of course this is not the case and these monosyllabic responses and egocentric behaviour reflect more typically a young person’s journey through adolescence. This is a significant transition typified by fundamental changes in biological, physical, intellectual, social, emotional and educational development; a challenging time no doubt for most adolescents (not to mention their parents).

Even though children as young as three or four have acquired the basic elements of their language and appear to talk effortlessly and fluently, a great deal of language development occurs throughout adolescence and well into adulthood. Language growth is more subtle and gradual during adolescence, but is no less significant, empowering the young person to interact, at a more sophisticated level, with peers and with a wider set of people in school and social settings. This stage signals its own period of language refinement and reasoning and the development of a more sophisticated understanding of idiomatic language and linguistic ambiguity.

Language growth during adolescence empowers young people to interact at a more sophisticated level.

While the majority of children learn language without explicit instruction, a significant number experience difficulties in the understanding and expression of all or some of its components: phonology (sound), syntax (grammar), semantics (words and their meanings) and pragmatics (use of language). The term ‘speech, language and communication needs’ (SLCN) is used to describe children who experience these difficulties.

The Changing Behaviours – Changing Futures research programme addresses this gap in research and practice by focusing on 1) exploring the nature and degree of language and communication impairments (and associated difficulties) experienced by such young people; 2) investigating the effectiveness of service delivery models and interventions that best enhance their language and communication; and 3) supporting teachers, mentors, parents, employers and others who interact with them, through training in the development of more communication-friendly environments where individuals with SLCN are more likely to prosper.

The programme consists of a series of interventions to support language and learning in the classroom and home contexts. The interventions focus on specific areas known to be difficult for this group and include telling stories, vocabulary knowledge and understanding of inferential language (e.g., idioms and figurative language).

Results show that narrative and vocabulary training improved the students’ storytelling abilities and vocabulary skills and also had a positive impact on their confidence and engagement in the classroom. Students used the Story Planner from the Narrative Intervention Programme to help structure their stories more coherently, both in the classroom and at home when completing homework. The Vocabulary Enrichment Programme provided opportunities to practise using a dictionary and to develop a more sophisticated understanding of idiomatic language, for example, the ability to contrast the literal and figurative interpretation of ‘raining cats and dogs’ and differentiate between multiple meanings of a word, for example, mole (animal versus skin blemish). The third intervention area, Communication for Life, currently being developed, focuses on the day-to-day functional and social uses of language required for daily living and aims to prepare young people for the demands of adult life and the workplace. Opportunities available to them through effective communication.

SLCN can be long term and pervasive, creating significant barriers for affected young people. However, there is evidence to show that with the appropriate support they can, and, in the words of Professor Kyriacou, can “go into places in the body that people have never gone before”.

Pioneers in healthcare

City University London’s Research Centre for Biomedical Engineering is leading the way in a discipline that is transforming advances in medicine and healthcare delivery. Research at the Centre has led to the development of blood oxygen sensors that are taking clinical assessment to places it has never been before.

Detecting oxygen levels in the body

Research at the Centre has led to the development of new blood oxygen optical and fibre optic sensors that advance clinical assessment in hospitals by monitoring a patient’s arterial blood oxygen in specific organs or tissues. The starting potential of these ever-smarter sensors includes non-invasive monitoring of the condition of specific organs and tracking the progress of critically ill patients during surgery and in intensive care.

Conventional technology requires measurements to be taken from peripheral parts of the body, which often gives rise to inaccuracies as blood flow may be restricted to the extremities in certain patient circumstances. The new sensors can be applied to specific organs such as the oesophagus, intestines, liver and stomach, as well as on the head in newborn babies, to monitor the well-being of organs, tissues, the brain and other parts of the body. It means that with minimal discomfort to patients, doctors can determine the condition and blood circulation within specific areas of the body.

Better monitoring of patients has meant an improvement in diagnoses and treatment, greater peace of mind for patients and for babies’ parents. For the first time, clinicians have been able to observe oxygen levels in specific organs in real time during operations, revealing their state of health before and after the surgical procedures.

The research has been the subject of important collaborations with eminent clinicians at hospitals including the St Bartholomew’s Hospital, Great Ormond Street Hospital for Children and the St Andrew’s Centre for Plastic Surgery and Burns. The sensors are in use within these institutions as research tools in clinical trials.

The sensor technologies have now attracted the attention of companies in the medical devices industry such as Covidien, GE Healthcare, Intelligent Fabric Technologies, Maximo, Philips and Samsung. Following an expression of interest by these companies, discussions are underway with our research groups and non-disclosure agreements are in place.

The new sensors have also led to more cost-effective healthcare and have helped provide a better understanding of chronic diseases and medical practice. Following clinical trials at collaborating hospitals the new sensors have already benefited more than 200 patients including children and babies.
The wider world

As befits one of the UK’s most international institutions, academics at City undertake research with a firmly global outlook. Similarly, their research is informing industry practice far beyond British shores.

Transforming lives

Professor Alan Simpson believes that user involvement in mental health practice and education is crucial to enhancing the experience of service users, aiding recovery and improving outcomes. However, he is just as interested in ensuring that collaboration underpins the research process itself, creating a virtuous cycle across his team’s work.

Having been at the cutting edge of Patient and Public Involvement well before major research funding bodies made it a prerequisite, the University is still at the forefront of research into the power of collaboration. On a day-to-day level, this means involving members of the public and patients in the design and development of research proposals, testing out measures that the Mental Health Research team intends to use, collecting interview data, helping to interpret their findings and assisting with the dissemination of those findings through joint workshops and presentations at research conferences.

It’s a philosophy best exemplified by Service Users and Carers Group Advisors on Research (SUGAR), a service user group, cited in the School of Health Sciences’ REF 2014 Impact submission, that collaborates on his team’s research activities and whose members receive training to develop understanding and capacity in research.

Research that impacts both patients and support workers

As part of his examination of the therapeutic potential of collaboration, Professor Simpson completed a randomised controlled trial, designed to study whether peer support provided by service users could help patients cope better following discharge from psychiatric hospital. The project yielded good qualitative evidence suggesting that those who received peer support found it very helpful. Meanwhile, the peer support workers themselves reported higher levels of confidence, self-esteem and understanding of their conditions.

Other projects include research into the physical health of people with severe mental illness, leading to the development of interventions aimed at improving the well-being of this particularly vulnerable group. Professor Simpson’s research extends to the student experience and tracks the relationship between emotional intelligence and the progress of mental health nursing students over several years.

After joining City in 2001, Professor Simpson rapidly fostered a culture that placed partnership at the heart of research, drawing on the experiences and expertise of service users at every stage. He was previously Chair of Mental Health Nurse Academics (UK) and holds an honorary post at the East London NHS Foundation Trust.

It's a philosophy best exemplified by Service Users and Carers Group Advisors on Research (SUGAR), a service user group, cited in the School of Health Sciences' REF 2014 Impact submission, that collaborates on his team's research activities and whose members receive training to develop understanding and capacity in research.

Research that impacts both patients and support workers

As part of his examination of the therapeutic potential of collaboration, Professor Simpson completed a randomised controlled trial, designed to study whether peer support provided by service users could help patients cope better following discharge from psychiatric hospital. The project yielded good qualitative evidence suggesting that those who received peer support found it very helpful. Meanwhile, the peer support workers themselves reported higher levels of confidence, self-esteem and understanding of their conditions.

Other projects include research into the physical health of people with severe mental illness, leading to the development of interventions aimed at improving the well-being of this particularly vulnerable group. Professor Simpson’s research extends to the student experience and tracks the relationship between emotional intelligence and the progress of mental health nursing students over several years.

After joining City in 2001, Professor Simpson rapidly fostered a culture that placed partnership at the heart of research, drawing on the experiences and expertise of service users at every stage. He was previously Chair of Mental Health Nurse Academics (UK) and holds an honorary post at the East London NHS Foundation Trust.
The wider world

The European Social Survey (ESS) continually develops new survey techniques and research methodologies for this multinational social survey, which is designed to monitor preferences, beliefs and behaviour patterns across diverse populations in 36 countries. This creates valuable data that provide vital insight and understanding of how people see the world.

The ESS has introduced state-of-the-art methodological standards to provide the highest levels of data comparability across different countries which in turn have been adopted by survey organisations across the world. It is the aim of the ESS to improve standards of research in the social sciences, including in questionnaire design and pre-testing, sampling, data collection, bias reduction and question reliability.

Based in the Centre for Comparative Social Surveys (CCSS) in the University’s School of Arts & Social Sciences, the ESS was founded in 2001 by Professor Sir Roger Jowell, who was Director of the ESS until his death in December 2011. His work continues and the Survey has grown to become a major European research facility.

In 2005 the ESS was awarded an annual European science award, the Descartes Prize, for excellence in scientific collaborative research. Today it has carried out over 300,000 interviews and over 70,000 people worldwide have used the resources on its website, with over 3,500 publications produced thus far. Part of its usefulness is that its surveys and interviews are freely available. Its data are used in thousands of academic and policy publications, providing a resource for other academics, think tanks, NGOs, students, private companies, government departments and more.

The Survey is now headed by Rory Fitzgerald (Director) and Dr Eric Harrison (Deputy Director), who, with their team, lead each round of the Survey by working closely with hundreds of colleagues from across Europe. The ESS questionnaire is written in English and then carefully tailored for the different participating cultures in their own languages. Academics in each country oversee the collection of the data. Being able to make sense of the responses is crucial, as the findings provide high-quality data on social, moral and political trends, patterns of thought processes and behaviour.

Exploring attitudes and mapping changes

The ESS makes a difference in many ways through its own findings and in how its innovations in methodology influence other organisations. A good example of the groundbreaking work carried out by Rory Fitzgerald and his team is the project to develop new methodology for cross-national pre-testing. This was done in collaboration with one of ESS’s key collaborators, the National Centre for Health Statistics, the largest health protection agency in the USA. The Centre has adopted much of this methodology when designing its questions.

In Europe, the European Quality of Life Survey carried out by the European Foundation to Improve Living and Working Conditions (Eurofound) used ESS as the benchmark to improve its methodology, while the Survey for Health, Ageing and Retirement in Europe (SHARE) has also adopted many ESS approaches. Government departments, commercial agencies and private companies in the countries taking part in the Survey have also adopted ESS methodology.

Impact on policy and society

Developing new methodology to help governments and policymakers understand how people interpret news media is another good illustration of how the ESS creates new research methods to unearth specific details. Carried out by City’s Professor Howard Tumber, working alongside Professor Paul Statham of the University of Sussex, the research explored the media landscapes of five European countries to show how the reporting of major political events, such as elections, political scandals and debates on issues such as immigration, can bias how respondents answer questions.

The new methodology they developed improved the coding of media claims for the ESS. The ESS has a direct impact on policy process in the UK. For example, the All-Party Parliamentary Group on Well-being Economics has used ESS data to understand people’s well-being. The Department of Work and Pensions uses the ESS and former UK Minister for Universities and Science David Willetts said in 2013 that the ESS “enables governments, policy analysts and scholars to keep up with trends that affect how democracy is working”.

Shining a light on Europe: a bright future for the ESS

ESS findings have become an increasingly important aspect of the decision-making process, providing valuable insight into attitudes that help governing bodies shape the Europe of the 21st century. As Rory Fitzgerald explains: “The Survey’s intention is to help the EU become a smart, sustainable and inclusive economy. The ESS plays a direct role in influencing discussion in democracies across Europe and the ESS methodology consistently sets new standards in cross-national harmonisation and data archiving and access.”

In late 2013 the ESS became the first UK-hosted European Research Infrastructure Consortium (ESS ERIC). This is a legal status awarded by the European Commission which acknowledges the ESS as a leading European social science facility with relevance across the continent. The ESS is playing a vital role in addressing several public concerns including attitudes to health, justice policy, policing, homosexuality, job security, well-being, inclusivity, migration and immigration.

Rory Fitzgerald continues: “The establishment of the ESS ERIC marks the formal acceptance of cross-national social survey measurement by governments across Europe, including more subjective attitudinal data. The ESS results provide a unique opportunity for social scientists to help address many of the grand societal challenges identified by the European Union, such as ensuring inclusive, innovative and reflective societies and addressing issues related to health, demographic change and well-being. The academics in the ESS ERIC headquarters at City are eager to harness the wealth of academically rigorous research made possible by the ESS and to ensure it plays an active role in shaping the societies of the future.”

As the Survey expands and more data become available, the University’s world-renowned academic research will continue to lead the way in providing essential data that have an impact on how we live. As Rory Fitzgerald points out, “City is the helm and engine room of the ESS.”

Pioneers on the research frontier

Senior Research Fellow Rory Fitzgerald is Director of the European Social Survey. This European Research Infrastructure Consortium (ESS ERIC) is housed within City’s Centre for Comparative Social Surveys.
Music as a cultural bridge

A City University London academic is leading the drive to bring Iranian music to the British public and is helping to foster a new appreciation of the country’s rich culture.

One way Dr Nooshin achieved this was through the Shahnameh Project, a collaboration with the London Philharmonic Orchestra (LPO), which she initiated and led. The project also involved one of the LPO’s partner organisations, the Bridge Project, which provides free music tuition to schoolchildren who might not otherwise have the opportunity to learn to play an instrument.

The project introduced Key Stage 2 children (ages 7 to 11) to Iranian music and culture through several workshops and teacher-led activities. The children were introduced to Iranian instruments such as the tambour, a long-necked lute with three strings which is plucked and strummed by the performer; the tombak, a wooden drum with a sheepskin or goatskin head, shaped like a goblet and which is held over the player’s knees; and the daf, a large, round frame drum with a skin (or synthetic head) and metal rings on the inside so that it makes a loud sound when you shake it.

One of the children who participated in the Shahnameh Project, Prince Zal and the Simorgh, was played in David Bruce’s piece, Prince Zal and the Simorgh.

Around 5,000 children and their teachers attended these concerts. The majority of children attending the workshops and concerts had not seen or heard the Iranian instruments before. Dr Nooshin wrote a Teachers’ Guide which introduced Iranian rhythms and instruments as well as broader aspects of Iranian culture and included practical classroom activities. The Guide was available through the LPO website, together with relevant sound examples. The workshops and Guide received very positive feedback, with one teacher saying: “My colleague and I loved the Teachers’ Guide. It is possibly the best resource we’ve had for an educational visit.” Additionally, two training sessions led by Dr Nooshin and Patrick Bailey (LPO Education and Community Department) were attended by 35 teachers, to assist them in preparing pupils for the concerts.

In recent years journalists have become the target of a disturbingly high number of physical assaults (including murders) and of many forms of intimidation including judicial harassment by state authorities and wrongful imprisonment.

In a disproportionately large number of cases where journalists are the victims of attacks or murder, the offenders are often not brought to justice and the crimes remain unpunished. The Initiative on Impunity and the Rule of Law was established in 2010 as a joint project between City’s Centre for Law, Justice and Journalism and the University of Sheffield’s Centre for Freedom of the Media with the aim of protecting journalists in danger.

The project was established to provide an independent platform to assess the effectiveness of existing legal, political and institutional safeguards against violence directed at journalists, and to present the case for more effective international mechanisms to counter such crimes of violence and to end impunity.

The Initiative is directed by Professor Howard Tumber from City and Professor Lorna Woods (formerly of City and now working at the University of Essex) in addition to Professor William Horsley and Jackie Harrison from the University of Sheffield. The Initiative has contributed to the adoption of the United Nations’ Plan of Action on the Safety of Journalists and the Issue of Impunity.

Music academics at City have long demonstrated a commitment to ethnomusicological outreach. None more so than Senior Lecturer Dr Laudan Nooshin, whose research has involved several periods of fieldwork in Iran, contemporary and historic forms of Iranian music cultures in Iran and around the world.

Dr Nooshin’s research has focused on two key areas. The first concerns the contemporary and historic forms of Iranian music. She has generated insights into both conceived creativity, the nature of youth empowerment.

In another strand of research, Professor Woods and Dr Carmen Draghici (pictured above) produced a study called Safety and Protection of Journalists: A Responsibility for the World. It aimed to identify the root of the phenomenon of impunity for violations of journalists’ rights and to suggest possible courses of action.

Public engagement: hosting a game-changing conference

In June 2011 the academics staged the Working Conference of the Initiative on Impunity and the Rule of Law. The event, which was held at City, was attended by many stakeholders including senior members of international and intergovernmental organisations such as UNESCO, journalists’ federations and expert NGOs. These include Amnesty International, Reporters Without Borders and the Red Cross. The conference also had the support of Archbishop Desmond Tutu, a long-time advocate for the worldwide protection of journalists’ rights.

The conclusions drawn from the meeting were presented at a UN Inter-Agency Meeting in Paris. The Initiative made recommendations which contributed to the UN’s decision to establish an inter-agency mechanism to monitor progress and to assist countries in the development of legislation favouring freedom of expression.

As a result the UN Plan of Action on the Safety of Journalists and the Issue of Impunity was endorsed by the UN Chief Executives Board in April 2012 and the United Nations General Assembly adopted the Resolution on Safety of Journalists and the Issue of Impunity at its 67th Session in December 2012. This led to the creation of The Implementation Strategy on United Nations Plan for the Safety of Journalists and the Issue of Impunity 2013-2014.

In 2012, the Initiative created an international platform of academic and legal expertise comprising governmental and non-governmental experts from organisations (including international bar associations, the UK House of Lords, the UN, Media Legal Defence Initiative and the International News Safety Institute) to seek acceptance for fighting violence against journalists and the right of citizens to be kept informed.

Making an impact with the UN
Professor Igor Gaber (then Professor of Political Journalism at City and now the First Professor of Journalism at the University of Sussex) played a key role in the Initiative, making use of his role as the UK government’s representative on the Intergovernmental Council of the UN’s International Programme for the Development of Communication, based at UNESCO. Professor Gaber persuaded the Council to direct UNESCO to convene a meeting of all UN agencies to draw up and implement a plan to increase journalists’ safety and to hold governments accountable for the impunity provided to their assailants.

The wider world
Who would think that tiny bubbles could cause damage to a powerful diesel engine? But that’s the serious problem facing the multi-billion-pound global transport industry.

Cavitation is the process where changing pressure within a flowing liquid (in this case diesel in a fuel injection system) creates the rapid growth and collapse of tiny vapour bubbles. Failure to control cavitation adequately can quickly lead to surface erosion, substandard engine operation or even failure of mechanical components. As fuel injection equipment has been one of the key technologies for reducing engine emissions and fuel consumption, anything that can improve fuel injectors is bound to attract commercial attention.

Building a world class team
Research in this area has been carried out at City for the past 15 years. It was initiated by Professor Arcoumanis, who has built a highly respected team of talented academics, now headed by his ex-student Professor Manolis Gavaises in the Department of Mechanical Engineering & Aeronautics. It has attracted millions of pounds of funding from companies including BMW, BP, Caterpillar Fuel Systems, Denso, Lubrizol, MAN B&W, Nissan, Siemens Automotive, Toyota and Yamaha. Research has also been supported by the likes of Innovate UK, the Engineering and Physical Sciences Research Council, the Lloyd’s Register Foundation and from the European Commission through several Marie Curie projects.

The team was the first to measure cavitation in fuel injectors, using X-rays to determine the density of the mixture of liquid diesel and its vapour during cavitation. Building on this fundamental research, Professor Gavaises and his team developed computer models that allow engineers to map the surface erosions caused by cavitation. Fuel injection system manufacturers have utilised these models to assist in the development of new products.

Injecting research into industry
“Fuel injection and combustion system manufacturers are extremely keen to make their products more efficient and environmentally friendly,” says Professor Arcoumanis. “It speaks volumes for the success of our research that leading companies such as Toyata, Denso, Caterpillar and Delphi make their products more efficient and fuel consumption substantially reducing their cost.

Full steam ahead
Elsewhere within City’s Department of Mechanical Engineering & Aeronautics, another area of research detailed in a REF2014 impact case study also resulted in a global impact. Based on the use of City’s patented rack generated ‘N’ rotor profile, Professors Nikola Stosic, Ian Smith and Ahmed Kovacevic, of the University’s Compressor Centre, have greatly increased the scope for the use of twin screw machines as both compressors and expanders by improving their efficiency and substantially reducing their cost.

The UK-based Delphi holds more than 20 per cent of the global fuel injection market and is ranked first in developing countries such as China and India; between 2009 and 2013 Professor Gavaises held the ‘Delphi Chair’ in Fluid Dynamics at City. The team helped Delphi apply the new computer models so it could understand the complex flow phenomena within the engine. The company says this “helped our research and development team to develop better understanding of the flow processes in common rail injectors for car engines. Furthermore, the investigations on cavitation and erosion prediction will contribute to the design of more durable injectors for the truck engine market, a necessary prerequisite for future market expansion.”

Cutting emissions, increasing efficiency
For Toyota, Professor Arcoumanis and Professor Gavaises were asked to investigate the physics of multiple fuel injections, a technique used by the industry for better emissions control. As a result of this work, Toyota’s fuel injector suppliers (such as Denso) are now manufacturing new nozzles that control injection shots more accurately, which has contributed to the reduction of environmentally harmful emissions such as soot and nitrogen oxides.

A spokesperson for Toyota’s Advanced Technology division said: “The current Toyota combustion concept couldn’t have been created without this collaboration.”

Caterpillar, the world’s leading manufacturer of construction equipment and diesel engines, turned to City’s experts to develop cavitation models for fuel injectors. Working closely with Caterpillar, the City academics tackled the problem using experimentation and simulations. They created nozzle tips with special geometric features that proved to be durable, had no negative effects on engine performance and which met with stringent emission regulations.

“The products meet and exceed our customer expectations... through superior durability and reliability,” said a Caterpillar spokesperson.

Taking cavitation research to the next level
In 2009, the team was joined by innovation grant from the Lloyd’s Register Foundation to develop and apply new cavitation research. The team expanded the team’s research into the marine sector and allowed more substantial focus on material erosion. Three years later, City was awarded by the Lloyd’s Register Foundation to establish the first International Institute on Cavitation Research in partnership with Loughborough University and Delft University of Technology in the Netherlands. Headquartered at City, the Institute coordinates a large number of research projects, including many directly for industry.

More recently, a new Marie Curie Innovative Training Networks programme, coordinated by Professor Gavaises, brought together 13 academic and industrial partners across Europe, the USA and Singapore. The project aims to provide new experimental data and develop and apply new cavitation models in several industrial sectors facing cavitation erosion problems.

Research makes engines greener
Some of the world’s largest automotive manufacturers are making cleaner, more reliable engines after collaborating with City University London academics. “It’s all to do with understanding the formation of bubbles within fuel injection systems,” says Professor Dinos Arcoumanis FREng, former Deputy Vice-Chancellor of the University and Dean of the former School of Engineering & Mathematical Sciences.
In practice

Close ties to business and the professions have been the hallmark of City University London throughout its history. Today, those links are evident in the role City academics play in shaping best practice and their extensive enterprise activities.

The world of offshore finance has undergone profound changes in the past five years, with more legislation and policy changes than in the entire preceding century. Fortunately at City there is an academic specialising in tax havens, offshore finance, tax avoidance and tax evasion, namely Professor Ronen Palan.

He and his research team explore issues including: how changes in policy and law will impact the global economy; the political and economic nature of nation states; and how financial markets will develop in the future. Their research considers the complex accounting and legal techniques used by businesses in their offshore tax dealings and the ways modern societies can channel business energy to socially beneficial goals.

Professor Palan's interest in the relationship between political power, nation states and economics led to a book on how small states such as Jersey, Bermuda and the Cayman Islands effectively sell their sovereignty as a commercial asset. His research showed that half the money in the world and a third of all foreign investment goes through those countries. The book was the start of Professor Palan's long period of study into the characteristics of the offshore world; he argues that offshore finance is an important contributing factor in the decline of the nation state but not the sole cause.

His co-authored and peer-reviewed study Tax Havens: How Globalization Really Works is considered a pioneering reference work. It has sold over 30,000 copies to date and has been translated into four other languages. The book challenges much of the conventional wisdom around tax havens. It illustrates how, rather than operating at the margins of the global economy, they are actually integral to it. Professor Palan and his co-authors argue that tax havens have become among the most powerful instruments of globalisation, a contributor towards global financial instability and a major political issue of the modern era.

With tax havens being such a source of intrigue around the world, Professor Palan is in great demand as an expert media contributor, having written for or been interviewed by a wide array of national and international newspapers, news agencies and documentary makers. He also participates in a four-year research project supported by the Norwegian Council to study tax evasion and money laundering and in 2013 was invited by the French embassy to meet members of the French National Assembly to discuss international tax avoidance policy.

Professor Palan is Senior Advisor to the Tax Justice Network, an influential NGO dedicated to high-level research, analysis and advocacy in the fields of international tax and financial regulation.
Influencing policy on immigration detention law

Professor Daniel Wilsher at the City Law School was behind the research, aimed at developing legal and ethical standards to regulate immigration detention.

From its findings, he produced a series of academic articles and a book, "Immigration Detention: Law, History, Politics" which has since informed policymakers across the world. It was the first book-length study to take a global and history-informed approach to the subject and analyses extensively the practices and frameworks behind the rapid growth in immigration detention in recent years. It also details the evolution of the practice of detaining immigrants since the days of Ellis Island and has brought into focus the vulnerability of large facilities around the world. It has stressed the need for judicial review, time limits on detention and the elimination of detention for vulnerable groups, such as children.

The immigration detention issues under the spotlight

By 2011, around 27,000 people went through (or got caught up in) immigration detention in the UK, at a cost of £130 million. In the same year, the US detained 429,000 immigrants, costing $1.7 billion. On a global scale, immigration detention is on the rise and largely unregulated, so governments have the power to decide whom they detain and release, without reference to universal guidelines. Clearly, while migration control is an issue for governments across the world, abuse of such power is common.

Professor Wilsher’s work proposed clear standards for policymakers for improving the balance between migration control and an individual’s fundamental rights. In particular, he stressed the need for judicial review, time limits on detention and the elimination of detention for vulnerable groups, such as children.

A wide range of government bodies and NGOs have consulted Professor Wilsher and he has sat as an immigration judge on detention issues, both throughout his research and since the book’s publication.

City research forces a rethink

The UK Supreme Court cited Professor Wilsher’s work in a landmark decision that led the UK Government to repeal part of the Anti-terrorism, Crime and Security Act and reassess its counterterrorism strategy. In one of the most important cases in recent British and global human rights law, the Supreme Court ruled that immigration powers could not be used to detain foreigners without trial simply on suspicion of them having connections with terrorist groups.

Other judges in, for example, the UK, Australia, New Zealand, Hong Kong and India have also cited the Supreme Court case on over 150 occasions when setting limits for immigration detention.

Immigration detention is widespread in the UK and beyond. It means thousands of vulnerable people are held for long periods without trial or access to adequate legal representation. City University London research has contributed to improvements in how detainees are treated. Specifically, it has influenced the legal framework and practices that govern detention and has encouraged courts and governments to respect the detainees’ basic rights.

Professor Wilsher’s work has the potential to improve the lives of vulnerable people around the world.

Professor Daniel Wilsher

A joint report by HM Inspectorate of Prisons and the Independent Chief Inspector of Borders and Immigration suggested reforms to the detention of foreign national prisoners pending deportation that would reduce costs and the ‘needless deprivation of liberty’, arguing that detainees not cooperating with their removal should be dealt with by criminal law, not administrative detention. This was one of the main arguments in Professor Wilsher’s book, which was quoted extensively throughout the report. The Home Office duly accepted most of the report’s recommendations.

Tackling one of Europe’s most criticised immigration detention systems

Professor Wilsher has also served as an expert consultant to the Turkish Ministry of the Interior, helping to draft its rulebook for immigration detention facilities. Turkey is a major trans-Atlantic route for migrants and its detention centres have been criticised heavily for lengthy and unlawful detention by, among others, the European Commissioner for Human Rights. The new rulebook improved many aspects of immigration detention in Turkey. It set time limits for detention, gave detainees stronger legal guarantees and set important performance and detention-justification criteria.

Professor Wilsher’s work has the potential to improve the lives of vulnerable people around the world.
In practice

Understanding autism helps police talk to witnesses

Eyewitnesses play a key role in helping the police to investigate crimes, but when they have an autism spectrum disorder the process can become difficult. Now, thanks to research by City University London’s pioneering Autism Research Group, many police officers are better equipped to question such witnesses.

The severity of the disorder can range from acute withdrawal, absence of language and general intellectual impairment to a generalised difficulty in dealing with social situations. Why some individuals develop ASD is still not known but scientists are increasingly making progress in understanding the disorder in cognitive and psychological terms. Since the late 1990s, City’s Autism Research Group has made a major contribution to our understanding of autism and, perhaps most importantly, has translated its findings into practical applications.

Understanding learning and memory

One of the Group’s key interests is how learning and memory operate in people with ASD. “By exploring how individuals with autism learn and remember, we can gain greater insight into the inner experiences of those with the disorder,” explains the Group’s head Professor Dermot Bowler. “As a result, we’ll be in a better position to provide an environment that plays to their strengths. For example, our research can help practitioners design more effective education and intervention programmes.” It can also support those who need to communicate with those with ASD.

A new approach to police interviews

A strand of research stemming from the Group’s work on memory has shown that a common forensic technique used by police to question witnesses, the cognitive interview, is inappropriate for those with ASD.

The cognitive interview involves asking witnesses to take time to imagine all the details that surrounded the crime before recalling what happened. The idea is to give them cues which help them remember more details.

The Group’s findings were published in the state of new academic circles and have been incorporated into police training. In the current project, the Group’s research involves asking witnesses to take time to imagine all the details that surrounded the crime before recalling what happened. The idea is to give them cues which help them remember more details.

The Group’s research, led by Honorary Visiting Research Fellow and former City PhD student Katie Matos, showed that the technique was ineffective at helping people with autism recall events and reduced the accuracy of their reports. People with ASD are often able to recall isolated items of information but they can experience difficulty in recalling specific events and how, when and from whom they learned the details.

However, the Group found that the memory difficulties of ASD witnesses can be overcome by taking a different approach. This involves paying careful attention to the way questions are phrased (using simple sentences, no figures of speech, no ‘why’ questions, etc.) and using physical clues, like photographs, rather than verbal instructions. The Group call this the Task Support Hypothesis.

Training for thousands of police officers

The Group’s findings were published in academic circles and have been incorporated into police training. In the current project, the Group’s research involves asking witnesses to take time to imagine all the details that surrounded the crime before recalling what happened. The idea is to give them cues which help them remember more details.

The Group’s research, led by Honorary Visiting Research Fellow and former City PhD student Katie Matos, showed that the technique was ineffective at helping people with autism recall events and reduced the accuracy of their reports. People with ASD are often able to recall isolated items of information but they can experience difficulty in recalling specific events and how, when and from whom they learned the details.

However, the Group found that the memory difficulties of ASD witnesses can be overcome by taking a different approach. This involves paying careful attention to the way questions are phrased (using simple sentences, no figures of speech, no ‘why’ questions, etc.) and using physical clues, like photographs, rather than verbal instructions. The Group call this the Task Support Hypothesis.

Traditionally there was a set of stringent rules which determined what evidence can and cannot be admitted during criminal trials but over the last few years there has been a worldwide shift towards a less prescriptive format,” says Professor Andrew Choo, Professor of Law specialising in criminal evidence and Associate Dean (Research) at City University London.

“In the past, when judges applied these fixed rules there were some quite absurd outcomes and in other cases judges somehow ‘goldilocks and weaved’ the rules to reach the result they felt was justified, so negating the point of having fixed rules in the beginning,” he says.

In Professor Choo’s research he considers the decisions courts make and whether fixed rules are preferable or if a more flexible model would be better.

The second aspect of Professor Choo’s research is the influence of the European Convention on Human Rights on principles of criminal evidence. He explains that since the Human Rights Act came into force in England and Wales in 2000, certain rights are now directly enforceable in domestic courts and some of them are relevant to the admissibility of evidence in criminal cases.

“Article 6: The Right to a Fair Trial has changed the face of criminal evidence as a defendant can now argue that their right to a fair trial has been violated by the fact that certain evidence is being allowed to be presented in court,” says Professor Choo.

“So one of the themes I examine is what framework is best in this situation; more fixed rules for judges to follow or a more discretionary case-by-case approach,” he adds.

One of the debates that interests Professor Choo concerns the use of hearsay evidence (second-hand evidence) in criminal trials and the extent to which the Crown can introduce it. “It is a pretty complex argument as such evidence is often allowed to be used in cases. However the defendant can raise their right to a fair trial to try and exclude hearsay evidence, on the basis that anyone providing a statement that the prosecution uses at trial should be available for cross-examination and this is clearly not possible.” He explains that not everyone believes hearsay evidence is an issue; in fact some think it may not be any more unreliable than first-hand evidence.

The aim of Professor Choo’s work is to stand back, analyse and make sense of the law of criminal evidence. He evaluates whether it is functioning well and whether anything can be learned by looking comparatively at how other jurisdictions manage similar issues. The objective is to assess whether there is need for further reform.

Although Professor Choo became an academic lawyer after the completion of his doctorate at Oxford, he later decided he wanted to experience how criminal evidence worked in practice. To do this he took a fast-track route to the Bar Council of England and Wales, available to teachers of the law of experience and distinction. He was then able to practise as a part-time barrister and member of Matrix Chambers in Gray’s Inn.

Professor Choo moved to City in November 2012 and became Associate Dean (Research) in September 2013, which sees him lead on The City Law School’s research strategy. As part of his role, he oversees the School’s REF2014 submissions. On the research aspect of his role, he says: “I very much appreciate the opportunity to oversee the consolidation and development of The City Law School’s research profile and the enhancement of the School’s reputation for producing research of the highest quality.”

The School’s Dean, Professor Carl Sylthin, says: “Andrew brings a wealth of experience in the management of research and, of course, a track record of excellence in research throughout his academic career.”

Professor Choo’s published work has been cited in decisions of various appellate courts, including the House of Lords, the UK Supreme Court, the Court of Appeal in Canada. He also serves on the editorial board of the International Journal of Evidence and Proof and on the International Criminal Evidence Advisory Panel of McWilliams’ Canadian Criminal Evidence.

Professor Andrew Choo
Professor of Law and Associate Dean (Research),
The City Law School, City University London
Evidence is central to proving the innocence or guilt of the accused in any criminal case, but the way it is gathered, presented and used needs to conform to recognised standards in order to be effective, ethical and binding.

Professor Keane has been an expert in this field for more than 25 years. He is the author of *The Modern Law of Evidence* and a significant contributor to *Blackstone’s Criminal Practice*. Both texts rigorously analyse legal doctrines and are relied on by judges and criminal court practitioners worldwide. They are regarded as highly authoritative works that have made a big impact by engaging with challenges in the most rapidly changing areas of law.

Professor Keane’s work examines the theory behind the law of evidence and the way it is used in practice. It has improved awareness, performance and understanding among the judiciary, legal practitioners, legal academics and legislators of the way evidence can and should be used. In courtrooms, it also helps judges give appropriate directions to juries.

Research relied on by legal leaders
The *Modern Law of Evidence* has been cited by the Privy Council and the House of Lords, with the Lords adopting Professor Keane’s definition of relevance, one of the most important concepts in the law of evidence. It has also been cited by the Supreme Court of Canada and the United Nations International Criminal Tribunal for Rwanda, as well as domestically by both the Employment Appeal Tribunal and the Law Commission.

Meanwhile, his contributions to *Blackstone’s Criminal Practice* have been cited by the High Court of Justice and the Court of Appeal. His impact on appeal decisions is particularly important, because when material is cited and approved in appeals it becomes part of the law and a binding precedent.

**Helping China reform its laws**

The *Modern Law of Evidence* and *Blackstone’s Criminal Practice* have also been used by those reforming the law of criminal evidence in China. As a result, Professor Keane was the only non-Chinese scholar invited to take part in an influential project at the Centre for Criminal Procedure Reform at Renmin University of China in Beijing.

“The project examined coerced confessions, concealed evidence and evidence obtained through special investigative measures like tapping phones, using undercover police officers and entrapment,” explains Professor Keane. “It aimed to give the Chinese judiciary a more uniform understanding of how the rules in these areas should be interpreted and implemented.”

The team also drafted proposals for the National People’s Congress for the reform of Criminal Procedure Law to enhance legal decision-making, minimise the risk of miscarriages of justice and reduce the negative international reputation China has created, particularly in cases involving the death penalty. They were modelled on the English law of evidence which Professor Keane had advocated and marked a major rebalancing of the Chinese criminal justice system in favour of the accused.

**Putting real change into practice**

Some of the project’s most significant recommendations were adopted by the National People’s Congress and included in the revised Criminal Procedure Law which came into force in January 2013.

“Suspects in China now have the right to appoint a lawyer when they are first interrogated, as well as the right not to be forced to prove their own guilt,” says Professor Keane. “For the first time, obtaining evidence illegally has become a criminal offence and there is a new burden on the prosecution to prove that evidence was not obtained illegally.”

Professor Keane says: “Overall, we have managed to establish new rules designed to ensure fairer trials and to reduce the potential for miscarriages of justice.”

The law of criminal evidence regulates the way facts can be proved in criminal trials. It is a constantly evolving subject that has a major impact on trial outcomes worldwide. In this complex field, City University London’s Professor Adrian Keane stands out as a voice of authority, turned to by those making and administering laws in the UK and beyond.
In practice

Professor Peter Fleming wonders whether we are working too much.

In 2013, Moritz Erhardt, a 21-year-old banking intern, died in his London apartment following 72 continuous hours of stressful work. Subsequent reports discovered that the banking industry implicitly celebrated incredibly long hours, almost treating it as a badge of honour or rite of passage. The same fate awaited Li Zheng, a 24-year-old from Beijing employed by a global PR firm. He died on his first day back following a stress-promoted holiday. Investigators discovered that Zheng stayed at the office until 11pm and described himself on social media as “an over-worker in overworking season”.

These are tragic and exceptional examples of overwork. However, my research has found that they are symptomatic of a rather troubling trend of lengthy work hours in many sectors of our society. We appear to live in a workers’ society given the sheer amount of time put in at the office, worrying about our jobs over the weekend or searching for employment if we are unemployed. One study has even noted how IT employees ‘sleep work’, solving worked-based problems in their dreams.

This cultural fixation with work is put into perspective when we read John Maynard Keynes’ classic 1930s essay Economic Possibilities for Our Grandchildren. With the rise of labour-saving technologies and impressive levels of wealth in Western countries, Keynes predicted that the very idea of work would be obsolete and antediluvian by 2014. How wrong he was.

So what happened? How have our jobs become so all-encompassing? Perhaps the desire to make more money is to blame. Where this explanation falls down is that many organisations don’t increase their rewards if we spend more time in the office. And once a certain level of material wealth is obtained, we tend to work to do other reasons.

What about the fear of unemployment, especially in times of economic crisis and uncertainty? There might be something to this. But marathon-like displays of work are also observed in occupations that are relatively secure and unthreatened by cuts.

Perhaps we work so much because we simply love our jobs. Unfortunately, ‘love’ is not a word used by most of the global workforce when describing their occupations. Gallup recently surveyed millions of workers around the world and found that only about 13 per cent considered themselves ‘engaged’ by their jobs, 63 per cent said they were ‘not engaged’ and 23 per cent of respondents claimed they were ‘actively disengaged’.

Mobile technology comes closer to accounting for our work-obsessed culture. Smartphones and laptops mean that we are always contactable. For example, a recent study found that a third of the UK workforce check their emails before 6.30am. Almost 80 per cent of British firms consider it standard practice to call employees outside work hours, even at 11pm. But this explanation is not completely convincing since there is nothing inherent in mobile technology that forces us to check our emails at 5am. There must be some other social pressure behind it.

Work is increasingly project-driven. Employers don’t care when and where the work is done, as long as the deadline is met.

My research has found that changes in the way work is organised has led to its steady expansion into more facets of life. For example, many jobs are structured around teams that become close-knit social systems. Dealing with a problem on Saturday morning is viewed as a basic courtesy, not overwork.

In addition, work is increasingly project-driven in which a deadline or final result is all that matters. Employers often don’t care when and where the work is done, as long as the deadline is met. But it isn’t long before we find ourselves preparing PowerPoint slides in the middle of the night or at the kids’ football game. Other jobs including managerial and administrative occupations are organised in such a manner that it seems as if the to-do list is never ending. As a result, employees tend to work arduous hours simply to keep on top of things and avoid disaster or embarrassment.

I think the problem lies in the old belief that if we are not working then we must be somehow lazy and unworthy as an individual. This strict black-and-white logic, coupled with a genuine increase in labour intensification where fewer employees are asked to do more, can erode a sense of perspective. I wonder what John Maynard Keynes would say now.

Data and digital

Humanity now produces more raw data in 48 hours than it managed to accumulate in its entire history up to 2003. City academics are exploring new ways of harnessing data to help us understand and transform the world around us.
As specialists in making sense of vast quantities of geographic information, academics at the giCentre at City University London are skilled purveyors of intelligent, creative and elegant visualisations. They have worked with partners including Eon, the Ministry of Defence and Transport for London to help them realise the value of understanding the wealth of data at their fingertips.

For City’s Professor of Visualisation Jason Dykes, part of the challenge for the emerging discipline of information visualisation is showing just how powerful an image can be. “When we are trying to make sense of data, numeric summaries can be useful,” he says. “However, visual representations of data can often be much more successful than a set of numbers in helping us recognise patterns, place data into a wider context of time and space and solve problems, particularly when they contain interactions to which we can explore ideas.” Science and industry are increasingly using graphical tools to make discoveries and communicate findings.

In a world that now produces more raw data in 48 hours than it managed to accumulate in its entire history up to 2003, visualisation represents a powerful tool for governments, companies and individuals alike.

A collaborative approach

A recent partnership with Eon, a leading UK energy provider, offers an example of how the giCentre’s techniques shape business practice. The UK government has committed to installing smart meters, which give real-time feedback on energy usage to users and suppliers, in every home by 2020. For suppliers, the real-time readings generated by smart meter technology will provide more data than ever before about energy consumption. The giCentre worked with Eon’s energy analysts to develop four visualisation prototypes to show peaks and troughs in daily demand, compare consumption by appliance and identify visualisation techniques across the era of smart homes.

Together with the Eon project, it is offered Eon a snapshot of how it might harness the power of its data in an era of smart homes.

The Eon project is a good example of the collaborative approach that characterises the giCentre and which is crucial to its success. At a micro level, three of the Centre’s academics and several of its PhD students were involved in designing and developing the prototypes, working closely with colleagues from elsewhere at City.

Dr Sara Jones, together with PhD student Graham Dove and Research Fellow Alison Duffy from the Centre for Creativity in Professional Practice coordinated creativity workshops through which design needs and possibilities were established. Energy consumption modelling generated by Dr Veselin Rakocevic of the Department of Electrical and Electronic Engineering formed the basis for some of the visualisations.

Collaboration was also a key aspect of the relationship between Eon and the giCentre. “With all our end-users, the building of relationships and trust is crucial,” explains Professor Dykes. “In our requirements workshop, we worked in partnership with the Eon energy analysts to establish how visualisation could help make use of what initially seemed to be unmanageable data.” For the giCentre, one measure of success is when end-users begin to see how visualisations can help them answer existing questions using their data. But a more important sign of a ‘job well done’ is when visualisations lead partners to ask more sophisticated questions and begin to seek the answers to them.

Global reach

In March 2014, the Centre was awarded €500,000 of EU funding to explore the potential for the use of visualisation in criminal intelligence analysis, part of a wider €13 million VALCRI Visual Analytics for Sensemaking in Crime (Vision for Analysis, Linking Crime, Visualisation for Intelligence Research) project involving 18 other European partners.

VALCRI will involve mapping data of different types and from different sources to help intelligence analysts develop hypotheses and establish narratives, together with the Eon project, it is an indication of the applicability of visualisation techniques across the breadth of human activity.

Some of the Centre’s best-known work uses Transport for London’s (TFL) data to map travel patterns in the capital. TFL is collaborating with Professor of Visual Analytics, Jo Wood and Research Fellow Roger Beecham to analyse data from the London Cycle Hire scheme.

The scientists’ initial work has allowed TRL to answer important questions about the barriers and incentives that affect the behaviour of cyclists in London. The City team believes that deeper understanding of this behaviour could offer valuable guidance to other cities around the world as they develop and expand similar schemes, aiming to follow the success of London in boosting cycling uptake.

“By using visual analytics, the giCentre is developing applications to understand the millions of journeys made by hundreds of thousands of cyclists across London,” says Professor Wood. “This allows transport planners and organisations such as TfL to make better informed decisions to support the movement of people around our cities.”

Other projects have explored voter bias in London local elections and involved working with the Ministry of Defence to help the military understand local populations (Human Terrain Analysis) through visualisations. However, the Centre’s work is not limited to human activity: recent projects, led by Dr Aidan Slingsby, involved collaboration with animal ecologists to design and implement visualisation techniques to understand the daily movements of seabirds and the migratory characteristics of geese.

The giCentre is trying to develop and use effective graphics that are ‘worth’ five million cycle journeys, eight million energy readings, two million animal locations or a million postcodes. A picture paints a thousand words, or so the saying goes. And as their pioneering work has an increasing impact on business, education and society, the giCentre’s talented academics are increasingly proving the old saying right.

Following the publication of the Research Excellence Framework (REF) 2014 results, Professor Wood created a REF Viewer for visual exploration of all UK universities’ research performance. It can be found at www.city.ac.uk/REF-2014-viewer

A visionary approach to data

Professors Jo Wood (left) and Jason Dykes (right) pose with a ‘Boris Bike’ in front of one of their data visualisations depicting the hundreds of thousands of London Cycle Hire journeys.

Visual Analytics, Jo Wood and Research Fellow Roger Beecham to analyse data from the London Cycle Hire scheme.
The nature of space and time has preoccupied physicists since ancient times. The intuitive concept of space asserts that it exists in its own right in an absolute way independent of anything it contains. This notion dates back to the pre-Aristotelian atomists and Democritus and was later adopted by Newton. However, this idea was already challenged by Aristotle who refuted the existence of a vacuum, arguing that due to its lack of resistance in it could be accelerated to infinite speed, which is implausible.

Using different reasoning, Descartes and Leibniz later denied the existence of an absolute void. From a modern scientific perspective the first major challenge to Newton's view was put forward by Einstein in his special theory of relativity. Einstein's theory was supported by experiments in every reference frame (i.e., from every viewpoint in the universe) that show the speed of light is the maximum possible velocity. In turn, this implied the non-existence of an absolute frame of reference. Therefore it was firmly established that space is not an absolute void, but instead possesses a physical structure.

Quantum mechanics is far from being a closed theory. This structure can be explored further by employing quantum mechanics on a very small scale, known as the Planck length (1.6 × 10⁻³⁵ metres). Quantum mechanics is about one hundred years old but is far from being a closed theory. Feynman's statement "I think I can safely say that nobody understands quantum mechanics" still holds today. What he alludes to is that, despite the theory providing very powerful tools which can be used for applications such as lasers, computers, smartphones and atomic reactions it still contains many unresolved issues, not least what it implies for our concepts of reality.

I lead the Mathematical Physics Group in City University London’s Department of Mathematics. We cover the spectrum of possibilities that quantum mechanics offers, from applicable positions of particles to fundamental questions about the nature of reality. In a publication he co-authored in 2001, Emeritus Professor Jiri Mathon employed techniques in quantum physics and topological predictions that magnesium oxide would exhibit magnetoresistances far larger than previously observed. The technology used in the modern reading heads of computer hard drives can be traced back to those ideas. This represents one end of the Group’s work.

At the opposite end my research explores new features in quantum mechanics which shed light on deeper structures of space and time. By exploring noncommutative (meaning that multiplying two coordinates, x and y, in a different order gives different results, i.e., x·y is not equal to zero) versions of space-time, I obtain generalised versions of Heisenberg’s uncertainty relations. The original formulation put forward in 1927 led to a surprising structure of space. It states that the product of the precision by which one can know, i.e., measure, a particle’s position and momentum has to be greater than or equal to a constant, i.e., half the Planck constant. This means that if one wants to know exactly which momentum a particle has then one can never know where the particle is. Vice versa if one wants to know the position of the particle exactly then one cannot know its momentum. It needs to be stressed that this ignorance we are faced with regarding either the position or the momentum is not a matter of the precision of the apparatus one is using but rather it is a structure of nature which makes such a measurement impossible. This was very surprising at the time because the assumption that the position in space of a particle and its momentum were regarded as properties one can simply associate independently. This means that space has yet another structure, prompting Niels Bohr to say: "If quantum mechanics hasn’t profoundly shocked you, you haven’t understood it.”

The noncommutative generalisations that I have studied go further. They state that the product of the uncertainties of both positions and momentum is greater than or equal to the quantum uncertainty squared rather than simply a constant. This implies that when one makes the momentum uncertainty very large, the square of the momentum will grow far larger than the original momentum uncertainty. One is led to a minimal length beyond which one cannot know the position of a particle and any time when giving up all the information about its momentum. This would lead to ultralattices far beyond any space in whose internal structure we can never probe. For physicists such questions is a very welcome feature as it can be used to remedy all kinds of previously observed quantum mechanical effects to quantum gravity.
Data and digital

PROFILE

Dr Joana Fonseca
Lecturer in Geotechnical Engineering, School of Mathematics, Computer Science & Engineering
City University London

With buildings becoming taller, trains getting faster and bridges becoming more intricate, civil engineering is facing challenges, some of which date back more than a thousand years, to name but a few. In order to make the 21st century infrastructure align with the demands of our modern life in the safest possible way.

In London alone, some 725 residential towers of more than 20 stories are currently either in the city’s planning system, recently approved or have started on site, according to a March 2015 report by Estates Gazette.

Dr Joana Fonseca specialises in investigating what lies beneath these structures: the soil. “People often think that civil engineering is about building buildings and iconic bridges but they tend to ignore that in my opinion it is a very important element of these infrastructures: their foundations,” she says.

Unlike the traditional geotechnical tendency to look at soil as a continuous material, Dr Fonseca’s approach considers the fact that soil comprises of individual grains with particular shapes and sizes that produce diverse geometrical arrangements or particular shapes and sizes that produce different microstructures. When a load is applied to the soil, the original structure evolves. For example, the soil can expand or contract, according to the load and environment. This expansion and contraction can cause significant problems for civil engineering projects.

Using X-ray computed tomography to generate three-dimensional images of soil samples helps her separate the grains and understand their internal structure. When the soil is stressed, the grains rotate, and she can then study the stress-strain relationship and its impact on soil behavior.

Her research group aims to provide engineers with vital information about how the soil will behave under stress. Using a technique called geotechnical centrifuge, they can simulate the effects of large-scale loads and understand how the soil will respond.

“By examining the soil in such detail, she hopes to improve our understanding of its response to loading,” she explains.

Although this is a fundamental area of research, Dr Fonseca explains that her investigations have useful applications. “Before we build any structure we must predict how the soil will respond using physical models in the geotechnical centrifuge, to see if the soil can support the structure and then measure its response to loading,” she explains.

Her research group aims to provide engineers with useful information about how the soil will behave under stress. Using a technique called geotechnical centrifuge, they can simulate the effects of large-scale loads and understand how the soil will respond.

In doing so, she hopes to improve our understanding of the soil’s response to loading. “For example, the soil can expand or contract, according to the load and environment. This expansion and contraction can cause significant problems for civil engineering projects.”

In the future, she envisions kids creating entirely new digital tastes and smells via their computers. Her research has implications not only for the civil engineering industry but also for other fields such as medicine, where understanding soil mechanics is crucial for designing safer buildings, roads, and pipelines.

Dr Fonseca’s work is of great value to London and the UK, without geotechnical engineering, buildings cannot be built on secure foundations. With the UK capital currently enjoying a construction boom, a strong understanding of soil mechanics is essential to the sector.

Research Impact

Professor Cheok is working on a device, wirelessly connected to the internet, that digitally creates a sense of taste by actuating the tongue through electrical and thermal stimulation. He has also been working with neuroscientists in France to measure brain activity when people experience sweet, sour, salty and bitter tastes and is trying to reproduce this activity by electrical means.

“It’s very early days for this invention but the potential is very exciting,” he says. “Today you can post a picture on Facebook and describe what you are doing, but what does it smell like to be at that amazing beach? Or how does dinner taste at that famous restaurant?”

“I want us to move from the information age, where we are communicating only visually, to the experience age, where we communicate sensually,” he explains. “If I can provide you with a smell and taste, he explains. “In the future I envisage kids creating entirely new digital tastes and smells via their computers.”

His recent published (co-authored) research has included a study of how smell stimuli during sleep can affect what people dream, as well as a ‘food media’ study on how people share cooking and food-based experiences remotely. The latter study comprises three focus-group interviews, a rice messaging printer that encourages collaboration, letting people prepare meals together from remote locations; a rice messaging printer that creates a link between social media platforms and traditional physical cooking and eating; and a 3D food printer that makes eating an interactive, emotionally-rich communication experience.

Commercial opportunities

Another of the research projects Professor Cheok is working on is a collaboration with chef Andoni Luis Aduriz at his Michelin-starred restaurant, Mugaritz, in Spain. The aim of the project is to bring the experience of eating there to the wider public. Professor Cheok has created a smartphone app that transmits the unique smells of the dishes created in the kitchen. Incorporating a small attachment that clips to a smartphone, the app was launched in early 2014 at one of the world’s largest gastronomy conferences in Madrid.

He is also working on a couple of inventions which recreate human touch. Microengineers have found that more than half of all human communication takes place nonverbally, but today’s busy society we aren’t always with each other so I wanted to find a way to re-establish human touch remotely,” he says.

The first of the products Professor Cheok has conceived is a pair of pajamas targeted at parents who work or live away from home. This ‘Huggy Pyjama’ is connected by a wireless app to the internet and allows parents to show their child affection even when they aren’t physically there by transmitting a realistic hug sensation to their child via the pajama suit.

Building on the same idea, Professor Cheok has also created a ring (known as RingPong) which you can give to your partner, child or friend and use the internet to transmit a ‘finger squeeze’ to let them know you are thinking of them.

He says that initially the products he is creating will be used primarily for leisure and entertainment but stresses that being able to communicate sensual data will have a dramatic impact on every facet of society. “Having the capability to communicate with all our senses will inspire new businesses. Children in school will be able to learn about things through smelling and tasting as well as watching videos and reading books. Even healthcare could benefit, as doctors often smell their patients to detect certain illnesses.”

Professor Cheok, who was born in Adelaide, Australia, was first introduced to the limitless possibilities of technology when he was taken by his aunt to see the original Star Wars film when he was six. “The scene that stuck with me was when R2D2 and Chewbacca were playing 3D hologram chess on the Millennium Falcon,” he remembers. Years later, after doing a Bachelor of Engineering at the University of Adelaide, he began creating a 3D hologram display when he started his academic career as Assistant Professor at the National University of Singapore. “It was like a dream come true for me working on something I’d been obsessed with as a kid,” he says.

Blurred lines

While working on this project Professor Cheok realised that communicating a ‘visual presence’ was a starting point and began thinking about what he could do to communicate presence in a more realistic way. This drew him to his current research field which distorts the lines between human senses and computers.

After working as a full Professor at Keio University’s Graduate School of Media Design and Associate Professor at the National University of Singapore, Professor Cheok joined City in 2013. His research output has included peer-reviewed journals, research awards, keynote speeches, international exhibitions and government demonstrations to presidents and prime ministers.
Reducing the risks of predicting life expectancy

Reliable information about mortality rates and life expectancy can make a huge difference to decision-making in fields such as pensions planning, insurance, economics and medicine.

Until recently, gathering data on mortality rates and life expectancy has depended on inadequate methods that do not reflect changing patterns across different ages. Now, thanks to a novel statistical approach created by academics at Cass Business School, City University London, a new level of accuracy is already having widespread impact. The problems of the traditional ways of compiling these figures relate to the small numbers of deaths that occur in a single year, especially at low and very advanced ages.

Mortality rates at these ends of the age range can vary erratically due to the low numbers involved and because no census is perfectly accurate or complete. Errors in these figures make it hard to generalise and to produce accurate long-term predictions about mortality and longevity. However, a ‘smoothing’ methodology, developed by the University’s Professors Steven Haberman (pictured above) and Vladimir Kaishev and Dr Dimitrina Dimitrova, has helped produce better, graduated data.

A statistical breakthrough

Data on deaths and life expectancy involve so-called ‘noisy’ observations, which have complex causes. To create a smooth curve to fit a sample of such observations, the Cass academics developed a method called Geometrically Designed Splines (GeDS), which improves the accuracy of life expectancy predictions at both ends of the age range.

Narrow bands can be used to estimate mortality rates and life expectancy at any age. GeDS so impressed the government’s actuaries that it adopted the new methodology in the most recent edition of the English Life Tables (known as ELT 16), which show the mortality rates and life expectancy of UK citizens and are widely used by actuaries and insurers. This began a long and successful collaboration between the ONS and Cass.

Because it uses GeDS, ELT 16 gives the most accurate data yet on life expectancy in the UK. It provides a valuable input to monitor trends in mortality in England and Wales over a long period of time. When ELT 16 is combined with fertility and migration data, it can help produce more accurate population estimates and projections.

ELT 16 and related life expectancy tables are available for the public and businesses to use, free of charge, through the ONS website. As an indication of its value to many industries, ELT 16 was downloaded up to 500 times a month between November 2012 and June 2013. Encouraged by the success of the GeDS method in England, statistics organisations in Scotland, Ireland, Northern Ireland and Canada have also used it to produce life tables. Ireland’s Central Statistics Office is now introducing a model similar to GeDS, while Statistics Canada is using a model based on the most recent GeDS methodology. This Canadian work is important as it confirms the accuracy of GeDS.

More accuracy, affecting more people

The development of GeDS at Cass has had an impact in many important areas. For example, making accurate calculations of likely life expectancy is vital in the pensions industry, for the pricing of annuities. It also has a major influence on the design of life insurance products, where actuaries must develop projections of future life expectancy and make risk assessments related to insured lives.

The research also has potential to be useful for government, largely because increasing longevity means people can work for longer. On average, a healthy 65-year-old man can now expect to live for another 21 years and a 65-year-old woman for another 24 years. This has a significant impact on the cost of pensions. When government legislation was introduced in 2010 to encourage more people to save for their retirement by buying annuities, the consultation cited ELT 16 and life expectancy tables that use the GeDS smoothing methodology.

More information about any of the case studies and academics featured in Research Impact can be found on www.city.ac.uk, including the University’s Research Excellence Framework (REF2014) performance, please visit www.city.ac.uk/research.

Any section of this publication is available upon request in an accessible format. For further information, please email citypublications@city.ac.uk or call +44 (0)20 7040 8734.