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**Nathu Puri Institute  
for Engineering and  
Enterprise  
Annual Report 2020**

# Executive summary



In the last year we have all witnessed the impact of the COVID-19 pandemic and looking forward there are great expectations that the vaccines that are becoming available around the world will enable the situation to be remedied. Along with the uncertainties caused by the pandemic there has been the need to work in a different pattern through virtual meetings and events as part of working from home and social distancing. Despite the challenging environment, the NPI team has pressed ahead with ongoing operations and academic activities along with delivery of a range of initiatives designed to raise the profile and extend the reach of the institute. In this context, the NPI team continued to deliver its strategic objectives across the research, education and knowledge exchange areas as part of the engineering and enterprise academic agenda. This includes appointment of NPI Visiting Fellows from China, South Africa, Pakistan and Brazil.

The institute's research portfolio has been advanced significantly with 18 new papers published, including 15 journal papers and 3 peer reviewed conference papers as well as several presentations at various conferences, webinars and other events. Thomas Empson has completed the empirical stage of his doctoral research project on understanding engineers' contribution to the creative process within sustainable production solutions and more recently has been writing up his doctoral thesis. Paul Mansell has also completed the empirical stage of his doctoral research on understanding the measurement of infrastructure projects' success against the sustainable development goals, and has recently been writing up his doctoral thesis. Paul's research studies have resulted in several journal articles being published over the last year. The research has been further validated through extensive case study work with the Environment Agency and Thames Tideway. Paul has also delivered guest lectures on his doctoral research at Sussex University and University College London.

Pavan Kumar Sala has been continuing his doctoral research studies on understanding how high-tech entrepreneurs successfully pivot as part of the entrepreneurial journey, and this includes significant recent progress on the empirical stage of his research.

Pavan also presented the preliminary findings from his qualitative studies at the Virtual ISPIM (International Society for Professional Innovation Management) Connects Global Conference – Celebrating the World of Innovation. Clarissa Rocha from the Pontifical Catholic University of Paraná (PUCPR) in Brazil finished her six-month visiting researcher position in the NPI and has subsequently completed her doctoral studies on open innovation and digital transformation in high-tech industrial companies, and more recently has successfully defended her dissertation at PUCPR.

Prof. Philbin continued to collaborate with a number of international researchers across a range of different areas as part of his wider interests in engineering management and sustainable engineering. This has included sustainability, environmental management and regulation as well as green productivity of the Chinese construction industry. Other studies have involved investigating the leadership competencies of project managers as well as applying the knowledge-based view of strategy in order to reveal new insights into the process of university tech transfer. Prof. Philbin investigated the process of carbon capture and utilization (CCU) and this includes undertaking a critical analysis and evaluation of the pathways that are available to support adoption of this form of sustainable technology. In further collaborative research, Prof. Philbin investigated the need for a new paradigm in engineering management and the decision-making process in technology-based organizations.

In regard to educational activities, Sunita Selvarajan has been supporting delivery of the Innovation and Enterprise undergraduate module in the School of Engineering. Sunita was a tutor on the module, which involved leading tutorial sessions and supporting the academic team to deliver the module. In 2020 and for the first time, the module also included

the IET Entrepreneurship for Engineers online course with students studying a unit from the course every week for ten weeks. Furthermore, Sunita had a lead role in successfully embedding the online course into the module and was responsible for overseeing course delivery each week as part of the tutorial sessions. Prof. Philbin and Pavan Kumar Sala also delivered guest lectures on the module.

Over the last year, Prof. Philbin has again delivered the Technology Evaluation and Commercialisation (TEC) module and the Technical, Research and Professional Skills (TRAPS) module, which are both level 7 Masters' modules in the School of Engineering. The modules substantially underpin the provision of enterprise education as well as research and professional skills for postgraduate MSc and final year undergraduate MEng students in the School of Engineering. Both modules received highly positive feedback from the students who participated in the 2020 delivery of the modules.

In order to ensure we maintained and enhanced our academic profile, we held a successful webinar in June 2020 called 'Enabling Enterprising Engineers'. The event attracted over 40 participants from different countries and it provided an excellent showcase of the work of the NPI, including the progress of the doctoral research projects. This virtual event was marketed extensively within LSBU and externally and therefore acted as a highly effective promotional activity for the institute. The NPI team were also busy across a number of other knowledge exchange activities. Indeed, Prof. Philbin delivered a successful webinar as part of the American Society for Engineering Management (ASEM) International Webinar Series in the Summer of 2020. More recently he gave an invited presentation at the Triple Helix Series Virtual Event on Integrating the Sustainable Development Goals into Energy Transition and Climate-Change Mitigation: Views from Brazil and UK.

In October 2020 Prof. Philbin completed his term as the President of ASEM, whereupon he commenced his one-year term as the Past President of the Society. Prof. Philbin also achieved Fellowship of the Higher Education Academy, which demonstrates a commitment to professionalism in teaching and learning in higher education. As part of his Sustainability Project Manager position at LSBU, Thomas Empson had a leading role in the organisation of the LSBU Virtual Conference: Sustainability and Climate Action Event on Carbon, Climate, Energy and Resources. The conference also included technical presentations by Thomas Empson, Paul Mansell and Prof. Philbin.

Looking ahead, the NPI team is in an excellent position to consolidate on its current academic profile in the area of engineering and enterprise through continued delivery of the research, education and knowledge exchange activities. The NPI team has established an extensive network both within LSBU, which includes different academic schools at the university as well as externally with various international collaborators. Current efforts are directed towards developing new projects that build on the existing platform of activities to ensure impact is maintained across the knowledge, industrial and societal dimensions of engineering and enterprise. The two main areas that are under development involve applying the lens of technology and engineering management (TEM) to improve our understanding of particular aspects of sustainability and digital transformation.

**Prof. Simon P. Philbin**

Director of the Nathu Puri Institute for Engineering and Enterprise  
London South Bank University

# Historical background of the institute

The NPI was originally established by LSBU in 2011 following a generous donation by the Puri Foundation in order to embed enterprise in engineering education and industrial practice. This was based on the premise that although engineers still require a solid technical foundation for their education and practice, they can also benefit from access to a wider set of enterprise and professional related skills and knowledge. The original intent for the institute that still remains valid was summarised succinctly by Professor Nathu Puri at the institute's launch event as follows: "Knowledge should be available to future engineers and engineering students so that more of them can break the glass ceiling and become entrepreneurs and our business leaders. Current demands are for engineers with a much wider knowledge base, hence this initiative today". The institute was also established according to the original vision of the founder, Emeritus Professor Rao Bhamidimarri.



# Members of the institute

The institute currently has the following members:

- Prof. Simon P. Philbin, Institute Director
- Paul Mansell, Doctoral Researcher
- Pavan Kumar Sala, Doctoral Researcher
- Sunita Selvarajan, Project Administrator
- Dr. Safia Barikzai, Affiliated Staff
- Thomas Empson, Affiliated Staff

The institute is an integral part of the School of Engineering at LSBU and the Director of the NPI reports to the Dean of the School of Engineering (Prof. Asa Barber).

Over the course of 2020, a number of Visiting Fellows were appointed who collaborate with the Institute across different research areas. The current NPI Visiting Fellows are as follows:

- Prof. Jingxiao Zhang, Chang'an University, China
- Prof. Arnesh Telukdarie, University of Johannesburg, South Africa
- Dr. Riaz Ahmed, Bahria University, Pakistan
- Dr. Fernando Deschamps, Pontifical Catholic University of Paraná, Brazil

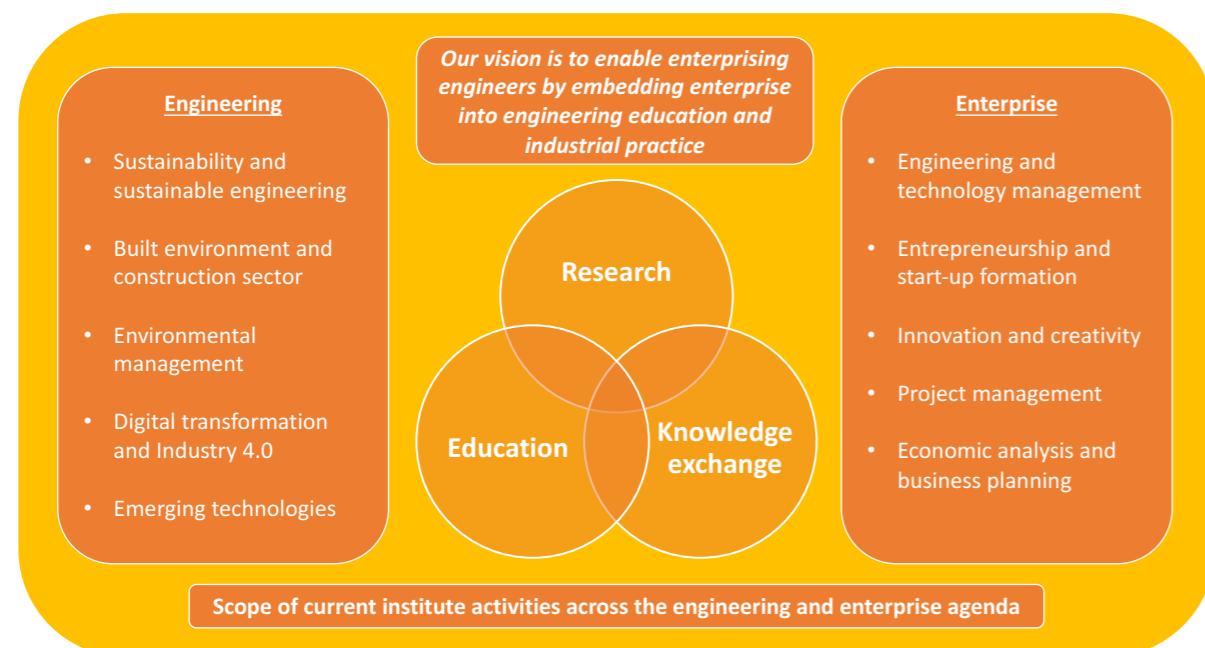
# Strategic profile of the institute

The institute conducts an integrated programme of activities across engineering and enterprise – this includes research, education and knowledge exchange as depicted in the schematic diagram. Since its formation, the NPI team has undertaken a series of projects and initiatives in regard to advancing this strategic agenda and generating the required outcomes and wider impact according to both societal and industrial perspectives.

The engineering remit of the institute is principally focused on the application and adoption of new technologies and management systems for different engineering applications. This includes the area of sustainability, including application to the built environment and construction sector, environmental management and sustainable engineering as well as different forms of renewable energy. In terms of the adoption of new technologies, this includes

digital transformation as part of the wider Industry 4.0 technological paradigm as well as other forms of technology and new product development.

The enterprise remit of the institute includes innovation, entrepreneurship and intrapreneurship as well as the development of broader professional related skills and knowledge. This is because being enterprising is not limited to new venture creation but also includes the ability to understand how to develop an idea into a new business area within an existing company. Enterprise also involves understanding how to commercialise research and technology towards new product development as well as the management of technology and engineering projects.



# Research projects

## Creative engineering for a sustainable future

Thomas Empson has been undertaking his doctoral research towards creative engineering for a sustainable future. In 2019, humanity extracted around 1.75 planets worth of natural resources and since the 1970's we have continued to extract more planetary resources than Earth can replenish, resulting in an ecological and climate crisis. The costs of our extractive economy jeopardises the long-term stability of a healthy planet and the prosperity of future generations. Solutions able to address global grand challenges are unfortunately not happening at the scale and pace needed to reverse climate change and regenerate the ecological overspend. However, within this reality, driven by science developments and real world degradation, what constitutes something as creative must be redefined, judged and measured accordingly. Thomas' research applies a number of frameworks to measure the creativity of an engineering project based on its positive social, environmental and economic impact; its alignment with the United Nations' Sustainable Development Goals and other macro factors which are contextually relevant in Post-normal Times. Through a combination of inductive and deductive research methods, Thomas has measured the contribution of engineers within a project lifecycle which is contextual creative towards sustainable development. Thomas has also identified the mindsets of different engineers, and their collaborators, on a time-space perspective to identify commonalities in attitudinal behaviour towards addressing long-term and far-reaching global challenges.





### **Capturing SDG impact for infrastructure projects**

Paul Mansell has been undertaking his doctoral research to address the following question: Does existing infrastructure project measurement capture SDG (sustainable development goal) impact? The PhD research is structured in four phases, which have now been completed and he is in his write-up completion phase. Phase 1 was the literature review – separated between contextual themes and the underlying theories. The first group includes sustainability, sustainable development, SDGs, defining project success, and SDG measurement on infrastructure projects. The second group includes the underlying theories, which are the theory of change, and the triple bottom line – planet, profit and people. Phase 2 was an exploratory investigation to test propositions using a survey of 350 engineers, followed by initial analysis of data and the subsequent data capture from 40 interviews with infrastructure organisations' CEOs and corporate Heads of Sustainability. Phase 3 involved development of the theoretical model and from early desk-top testing, a proposed methodology for use in practice. Phase 4, which involved case studies with leading projects (primarily the Environment Agency but also the Thames Tideway megaproject) to test the model and methodology with partners across the project-programme-portfolio and organisational boundaries. The impact of this work will be that the Environment Agency will have a credible approach to prioritise investment decisions on which SDG targets and indicators they will measure performance against for projects across the portfolio.



### **High-tech entrepreneurs and start-up pivoting**

Pavan Kumar Sala has been undertaking his doctoral research on understanding how high-tech start-up companies successfully pivot as part of the entrepreneurial journey. The research study is focused on the practice of high-tech entrepreneurs in order to understand how pivoting (i.e. changing direction) has impacted the entrepreneurial journey of start-up companies. The research is considering the types of pivots available to a high-tech start-up and the possible factors that trigger the start-up to pivot. Furthermore, the research is focused on identifying the impact of technology in pivoting through using the technology S-curve model. The qualitative research approach is being employed to understand the phenomenon of entrepreneurial pivoting of tech start-ups, including the type of pivots, factors that cause pivoting and the impact of technology maturity on pivoting. As part of the research study, Pavan has conducted thirty interviews with high-tech entrepreneurs from across the UK. Ten of these thirty high-tech entrepreneurs were selected for further interviews in order to identify the detailed characteristics of pivoting and the conditions that influence pivoting. Once the empirical solution has been obtained, the research study will address the knowledge gap in the extant literature and develop insights that will benefit practising entrepreneurs in the high-tech sector.



### **Open innovation and digital transformation in high-tech industrial companies**

Clarissa Rocha was a Visiting Researcher based at the NPI from September 2019 to February 2020. Clarissa is from the Business Administration Program at the Pontifical Catholic University of Paraná (PUCPR) and her research is under the supervision of Prof. Carlos Quandt and Prof. Fernando Deschamps both from PUCPR and in collaboration with Prof. Simon Philbin. The research aimed to analyse how R&D collaborations contribute to business innovation in Brazilian and European industrial firms in the context of Industry 4.0 and through utilising the open innovation theoretical concept in manufacturing. While in the UK, Clarissa was able to conduct case study research through investigating digital transformation at several high-tech industrial companies. This research enabled a Brazil/UK comparative analysis to be undertaken in order to improve our understanding of how open innovation supports the adoption of digital technologies. Clarissa has now completed her doctoral research and has recently successfully defended her doctoral thesis at PUCPR.

### Research on engineering management and sustainable engineering

Prof. Philbin has continued to undertake various strands of research on engineering management and sustainable engineering with several international collaborators. This has included collaborating with researchers from Chang'an University in China on sustainability and economic analysis in the context of the Chinese construction industry. This includes several related studies across a number of areas, such as measuring the capacity utilization of China's transportation industry under environmental constraints; exploring the role of the business model and green production to enable green dynamic capability of construction enterprises; investigating environmental regulation and green productivity of the construction industry in China; and understanding the influence of agglomeration and selection effects on the Chinese construction industry. This collaborative work has supported the publication of several articles in leading academic journals.

Collaborative research studies by Prof. Philbin with Bahria University in Pakistan have involved investigating the leadership competencies of project managers, which synthesized clusters of leadership competencies and prioritized project manager's leadership competencies as 'high priority', 'moderate priority' and 'low priority'. Other collaborative research studies by Prof. Philbin with SUNY (State University of New York) in Korea on technology transfer offices (TTOs) focused on applying the knowledge-based view of strategy in order to reveal new insights into the process of university tech transfer. The study identified that the relationship between TTO knowledge management and knowledge deployment as well as start-up business performance is where TTOs secure the strongest returns. Both of these collaborative studies involved use of the systematic literature review (SLR) technique as an exploratory tool to increase our understanding of the respective areas.



Prof. Philbin has continued to explore the characteristics of emerging technologies and this includes carbon capture and utilization (CCU). CCU is the process of capturing unwanted carbon dioxide and utilizing for further use. CCU offers significant potential as part of a sustainable circular economy solution to help mitigate the impact of climate change resulting from the burning of hydrocarbons and alongside adoption of other renewable energy technologies. Research has been carried out to provide a critical analysis and evaluation of the technology pathways for CCU in order to explore the potential from a circular economy perspective of this emerging area of clean technology.

In further collaborative research, Prof. Philbin investigated the need for a new paradigm in engineering management and the decision-making process in technology-based organizations. Additionally, collaborative studies were carried out to capture best practice from measuring the performance of project management offices (PMO) through application of the balanced scorecard in a collaborative research context.

### Research on engineering education

Prof. Philbin has continued to investigate how enterprise related skills and knowledge can be delivered as part of engineering education programmes. Indeed, when considering the education of engineers a number of questions arise. How can engineers be successful in knowledge-driven organizations and tackle the challenges and opportunities arising today? How can they build on their technical foundation and numerical skills by becoming more innovative and entrepreneurial? Consequently, the recent development of the IET Entrepreneurship for Engineers online course has been investigated and presented as part of a conference paper. The study provided details on how the online programme was designed and developed, including the structure and educational content of the programme. Furthermore, illustrative details were described on the content from the managing innovation projects unit as well as discussion of the formative and summative assessment strategy adopted in the programme. The study allowed a number of lessons learnt to be identified that are useful for engineering academics and others who are seeking to develop enterprise related programmes for engineers.



# Highlights

- **January 2020** – Paul Mansell delivered a further workshop as part of the Measuring Infrastructure SDG Impact project with the Environment Agency, Thames Tideway and other stakeholders.
- **January 2020** – Prof. Philbin commenced teaching of the 2019/20 Technology Evaluation and Commercialisation module.
- **February 2020** – Thomas Empson delivered an SDG workshop to LSBU's Corporate Group Leaders to identify priority SDGs to focus on.
- **March 2020** – Pavan Kumar Sala delivered a guest lecture for Masters' students on the Technology Evaluation and Commercialisation module.
- **April 2020** – Prof. Philbin was invited as the Guest Editor for a Special Issue in the journal Sustainability.
- **May 2020** – Prof. Philbin chaired the virtual ASEM Spring Board of Directors meeting.
- **June 2020** – Thomas Empson, Paul Mansell and Prof. Philbin gave presentations at the LSBU Virtual Conference on Sustainability and Climate Action (Carbon, Climate, Energy and Resources).
- **July 2020** – The NPI team delivered the 'Enabling Enterprising Engineers' Webinar.
- **July 2020** – Paul Mansell successfully completed the RES-4B panel review for his doctoral research project.
- **September 2020** – Sunita Selvarajan was appointed as a Tutor to support delivery of the Innovation and Enterprise undergraduate module in the School of Engineering.
- **September 2020** – Pavan Kumar Sala successfully completed the RES-4B panel review for his doctoral research project.
- **September 2020** – 230 Students from across the LSBU School of Engineering commenced the IET Entrepreneurial Skills for Engineers online course as part of the Innovation and Enterprise Module (coordinated by Sunita Selvarajan).
- **October 2020** – Prof. Philbin presented on 'How Can Engineers Become More Enterprising?' as part of the ASEM International Webinar Series.
- **October 2020** – Prof. Philbin completed his term as the President of ASEM and commenced his term as Past President.
- **October 2020** – Prof. Philbin presented a paper at the virtual ASEM International Annual Conference.
- **November 2020** – Prof. Philbin was awarded Fellowship of the Higher Education Academy.
- **November 2020** – Paul Mansell gave guest lectures on his doctoral research at UCL and Sussex University.
- **November 2020** – Clarissa Rocha, former Visiting Researcher at LSBU, successfully defended her doctoral dissertation at PUCPR in Brazil.
- **December 2020** – Pavan Kumar Sala presented a paper at the ISPIIM Connects Global Virtual Conference: Celebrating the World of Innovation.
- **December 2020** – Prof. Philbin gave an invited presentation at the Triple Helix Series Virtual Event on Integrating the Sustainable Development Goals into Energy Transition and Climate-Change Mitigation: Views from Brazil and UK.



# Education initiatives



## Innovation and Enterprise Undergraduate Module

The NPI team have been supporting delivery of the Innovation and Enterprise module, which is an undergraduate elective module in the School of Engineering that is led by Dr. Francis Babayemi and Barney Townsend. In response to COVID-19 restrictions, the module was delivered online to 230 undergraduate students. As a module tutor, Sunita Selvarajan from the NPI team led the tutorial sessions, providing input and linking the subject material taught on the module with the world of commerce. Sunita also supported students to complete their presentations for the 'Mayor of London's Entrepreneur Competition'.

In addition, the 'Entrepreneurial Skills for Engineers' online course previously developed by the NPI team in partnership with the IET (Institution of Engineering and Technology) formed an integral part of the Innovation and Enterprise module with marks awarded to students who successfully completed the course. These contributions helped the undergraduate students to gain valuable insights into engineering innovation and enterprise as well as the skills that are required in the working environment, including the importance of understanding the client, cross-cultural teaming, the art of presentations and the habits of effective people. Prof. Philbin and Pavan Kumar Sala also gave guest lectures on the module on 'The Need for Engineers to be Entrepreneurial' and 'Entrepreneurial Finance' respectively.



## Technology Evaluation and Commercialisation Masters' Level Module

Prof. Simon Philbin delivered the level 7 Masters' Technology Evaluation and Commercialisation (TEC) module for the School of Engineering in the second semester of the 2019/20 academic year. The module involves use of the TEC Algorithm that was originally developed at North Carolina State University in USA. The TEC module enables Masters' level students to be guided towards identifying an emerging technology idea that is evaluated for its commercial potential. Detailed research and analysis is conducted according to a prescribed algorithmic model in order to evaluate the business potential of the technology. This approach allows the students to prepare the commercialisation strategy and write the business plan for the potential high-tech start-up company based on an emerging technology.

The educational model adopted in the module represents a simulation exercise for start-up business planning (although at the end of the course students are not required to actually launch a real company). The students work as part of teams and so they encounter many of the real world issues associated with team working and are required to meet deadlines through submission of the assignments. In addition to the algorithmic approach students are provided with lectures across a range of business and technology management areas. Feedback received from the students that participated in this delivery of the module was highly favourable.



### Technical, Research and Professional Skills Masters' Level Module

Prof. Simon Philbin delivered the level 7 Masters' Technical, Research and Professional Skills (TRAPS) module for the School of Engineering in the first semester of the 2020/21 academic year. The module enables development of the skills that are necessary for successful completion of the research dissertation in the near future and for professional development in the long-term future. The students are required to prepare a feasibility study report for their proposed Master's research project and also present a summary of the report as part of meeting the requirements for the module assessment. More specifically, the aim of the module is to ensure that engineering students from Masters' programmes can undertake research and project work in a professional way and communicate their technical proposals effectively. Additionally, students are given support to enhance their technical and analytical skills that will enable them to manage complex technical projects.

The key areas covered in the module include critical thinking and formulating a research problem; critical analysis of technical literature; research methods and strategy; access to research data and data collection; research data analysis techniques; ethics and professional skills; principles of project management; technical report writing and presenting. The module includes a diverse range of tutorial sessions across different technological areas and engineering applications in order to embed learning and the knowledge acquired in the corresponding lectures. Feedback received from the students that participated in this delivery of the module was highly favourable.



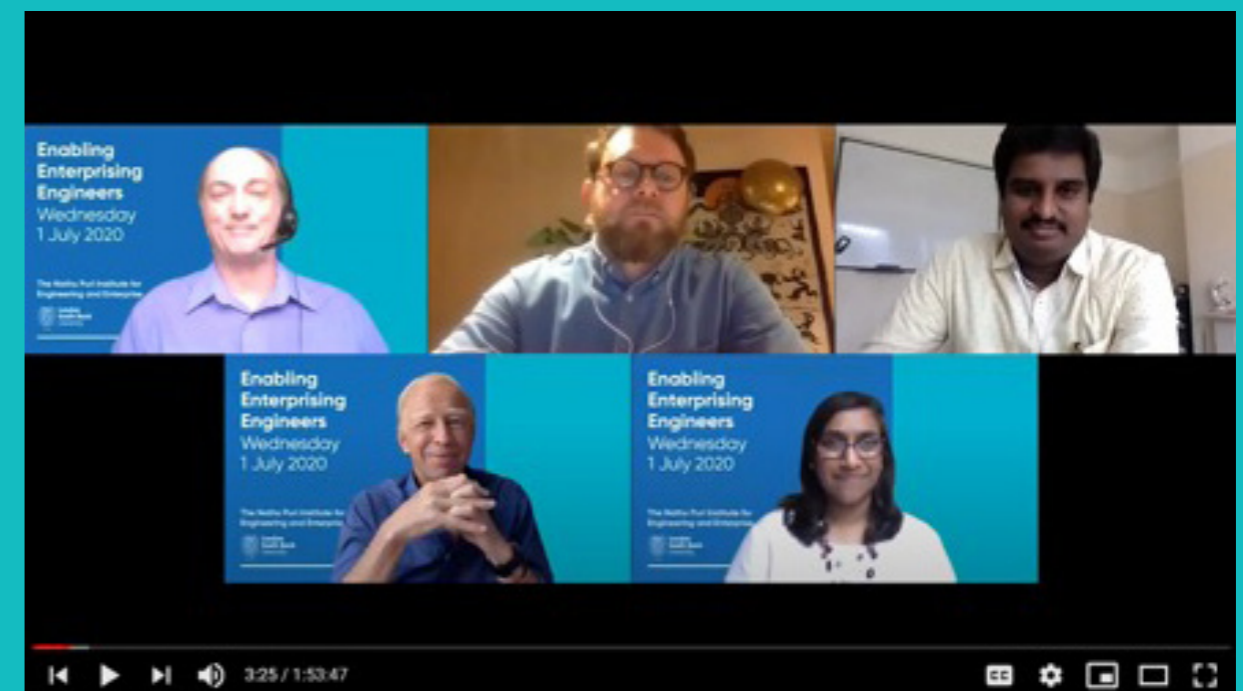
# Knowledge exchange

### International Leadership Role with the American Society for Engineering Management

Prof. Simon Philbin completed his term as the President of the American Society for Engineering Management (ASEM) in October 2020 whereupon he commenced his one-year term as the Past President of the Society. Prof. Philbin has been serving on the ASEM Board of Directors since 2014 in different roles. ASEM has its origins in the United States but also has international members and sections – the Society is focused on advancing the discipline of engineering management. ASEM has the objective to develop the tools, techniques and core knowledge to help with the management of people and projects in technology-driven organisations. During his tenure as the President of ASEM, there was a need to provide overall leadership for the Society as well as ensuring delivery of various strategic initiatives in the context of uncertainties caused by the global pandemic. As recognition for his service, Prof. Philbin received the Past President's Award at the ASEM Virtual International Annual Conference held in October 2020.

### Enabling Enterprising Engineers Webinar

The Enabling Enterprising Engineers Webinar was held on 1st July 2020 with 105 people registered to attend and 42 people attending on the day of the event. This 2-hour event was organised to showcase the work of the NPI team and included the following presentations: 'Introduction and the Need for Engineering and Enterprise' (Prof. Simon Philbin), 'Creative Engineering for a Sustainable Future' (Thomas Empson), 'Capturing SDG (Sustainable Development Goal) Impact for Infrastructure Projects' (Paul Mansell) and 'Entrepreneurial Pivoting and the Impact of Technology' (Pavan Kumar Sala). The webinar was organised by Sunita Selvarajan and supported by Neil Basing from the LSBU corporate events team. The event provided an excellent opportunity to highlight the work of the NPI team both across LSBU and externally with a number of the webinar attendees being international.



### LSBU Virtual Conference on Sustainability and Climate Action

As part of his Sustainability Project Manager position alongside his Research Fellow post in the NPI team, Thomas Empson had a leading role in the organisation of the LSBU Virtual Conference: Sustainability and Climate Action Event on Carbon, Climate, Energy and Resources. As part of this contribution, Thomas hosted various sessions as well as technical panel sessions. Additionally Thomas delivered a presentation on 'Creating Sustainable Development: Measuring the Positive Ecological, Economic and Social Impact of the Kachumbala Maternity Unit'. Further conference presentations at the virtual event were also given by Paul Mansell (Measuring SDG Impacts under the 'Carbon Umbrella' - Using Theory of Change and the Triple Bottom Line to Develop New Ways of Ensuring Alignment of Stakeholders to Drive Greater SDG Impacts) and Prof. Simon Philbin (Towards Environmental Sustainability through Engineering Management). The event was an excellent opportunity to raise the profile of sustainability related activities at LSBU including the research studies of the NPI team related to the sustainability agenda.



### ASEM Webinar

As part of the American Society for Engineering Management (ASEM) International Webinar Series in the Summer of 2020, Prof. Simon Philbin delivered a webinar on 'How Can Engineers Become More Enterprising?'. The event generated detailed discussions on the subject and helped to further raise the international profile of the NPI team and our work across engineering and enterprise.

### NPI Playlist on YouTube

In order to further promote the work of the NPI and the range of activities delivered, an NPI Playlist has been established on YouTube. The playlist is part of the main LSBU YouTube website. The playlist was set up by the LSBU Marketing Department and was organised by Sunita Selvarajan. The initial list has fourteen videos, including the Enabling Enterprising Engineers Webinar, three presentations from the LSBU Virtual Conference on Sustainability and Climate Action and ten introductory videos from the IET Entrepreneurship for Engineers online course that were previously filmed at the LSBU Elephant Studios. The NPI Playlist on YouTube helps to further raise the international profile of the institute and where possible, further videos and presentation will be added to the site in the future.

### Other academic activities of the institute

Prof. Philbin has been involved in various other academic activities. This includes continuing to serve alongside other colleagues in the School of Engineering as an external moderator for various modules in the Faculty of Engineering, British University in Egypt (BUE). Prof. Philbin also served as an external examiner for the Faculty of Engineering and the Built Environment, Post Graduate School of Engineering Management, University of Johannesburg in South Africa.

Prof. Philbin was invited to serve as the Guest Editor for a Special Issue in the journal Sustainability called 'Driving Sustainability through Engineering Management and Systems Engineering'. Several articles have already been published in the special issue and further articles are envisaged to be published before the deadline for submissions on 31st March 2021.

Prof. Philbin has also continued to serve as the Associate Editor (Program and Project Management) for the Engineering Management Journal (EMJ) and as a Member of the Editorial Board for the Journal of Research Administration (JRA).

# Publications, conference and webinar presentations

1. Journal paper – Zhang, J., Ouyang, Y., Ballesteros-Pérez, P., Li, H., Philbin, S. P., Li, Z., Skitmore, M. (2021). Understanding the Impact of Environmental Regulations on Green Technology Innovation Efficiency in the Construction Industry. *Sustainable Cities and Society*, 65, 102647 [published online: 7 December 2020].
2. Journal paper – Hasnat, R., Philbin, S.P. (2021). Understanding the communication and collaboration challenges encountered by technology managers. *International Journal of Knowledge Management Studies*, 12(1), 80-100 [published online: 16 December 2020].
3. Journal paper – Philbin, S.P. (2020). Critical Analysis and Evaluation of the Technology Pathways for Carbon Capture and Utilization. *Clean Technologies*, 2(4), 492-512.
4. Journal paper – Philbin, S.P., Kennedy, D. (2020). Exploring the Need for a New Paradigm in Engineering Management and the Decision-Making Process in Technology-based Organizations. *Engineering Management in Production and Services*, 12(4), 7-21.
5. Journal paper – Mansell, P., Philbin, S.P., Konstantinou, E. (2020). Delivering UN Sustainable Development Goals' Impact on Infrastructure Projects: An Empirical Study of Senior Executives in the UK Construction Sector. *Sustainability*, 12(19), 7998.
6. Journal paper – Mansell, P., Philbin, S.P., Broyd, T. (2020). Development of a New Business Model to Measure Organizational and Project-Level SDG Impact—Case Study of a Water Utility Company. *Sustainability*, 12(16), 6413.
7. Journal paper – Zhang, J., Cai, W., Philbin, S.P., Li, H., Lu, Q.C., Ballesteros-Pérez, P., Yang, G. L. (2020). Measuring the capacity utilization of China's transportation industry under environmental constraints. *Transportation Research Part D: Transport and Environment*, 85, 102450.
8. Journal paper – Zhang, J., Ouyang, Y., Philbin, S.P., Zhao, X., Ballesteros-Pérez, P., & Li, H. (2020). Green dynamic capability of construction enterprises: Role of the business model and green production. *Corporate Social Responsibility and Environmental Management*, 27(6), 2920-2940.
9. Journal paper – Mansell, P., Philbin, S.P., Konstantinou, E. (2020). Redefining the Use of Sustainable Development Goals at the Organisation and Project Levels—A Survey of Engineers. *Administrative Sciences*, 10(3), 55.
10. Journal paper – Hamilton, C., Philbin, S.P. (2020). Knowledge Based View of University Tech Transfer—A Systematic Literature Review and Meta-Analysis. *Administrative Sciences*, 10(3), 62.
11. Journal paper – Philbin, S.P., Kaur, R. (2020). Measuring PMO Performance—Application of the Balanced Scorecard in a Collaborative Research Context. *Journal of Modern Project Management*, 7(4), 1-22.
12. Journal paper – Mansell, P., Philbin, S.P. (2020). Measuring Sustainable Development Goal Targets on Infrastructure Projects. *Journal of Modern Project Management*, 8(1), 42-63.
13. Journal paper – Ahmed, R., Philbin, S.P., Cheema, F.-A. (2020). Systematic literature review of project manager's leadership competencies. *Engineering, Construction and Architectural Management*, doi.org/10.1108/ECAM-05-2019-0276.
14. Journal paper – Zhang, J., Zhang, Y., Philbin, S.P., Ballesteros-Pérez, P., Ouyang, Y., Cheng, J. (2020). Influence of Agglomeration and Selection Effects on Chinese Construction Industry. *Proceedings of the Institution of Civil Engineers – Engineering Sustainability*, doi.org/10.1680/jensu.20.00012.
15. Journal paper – Zhang, J., Pu, S., Philbin, S.P., Li, H., Skitmore, M., & Ballesteros-Pérez, P. (2020). Environmental Regulation and Green Productivity of the Construction Industry in China. *Proceedings of the Institution of Civil Engineers – Engineering Sustainability*, doi.org/10.1680/jensu.20.00013.
16. Conference paper – Mansell, P., Van Rooyen, D., Philbin, S.P., Sabini, L. (2020). Measuring sustainable development goal targets on infrastructure projects. *Proceedings of the EPOC 2020 – Virtual Engineering Project Organizations Conference*, 21-23 October 2020.
17. Conference paper – Philbin, S.P. (2020). Entrepreneurial Skills for Engineers – Insights from the Development of an Online Course, *Proceedings of the ASEM (American Society for Engineering Management) Virtual International Annual Conference and 41st Annual Meeting*, 28-30 October 2020.
18. Conference paper – Sala, P.K., Philbin, S.P., Barikzai, S. (2020). Investigating the Entrepreneurial Pivoting Experience of UK-based Technology Start-ups. *Proceedings of the ISPIM (International Society for Professional Innovation Management) Connects Global Virtual Conference – Celebrating the World of Innovation*, 6-8 December 2020.
19. Conference presentation – Empson, T. (2020). Creating Sustainable Development: Measuring the Positive Ecological, Economic and Social Impact of the Kachumbala Maternity Unit, Virtual Conference: LSBU Sustainability and Climate Action Event – Carbon, Climate, Energy & Resources, 22-26 June 2020.

20. Conference presentation – Mansell, P. (2020). Measuring SDG Impacts under the 'Carbon Umbrella'. Using Theory of Change and the Triple Bottom Line to Develop New Ways of Ensuring Alignment of Stakeholders to Drive Greater SDG Impacts. Virtual Conference: LSBU Sustainability and Climate Action Event – Carbon, Climate, Energy & Resources, 22–26 June 2020.
21. Conference presentation – Philbin, S.P. (2020). Towards Environmental Sustainability through Engineering Management, Virtual Conference: LSBU Sustainability and Climate Action Event – Carbon, Climate, Energy & Resources, 22–26 June 2020.
22. Webinar presentation – Philbin, S.P. (2020). Introduction and the Need for Engineering and Enterprise, LSBU Nathu Puri Institute for Engineering and Enterprise Webinar: Enabling Enterprising Engineers, 1 July 2020.
23. Webinar presentation – Empson, T. (2020). Creative Engineering for a Sustainable Future, LSBU Nathu Puri Institute for Engineering and Enterprise Webinar: Enabling Enterprising Engineers, 1 July 2020.
24. Webinar presentation – Mansell, P. (2020). Capturing SDG (Sustainable Development Goal) Impact for Infrastructure Projects, LSBU Nathu Puri Institute for Engineering and Enterprise Webinar: Enabling Enterprising Engineers, 1 July 2020.
25. Webinar presentation – Sala, P.K. (2020). Entrepreneurial Pivoting and the Impact of Technology, LSBU Nathu Puri Institute for Engineering and Enterprise Webinar: Enabling Enterprising Engineers, 1 July 2020.
26. Webinar presentation – Philbin, S.P. (2020). How Can Engineers Become More Enterprising?, ASEM (American Society for Engineering Management) International Webinar Series, 1 October 2020.
27. Invited presentation – Philbin, S.P. (2020). Investigating the Measurement of SDG Impact for Infrastructure Projects in the Construction Sector, Triple Helix Series Virtual Event on Integrating the Sustainable Development Goals into Energy Transition and Climate-Change Mitigation: Views from Brazil and UK, Organised by the Research Centre for Gas Innovation, University of São Paulo and the Sustainable Gas Institute, Imperial College London, 2 December 2020.

## Collaborative partners of the NPI

- American Society for Engineering Management (ASEM), USA
- Bahria University, Pakistan
- Building Research Establishment (BRE)
- Chang'an University, China
- Environment Agency
- Institution of Civil Engineers (ICE)
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- Pontifical Catholic University of Paraná (PUCPR), Brazil
- SUNY (State University of New York), Korea
- Tideway (Thames Tideway Tunnel)
- University College London (UCL)
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# Contact

**Prof. Simon P. Philbin**

Director of the Nathu Puri Institute  
for Engineering and Enterprise  
School of Engineering  
London South Bank University  
103 Borough Road  
London SE1 0AA  
United Kingdom

Tel: +44 (0)20 7815 7559

Email: [philbins@lsbu.ac.uk](mailto:philbins@lsbu.ac.uk)

Web: [www.lsbu.ac.uk/research/centres-groups/the-nathu-puri-institute](http://www.lsbu.ac.uk/research/centres-groups/the-nathu-puri-institute)



