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LSBU

**Nathu Puri Institute
for Engineering and
Enterprise**
Annual Report 2022

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Executive summary



Over the last year, the Nathu Puri Institute for Engineering and Enterprise at London South Bank University (LSBU) has continued to generate significant academic

outputs in support of its vision, which is to enable enterprising engineers by embedding enterprise into engineering education and industrial practice. The Institute has produced sustained performance across the portfolio areas of research and education combined with various knowledge exchange activities. The Institute delivers local value for the School of Engineering in terms of teaching and student support, but crucially this is combined with wider impact through the international collaborative research and global reach of the Institute.

A key tenet of the Institute is to support the educational provision in the School of Engineering through helping to provide engineering students with access to a broader set of skills and knowledge that builds on their technical foundation. In this regard, the Technology Evaluation and Commercialisation (TEC), and Technical, Research and Professional Skills (TRAPS) modules have again been delivered by Prof. Simon Philbin as the Module Leader. Sunita Selvarajan has supported the Innovation and Enterprise undergraduate module through serving as a Tutor, where a further 206 students successfully completed the IET Entrepreneurial Skills for Engineers online course that was originally developed by the NPI team. Furthermore, Sunita Selvarajan delivered a successful Coaching

Pilot Project for undergraduate students from across the School of Engineering in academic year 2021/22 and has more recently launched a new coaching project for academic year 2022/23 that is supporting a further cohort of students. The coaching interventions that are part of the initiative provide direct support to help students realise their educational goals.

Regarding research highlights of the Institute, Prof. Philbin has continued to lead an integrated programme of research in engineering management and this research is principally focused in three main themes, namely value optimisation, sustainable development, and digital transformation. Pavan Kumar Sala has completed the data collection and analysis stage of his doctoral research project (supervised by Prof. Philbin and Dr. Safia Barikzai) on entrepreneurial pivoting and the impact of technology maturity, and recently he has been writing up his PhD thesis. Prof. Philbin has continued to supervise MSc and MEng research projects on different aspects of renewable energy technologies, which includes collaborating with Dr. Saim Memon of Arden University through supervising a project on floatovoltaics. Furthermore, Prof. Philbin collaborates with Prof. Deborah Andrews from the LSBU School of Engineering through co-supervising an MRes project with Dominika Ptach on the sustainable design and development of data centres. Prof. Philbin also collaborates with Dr. Sara Rye from the LSBU Business School through co-supervising a PhD project with Firdaus Ennami on the sustainability risk management of renewable energy projects.

In other research, Prof. Philbin has continued to collaborate with several leading academic groups from across the world. This includes research on digital transformation through open innovation

by high-tech manufacturing firms with Dr. Clarissa Rocha, Prof. Carlos Quandt and Prof. Fernando Deschamps from the Pontifical Catholic University of Paraná in Brazil. Research on innovation in the built environment with Prof. Jing-xiao Zhang from Chang'an University in China. Research on different aspects of project management with Prof. Riaz Ahmed from Bahria University in Pakistan. Finally, research with Prof. Arnesh Telukdarie from the University of Johannesburg in South Africa, which is investigating how SMEs (small and medium-sized enterprises) from the food and beverage sector undergo the process of digital transformation. This collaborative research project is funded by the Royal Academy of Engineering and the Newton Fund as part of the Engineering X – Transforming Systems through Partnership Programme.

In regard to knowledge dissemination, Prof. Philbin has delivered presentations at various events and meetings, including a seminar at the International Entrepreneurship Educators Conference (IEEC) held at Swansea University. A conference presentation at the American Society for Engineering Management's International Annual Conference held in Tampa, Florida. A virtual seminar at the Annual Huawei Strategy and Technology Workshop in China (Systems Engineering Track), and a virtual presentation as part of the Academic Partnership Webinar Series of the American Society for Engineering Management. In terms of specific research outputs, over the last year there were 15 journal papers published; 2 conference papers; 3 journal editorials; 1 technical magazine article; and 3 external seminar/webinar presentations delivered.

In 2022, Prof. Philbin was appointed a Visiting Professor at the Institute of Advanced Research Gandhinagar in India, and Co-Editor-in-Chief of the Engineering Management Journal (EMJ), in addition to serving a 5-month appointment as the Interim Head of the Division of Electrical & Electronic Engineering in the School of Engineering. Also, Sunita Selvarajan was awarded the ILM Level 5 Certificate in Coaching and Mentoring.

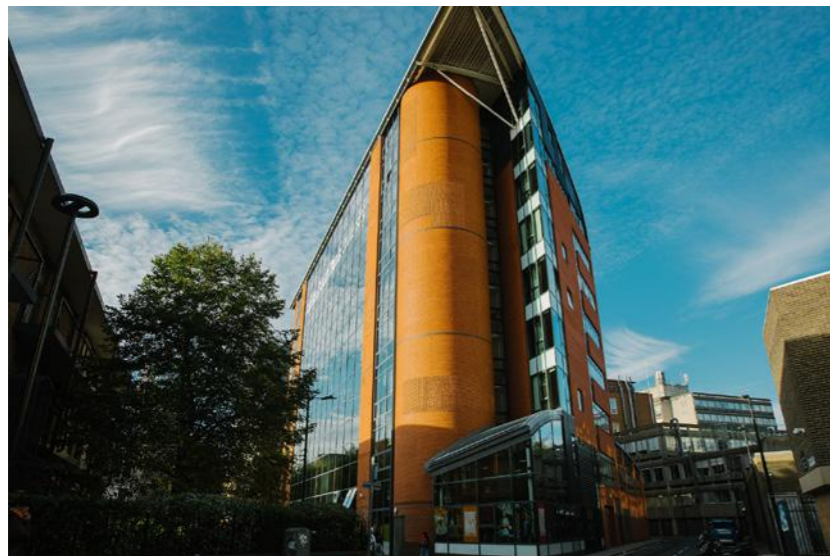
Looking forward, the NPI team is well positioned to develop the academic capabilities of the Institute through continued delivery of the education programme, including teaching and student support through targeted coaching interventions. There is clear potential to further expand the research programme through continued collaboration with international research partners as well as the development of new research projects and programmes. In this regard, there is significant scope for the initiation of new projects in sustainable engineering and in particular research on the development of clean and renewable energy technologies for different applications.

Prof. Simon P. Philbin

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

Historical background of the institute

The Nathu Puri Institute for Engineering and Enterprise (or NPI) was launched by LSBU in 2011 following a generous donation by the Puri Foundation to embed enterprise in engineering education and industrial practice. This objective was based on the premise that although engineers require a solid technical foundation for their education and practice, they also benefit from access to a wider set of enterprise and professional related skills and knowledge. This original intent for the Institute remains valid today and 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 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 Philbin, Institute Director
- Mr. Pavan Kumar Sala, Doctoral Researcher
- Ms. Sunita Selvarajan, Project Co-ordinator and Education Support
- Prof. Deborah Andrews, Affiliated Staff
(LSBU Division of Mechanical Engineering and Design)
- Dr. Safia Barikzai, Affiliated Staff
(LSBU Division of Computer Science and Informatics)
- Dr. Sara Rye, Affiliated Staff *(LSBU Business School)*
- Mr. Thomas Empson, Affiliated Staff
(LSBU Research, Enterprise and Innovation Division)
- Prof. Jing-xiao Zhang, Visiting Fellow
(Chang'an University, China)
- Prof. Arnesh Telukdarie, Visiting Fellow
(University of Johannesburg, South Africa)
- Prof. Riaz Ahmed, Visiting Fellow *(Bahria University, Pakistan)*
- Prof. Fernando Deschamps, Visiting Fellow
(Pontifical Catholic University of Paraná, Brazil)
- Dr. Clarissa Rocha, Affiliated Researcher
(Pontifical Catholic University of Paraná, Brazil)
- Prof. Saim Memon, Affiliated Researcher
(School of Engineering, Arden University)
- Ms. Firdaous Ennami, Affiliated Researcher
(LSBU Business School)
- Ms. Dominika Ptach, Affiliated Researcher
(LSBU Division of Mechanical Engineering and Design)

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).

Strategic profile of the institute

The vision of the Institute is to enable enterprising engineers by embedding enterprise into engineering education and industrial practice. To achieve this goal, the Institute delivers an integrated programme of work across engineering and enterprise, including education, research and knowledge exchange (see the table below).

The Institute combines a local focus on supporting the School of Engineering at LSBU with a global reach enabled through various academic activities. The overall disciplinary focus of the Institute is engineering management, which involves a portfolio of activities in areas such as innovation, entrepreneurship, project management, sustainable engineering, renewable energy, and digital transformation.

Academic portfolio	Representative activities
Education	<ul style="list-style-type: none"> • Embedding innovation, entrepreneurship, and project management into engineering education. • Enabling professional skills development for engineers. • Providing professional coaching support for engineering students.
Research	<ul style="list-style-type: none"> • Investigating how to improve the process of project management as well as the impact of project leadership. • Improving our understanding of entrepreneurial pivoting by tech start-ups. • Investigating sustainable engineering, environmental management, and renewable energy technologies. • Exploring the adoption of digital transformation by industrial companies.
Knowledge exchange	<ul style="list-style-type: none"> • Focused knowledge exchange activities and 'thought leadership' on engineering and enterprise. • Close working with international collaborative partners and other stakeholders. • Engaging academic and professional societies to exchange knowledge and generate further impact.

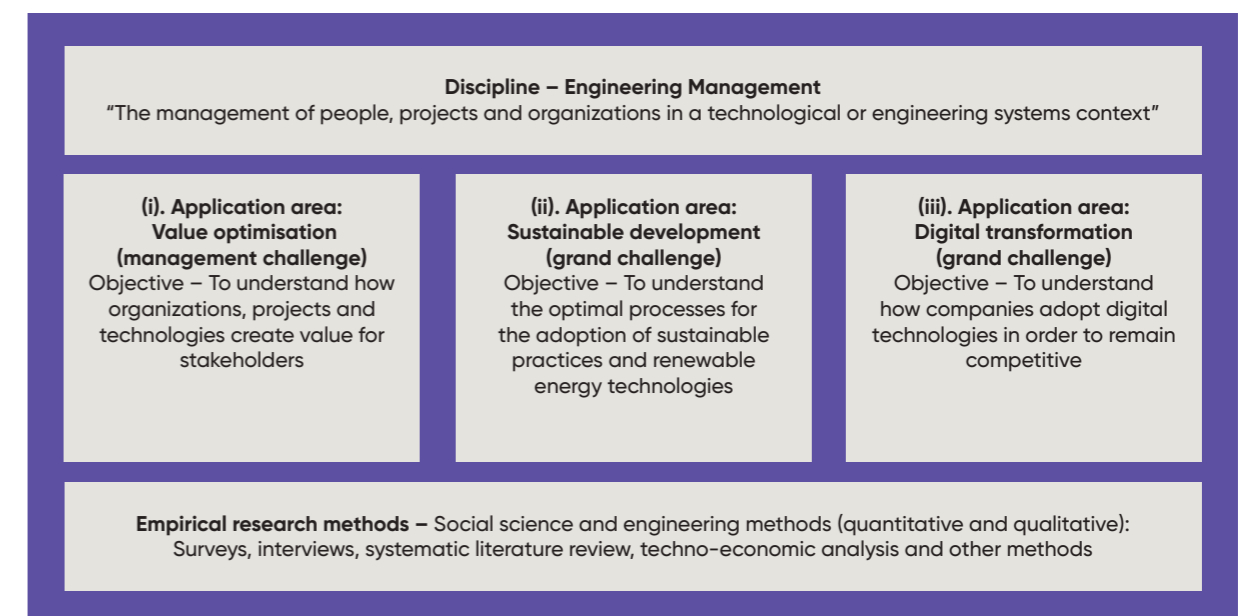
Research strategy of the institute

The research strategy of the Institute is focused on addressing both management challenges and grand challenges (see the Figure below). Management challenges relate to the need to improve how organisations and projects utilize people, processes, and technology; whereas grand challenges involve fostering innovation to address a major societal need. These challenges require the management of complexity as well as various technological inputs and the subject of engineering management provides an ideal knowledge base to tackle such challenges. The objectives for the Institute's research programme are summarised as follows:

(i). Value optimisation, which is a management challenge focused on understanding how organizations, projects and technologies create value for stakeholders. This application area includes research on entrepreneurial pivoting and the impact of technology; project management and risk management; and studies on project leadership capabilities.

(ii). Sustainable development, which is a grand challenge focused on understanding the optimal processes for the adoption of sustainable practices and renewable energy technologies. This application area includes research on environmental management in the construction industry; measuring the sustainability performance of projects and organisations; and techno-economic analysis of renewable energy technologies.

(iii). Digital transformation, which is a grand challenge focused on understanding how companies adopt digital technologies to remain competitive. This application area includes research on open innovation and digital transformation in high-tech industrial companies; research studies on digital transformation in the built environment; and studies on enabling digital transformation for SMEs from the food and beverage sector.



Research programmes

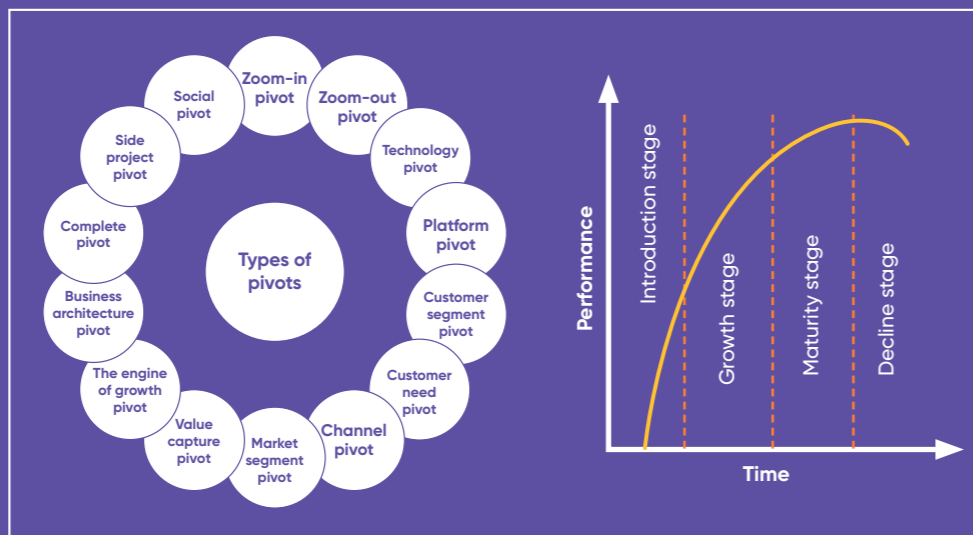
(i). Research application area: Value optimisation

Entrepreneurial pivoting by start-ups and the impact of technology maturity



Pavan Kumar Sala has been working on doctoral research to understand how high-tech start-up companies successfully pivot (i.e. change direction) as part of the entrepreneurial journey. The project is supervised by Prof. Simon Philbin and Dr. Safia Barikzai. The empirical research study considers the types of pivots available to a tech start-up company and the factors that trigger the start-up to pivot. Furthermore, the research is focused on

identifying the impact of technology maturity on pivoting through applying the technology S-curve model.

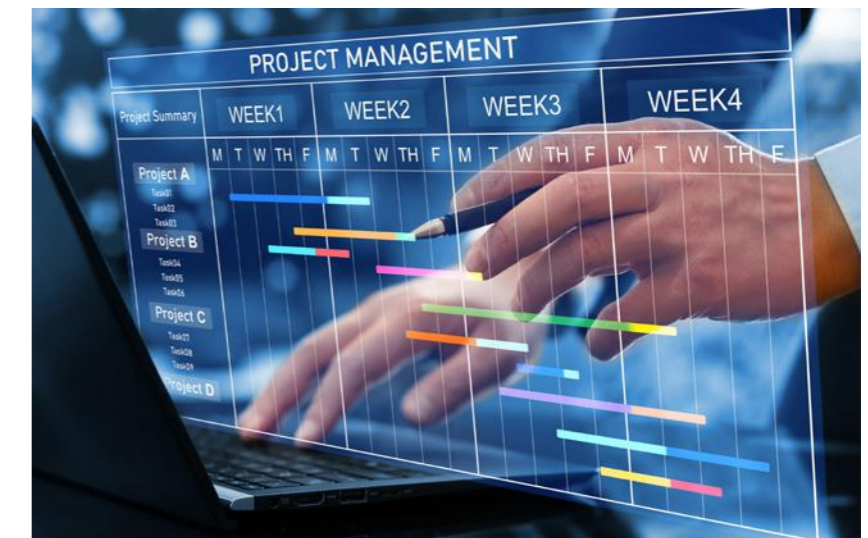


The qualitative research approach has been employed to understand the phenomenon of entrepreneurial pivoting of tech start-ups, including the type of pivots, factors that cause pivoting and the impact of technology maturity on pivoting. Pavan has conducted 30 interviews with high-tech entrepreneurs from the UK as part of the research study, combined with a further 27 interviews with a subset of 9 participants from the original sample as part of a longitudinal evaluation of further aspects of entrepreneurial pivoting.

The study has validated the types of pivots and the factors that trigger a tech start-up to change its direction. The research also determined that there can be a domino effect in pivoting and the value proposition of the start-up can be created and sustained through pivoting. Pavan is currently writing up his doctoral thesis.

Studies on project management

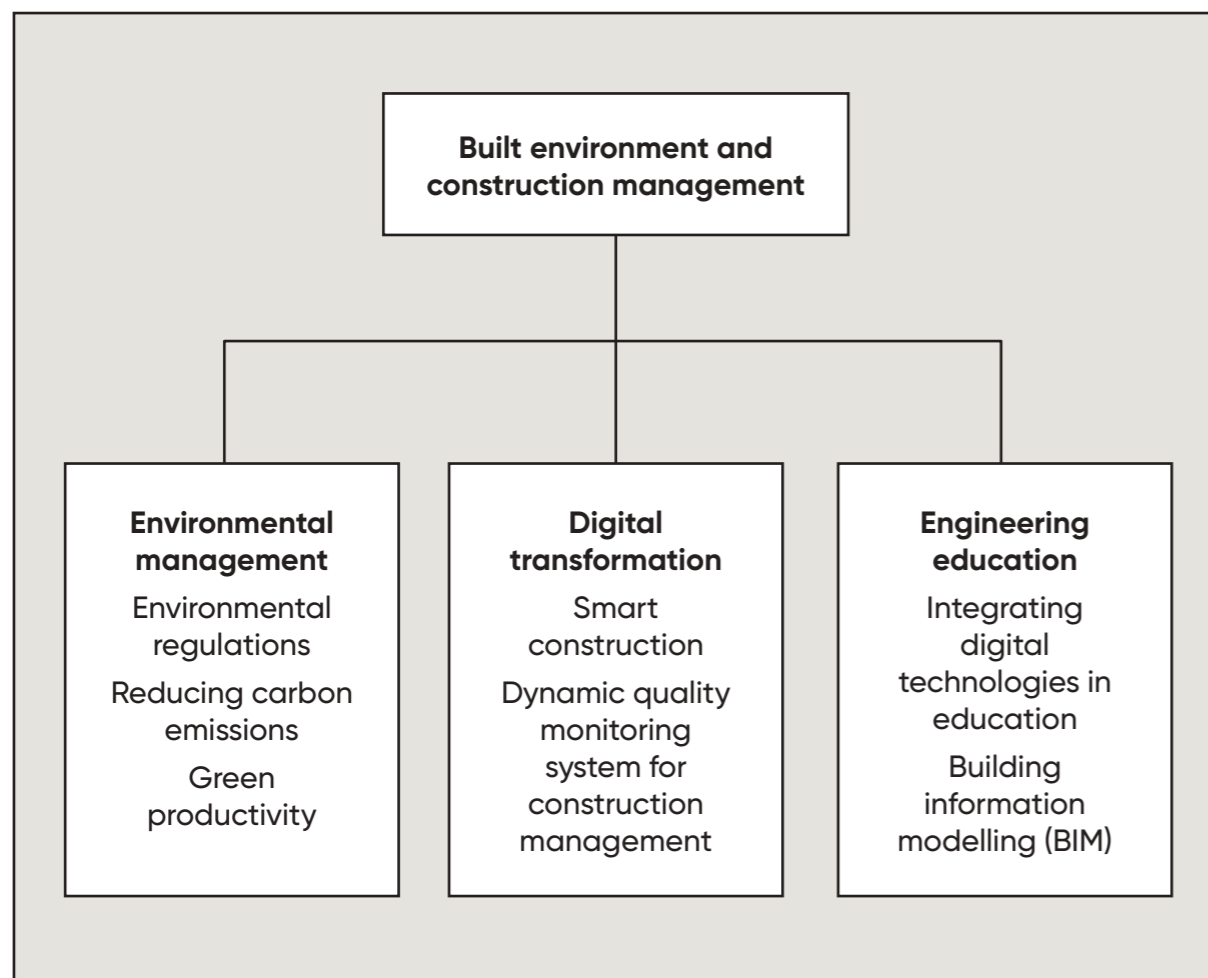
Prof. Philbin undertakes collaborative research with Prof. Riaz Ahmed from Bahria University in Pakistan. This includes several studies across the field of project management, such as understanding the role of big data analytics and decision-making in achieving project success as well as evaluating the importance of senior management support for successful social sector projects. Further studies include investigating the moderating effect of big data analytics on green human resource management and organizational performance.



(ii). Research application area: Sustainable development

Innovation in the built environment

Prof. Philbin collaborates with Prof. Jing-xiao Zhang from Chang'an University in China and other international researchers on various studies associated with the built environment, construction management and sustainable engineering. This includes research on environmental management, digital transformation, and engineering education. In the area of environmental management, studies have included evaluating the impact of highway construction projects on landscape ecological risks in high altitude plateaus as well as research on investigating the influencing factors of urban innovation and development.



Studies on digital transformation included a systematic identification of the influencing factors for the digital transformation of the construction industry. Furthermore, studies on engineering education included assessing the impact of digital education and the role of the big data analytics course to enhance the skills and employability of engineering students; investigating the moderating effect of learning experience on learning motivation and learning outcomes of international students; and testing the effects of the digital linguistic landscape on engineering education for smart construction.



Highlights

January 2022 – 206 students successfully completed the IET Entrepreneurial Skills for Engineers online course as part of the Innovation and Enterprise undergraduate module with Sunita Selvarajan as the Tutor.

January 2022 – Prof. Philbin commenced teaching for the 2021/22 delivery of the Technology Evaluation and Commercialisation module in the School of Engineering.

February 2022 – Prof. Philbin (with Dr. Yongjian Ke and Prof. Jingxiao Zhang) launched a new Special Issue on 'Tradition and Innovation in Construction Project Management' in the journal Buildings.

March 2022 – Prof. Philbin gave a guest lecture on 'Managing Complex Engineering Projects – Tools, Techniques and Insights' at the LSBU School of Business.

March 2022 – Prof. Philbin served as an External Examiner for a PhD examination in the Department of Management Science at Bahria University in Pakistan.

May 2022 – Prof. Philbin was appointed by the American Society for Engineering Management (ASEM) as Co-Editor-in-Chief of the Engineering Management Journal (EMJ).

May 2022 – Pavan Kumar Sala published the first journal article from his PhD (with Prof. Philbin & Dr. Barikzai) in the International Journal of Entrepreneurial Behavior and Research.

May 2022 – Sunita Selvarajan was awarded the ILM Level 5 Certificate in Coaching and Mentoring.

June 2022 – Sunita Selvarajan completed delivery of the 2021/22 Coaching Pilot Project for the School of Engineering.

June 2022 – As part of the Newton Fund research project, Prof. Arnesh Telukdarie and Dr. Megashnee Munsamy from the University of Johannesburg visited the Nathu Puri Institute for Engineering & Enterprise.

July 2022 – Prof. Philbin was appointed as a Visiting Professor at the Institute of Advanced Research Gandhinagar in India.

August 2022 – Prof. Philbin completed his 5-month appointment as the Interim Head of the Division of Electrical & Electronic Engineering in the School of Engineering.

September 2022 – Prof. Philbin delivered a seminar at the International Entrepreneurship Educators Conference (IEEC) held at Swansea University

September 2022 – Prof. Philbin delivered a virtual seminar at the Annual Huawei Strategy and Technology Workshop in China (Systems Engineering Track).

September 2022 – Sunita Selvarajan commenced delivery of the 2022/23 Coaching Project for the School of Engineering.

September 2022 – Sunita Selvarajan commenced tutoring final year students on the Innovation and Enterprise module for the School of Engineering.

September 2022 – Prof. Philbin was confirmed as an Editorial Board Member for the Journal of Research Administration for a further year.

October 2022 – Prof. Philbin presented a paper at the American Society for Engineering Management International Annual Conference held in Tampa (FL), USA.

October 2022 – Sunita Selvarajan gave an interactive session/guest lecture on professional skills development on the Technical, Research and Professional Skills module.

November 2022 – Prof. Philbin delivered his Inaugural Lecture at London South Bank University.

December 2022 – Prof. Philbin completed teaching for the 2022/23 delivery of the Technical, Research and Professional Skills module in the School of Engineering.

December 2022 – Prof. Philbin delivered a virtual presentation as part of the Academic Partnership Webinar Series of the American Society for Engineering Management.

Renewable energy technologies

Prof. Philbin supervises postgraduate research into the adoption of various clean technologies. This includes the use of techno-economic analysis (TEA) and numerical modelling to investigate renewable energy sources (RES), such as solar and wind power generation as well as studies on the adoption of carbon capture, utilisation, and storage (CCUS) technologies. Recent studies on RES include an MSc research project on the techno-economic analysis and modelling of the feasibility of wind energy in Kuwait, and an MSc research project on techno-economic analysis to meet the power shortfall in Pakistan through solar power generation. Over the last year, Prof. Philbin also co-supervised an MEng research project (with Prof. Saim Memon, formerly at LSBU and now at Arden University) on evaluating the potential sustainability of 'floatovoltaic' systems for power generation.



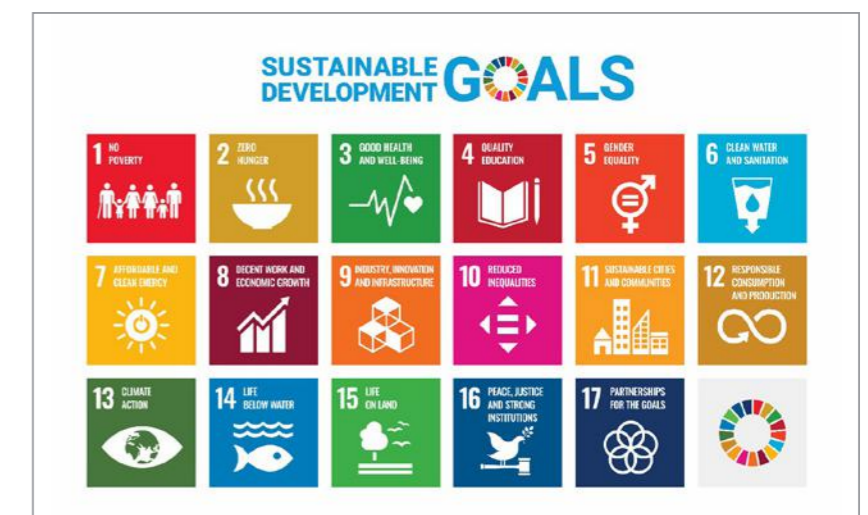
Sustainability risk management of renewable energy projects

Ms. Firdaous Ennami from the LSBU Business School is undertaking a PhD research project to investigate the sustainability risk management of renewable energy projects in Morocco. The project involves empirical research based on a case study approach to determine the optimal conditions for sustainability risk management of renewable energy projects. The doctoral study is supervised by Dr. Sara Rye (LSBU Business School) and Prof. Simon Philbin.



Sustainable design and development of data centres

Ms. Dominika Ptach is carrying out an MRes research project to investigate the impact of the data centre industry on achievement of the United Nations SDGs (sustainable development goals) and this has included a series of interviews with experts from the sector. The project is supervised by Prof. Deborah Andrews (LSBU Division of Mechanical Engineering & Design) and Prof. Simon Philbin.



(iii). Research application area: Digital transformation

Digital transformation by SMEs from the food and beverage sector

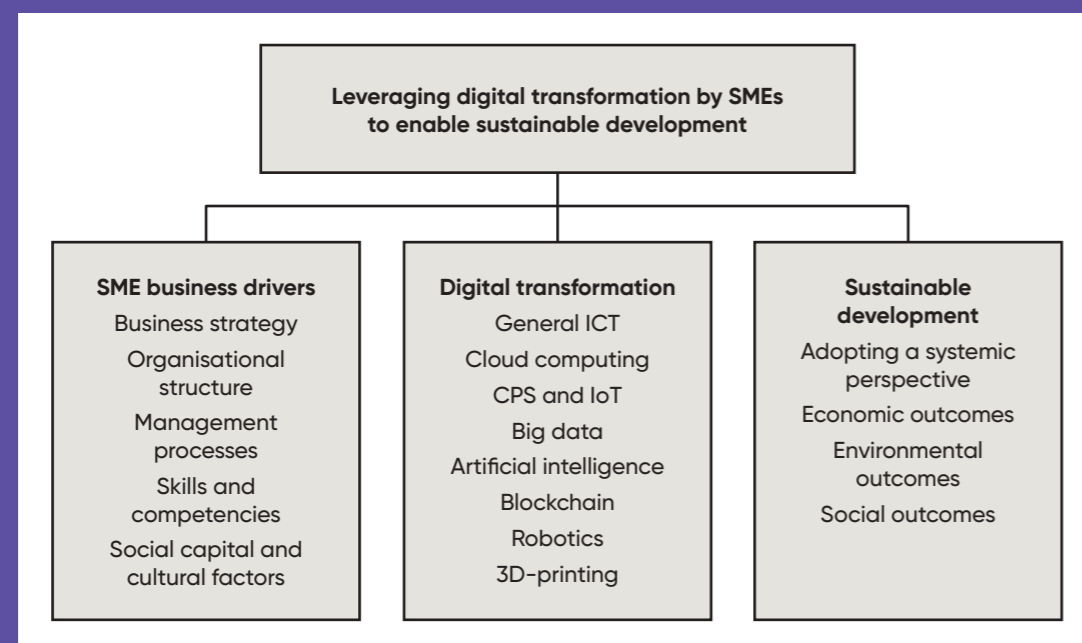
Prof. Simon Philbin collaborates with Prof. Arnesh Telukdarie from the University of Johannesburg in South Africa on a research project to investigate how SMEs (small and medium-sized enterprises) from the food and beverage sector undergo the process of digital transformation. The project is funded by the Royal Academy of Engineering and the Newton Fund as part of the Engineering X – Transforming Systems through Partnership (TSP) Programme. The objective of the TSP Programme is to build engineering teaching, research, and innovation capacity with universities from partner countries and enable collaboration between local stakeholders towards meeting complex, interconnected SDG challenges in partner countries and at a global level.

SMEs and specifically those from the food and beverage sector face major challenges regarding digital transformation and the wider adoption of Industry 4.0 related technologies, such as the internet of things and artificial intelligence. The collaborative research project involves a systematic investigation of the technology pathways for digitalization as well as work on identifying digital transformation best practice to develop an innovative digital platform. The project includes engaging collaborative network partners in South Africa to work with SMEs on digital transformation and disseminate the knowledge generated by the project. A systematic literature review has been carried out to understand how digital transformation enables SMEs to achieve sustainable development and the research has been published. Furthermore, the project is now focused on supporting the development of a digital platform for SME digital adoption and enablement.

Digital transformation through open innovation by high-tech manufacturing firms

Prof. Simon Philbin is continuing to collaborate with Dr. Clarissa Rocha, Prof. Carlos Quandt and Prof. Fernando Deschamps from the Pontifical Catholic University of Paraná (PUCPR) in Brazil. This follows on from the 6-month Visiting Researcher position that Dr. Rocha held in the NPI team at LSBU in academic year 2019/20. The aim of this research is to analyse how R&D collaborations contribute to business innovation in Brazilian and European industrial firms in the context of Industry 4.0 and digital transformation. The research utilised the open innovation theoretical concept in high-tech manufacturing and used qualitative empirical evidence from interviews with managers of Brazilian and UK manufacturers directly involved in digital projects. The findings enable manufacturing firms to understand more about the antecedent factors in preparing for the change towards digitalisation through engaging with external actors to accelerate the operationalization of digital initiatives.

The study has recently generated a joint publication in the *Journal of Engineering & Technology Management*, which follows on from the first joint article published in the *IEEE Transactions on Engineering Management*. The research team are planning further joint publications arising from the study.



Education programme



Innovation and Enterprise Module (BEng)

Sunita Selvarajan supported delivery of the Innovation and Enterprise module, which is an undergraduate module in the School of Engineering led by Mr. Barney Townsend (Senior Lecturer in Engineering Product Design and Enterprise). In academic year 2021/22, the module was delivered online for 225 students. As a Tutor

on the module, Sunita facilitated student discussions during lectures, provided input during tutorial sessions, and linked the subject material taught with workplace expectations.

In addition, and for the second year running, the 'Entrepreneurial Skills for Engineers' online course developed by the NPI team in partnership with the IET (Institution of Engineering and Technology) continued to form an integral part of this module with marks awarded to students who successfully completed the course. During the semester, Sunita supported students to complete the course and encouraged them to apply the knowledge gained to their coursework assignments. From the 2021/22 cohort on the module, 206 students (91%) successfully completed the course and received an IET approved certificate of completion by the NPI.

Technology Evaluation and Commercialisation Module (MSc)

Prof. Simon Philbin delivered the Technology Evaluation and Commercialisation (TEC) module for the School of Engineering in the second semester of the 2021/22 academic year. The module is part of the level 7 MSc in Mechanical Engineering and was delivered for 18 students. The module involves use of the TEC Algorithm, which was originally developed at North Carolina State University in USA. The TEC module enables students to be guided towards identifying an emerging technology idea that is evaluated for its commercial potential. Detailed analysis is conducted according to a prescribed algorithmic model to evaluate the business potential of the leading technology. This approach allows 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 launch a real company. Nevertheless, students work as part of teams and so they encounter many of the real-world issues associated with team working in a business venture and are required to meet deadlines through submission of the coursework assignments. In addition to the algorithmic approach, students are provided with lectures and tutorials across a range of business and technology management areas. The module included a guest lecture by Ms. Syeda Rahimunnessa (LSBU IP & Senior Student Enterprise Manager) on intellectual property. The feedback received from the 2021/22 cohort of students that participated in the module was highly favourable.



Technical, Research and Professional Skills Module (MSc/MEng)

Prof. Simon Philbin delivered the Technical, Research and Professional Skills (TRAPS) module for the School of Engineering in the first semester of the 2022/23 academic year. The module was delivered for 43 students from both MSc and final year MEng engineering programmes. The module enables development of the skills necessary for successful completion of the research dissertation in the near-future and for professional development in the long-term future. Students are required to prepare a feasibility study report for the proposed research project and present a summary of the report as part of meeting the requirements for the module assessment.

The module aim is to ensure that engineering students from MSc and MEng courses undertake research and project work in a professional and ethical manner and can effectively communicate research proposals. Additionally, students are provided with support to enhance their technical and analytical background across a range of areas related to the professional engineering discipline, including project management, risk management, sustainability, engineering design, and systems engineering. The module includes a diverse range of tutorial sessions across different technological areas and engineering applications to embed learning and knowledge acquired in the corresponding lectures. This year included an interactive session/guest lecture on professional skills development for engineers, which was delivered by Ms. Sunita Selvarajan. The feedback received from the 2022/23 cohort of students that participated in the module was highly favourable.



Professional coaching for student development

LSBU's strategy and vision is to transform lives, communities, businesses and society through applied education and insights. Our educational framework includes embedding learning so that students have the required skills and knowledge to reach their personal and professional aspirations.



In particular, we are keen to reduce the attainment gap and improve employment opportunities for students from a minority background. Within this context, Sunita Selvarajan developed and delivered a coaching pilot project. The aim of the project was to assess if professional coaching could improve retention for students who were struggling to progress or complete their studies.

As the coach, Sunita met with undergraduate students on a one-to-one basis either every week or fortnightly in person or online. Through the coaching support that was provided, the students (coachees) were able to identify their own personal challenges, formulate objectives to overcome the challenges, and create action plans to achieve their goals. Furthermore, the coachees took ownership for their progress and development. They became more self-aware of their strengths and weaknesses, and applied methods to meet the challenges that took place in their respective lives. The use of industry standard professional coaching tools and psychological techniques also helped embed learning, thereby allowing students to review their current thinking and behaviour, and apply constructive changes in their academic and personal lives.

Students who took part in the pilot project made very good progress. Year 1 engineering students continued in their studies and final year undergraduate students completed their degree and graduated. With the student's permission, their journey supported by coaching has been documented in a short film which is available on YouTube. Furthermore, following positive outcomes from the coaching pilot project, this development initiative has been rolled out to a wider group of undergraduate students within the School of Engineering for the 2022/23 academic year.

Publications, conference and seminar presentations

1. Journal paper – Ahmed, R., Shaheen, S., & Philbin, S.P. (2022). The Role of Big Data Analytics and Decision-Making in Achieving Project Success. *Journal of Engineering and Technology Management*, 65, 101697.
2. Journal paper – Li, H., Han, Z., Zhang, J., Philbin, S.P., Liu, D., & Ke, Y. (2022). Systematic Identification of the Influencing Factors for the Digital Transformation of the Construction Industry Based on LDA-DEMATEL-ANP. *Buildings*, 12(9), 1409.
3. Journal paper – Xu, L., Zhang, J., Ding, Y., Sun, G., Zhang, W., Philbin, S., & Guo, B.H.W. (2022). Assessing the impact of digital education and the role of the big data analytics course to enhance the skills and employability of engineering students. *Frontiers in Psychology*, 13, 974574.
4. Journal paper – Zhang, J., Sun, G., Xu, L., Khan, I., Lv, W., & Philbin, S. (2022). The Moderating Effect of Learning Experience on Learning Motivation and Learning Outcomes of International Students. *Frontiers in Psychology*, 13, 913982.
5. Journal paper – Philbin, S., Viswanathan, R. & Telukdarie, A. (2022). Understanding how digital transformation can enable SMEs to achieve sustainable development: A systematic literature review. *Small Business International Review*, 6(1), p. e473.
6. Journal paper – Xu, L., Zhang, J., Yuan, Y., Zheng, J., Philbin, S., Guo, B.H.W. & Jin, R. (2022). Testing the Effects of the Digital Linguistic Landscape on Engineering Education for Smart Construction. *Computational Intelligence and Neuroscience*, Vol. 2022, Article ID 4077516.
7. Journal paper – Zhang, J., Li, C., Philbin, S.P., Yang, X., Dong, Z., Hong, J., & Ballesteros-Pérez, P. (2022). Evaluating the impact of highway construction projects on landscape ecological risks in high altitude plateaus, *Scientific Reports*, 12, 5170.
8. Journal paper – Sala, P.K., Philbin, S.P., & Barikzai, S. (2022). A Qualitative Research Study of the Tech Startup Journey through Entrepreneurial Pivoting. *International Journal of Entrepreneurial Behavior and Research*, 28(4), 1050-1074.
9. Journal paper – Mahmood, Q.-u.-A., Ahmed, R., & Philbin, S.P. (2022). The moderating effect of big data analytics on green human resource management and organizational performance. *International Journal of Management Science and Engineering Management*, doi.org/10.1080/17509653.2022.2043197.
10. Journal paper – Rocha, C.F., Quandt, C.O., Deschamps, F., & Philbin, S. (2022). R&D Collaboration Strategies for Industry 4.0 Implementation: A Case Study in Brazil. *Journal of Engineering and Technology Management*, 63, 101675.
11. Journal paper – Telukdarie, A., Philbin, S., Mwanza, B.G., & Munsamy, M. (2022). Digital Platforms for SMME Enablement, *Procedia Computer Science*, 200, 811-819.
12. Journal paper – Ahmed, R., & Philbin, S.P. (2022). It takes more than the project manager: The importance of senior management support for successful social sector projects. *Project Leadership and Society*, 3, 100042.
13. Journal paper – Ahmed, R., Khan, I.Q., & Philbin, S.P. (2022). Mediating Role of Switch Leadership Between Dynamic Work Environment and Project Success. *International Journal of Information Technology Project Management*, 13(1), 1-19.
14. Journal paper – Khajah A.M.H.A., & Philbin S.P. (2022). Techno-Economic Analysis and Modelling of the Feasibility of Wind Energy in Kuwait. *Clean Technologies*, 4(1), 14-34.
15. Journal paper – Zhang, J.X., Cheng, J.W., Philbin, S.P., Ballesteros-Perez, P., Skitmore, M., & Wang, G. (2022). Influencing factors of urban innovation and development: A grounded theory analysis. *Environment, Development and Sustainability*, 1-26. doi.org/10.1007/s10668-022-02151-7.
16. Conference paper – Philbin, S.P. (2022). Engineering Education: Research and Professional Skills Development. *International Annual Conference and 43rd Annual Meeting of the American Society for Engineering Management (ASEM)*, Tampa (FL), USA.
17. Conference paper – Telukdarie, A., Dube, T., Matjuta, P., & Philbin, S. (2022). The opportunities and challenges of digitalization for SMEs, *International Conference on Industry 4.0 and Smart Manufacturing – ISM 2022*, Upper Austria University of Applied Sciences, Hagenberg Campus, Linz, Austria.
18. Technical magazine article – Kennedy, D., & Philbin, S.P. (2022). Data complexity does not improve knowledge, *Industrial Management*, May/June Issue, 12-17.
19. Journal editorial – Smith, B., Cross, J., & Philbin, S. (2022). Editor's Introduction, *Engineering Management Journal*, 34(2), 175-175.
20. Journal editorial – Smith, B., Cross, J., & Philbin, S. (2022). Editor's Introduction, *Engineering Management Journal*, 34(3), 341-342.
21. Journal editorial – Smith, B., Cross, J., & Philbin, S. (2022). Editor's Introduction, *Engineering Management Journal*, 34(4), 509-510.
22. Seminar – Philbin, S.P. (2022). Insights from Embedding Research Impact and Sustainability into Engineering Education, 16th International Entrepreneurship Educators Conference (IEEC), Swansea University.
23. Seminar – Philbin, S.P. (2022). Exploring the Theory and Practice of Systems Engineering, 13th Annual Huawei Strategy and Technology Workshop in China (Virtual Presentation in the Systems Engineering Track).
24. Webinar – Philbin, S.P. (2022). Harnessing Engineering Management for Sustainable Development, Academic Partnership Webinar Series of the American Society for Engineering Management (ASEM).
25. Presentation – Philbin, S.P. (2022). Energy and Sustainability Related Research, London Centre for Energy Engineering (LCEE) Research Symposium, LSBU.
26. Inaugural Lecture – Philbin, S.P. (2022). Navigating a Research Career From Chemistry to Engineering Management, London South Bank University, 2022.
27. Guest lecture – Philbin, S.P. (2022). Managing Engineering Projects – Methods, Techniques and Practice, MSc Module on Quantitative Aspects of Project Management, LSBU School of Business.

Collaborative partners and professional society engagement

- American Society for Engineering Management (ASEM), USA
- Arden University
- Bahria University, Pakistan
- Chang'an University, China
- Institute of Advanced Research Gandhinagar, India
- Institution of Engineering and Technology (IET)
- Pontifical Catholic University of Paraná (PUCPR), Brazil
- Royal Academy of Engineering
- The Puri Foundation
- Society of Research Administrators (SRA) International, USA
- University of Johannesburg, South Africa



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