Lancaster University Management School

Lancaster University

THE DEPARTMENT OF MANAGEMENT SCIENCE

BACKGROUND

ⓘ For further information on the Department, including its research groups, teaching portfolio and related video content, please visit our webpages. Details of the Management School's ranking within the UK Research Excellence Framework exercise (REF 2014) are also available here.

The Department of Management Science was formed from the merger of the two Departments of Operational Research and Systems Engineering in 1993. Established in 1964 and 1967 respectively, the departments made their mark by their research, scholarship and co-operative attitude to collaboration with industry and the public sector.

The Department of Management Science combined Professor Peter Checkland's work in Soft Systems Methodology and its application in information systems, with the formal, quantitative modelling skills of the Operational Research staff. It is now an international centre of excellence for research and teaching in Management Science, covering the disciplines of Information Systems and Information Technology, Operations Management, and Operational Research. It thus embraces a rare combination of research skills, from the hard quantitative skills through to qualitative research approaches including action research, often based on collaboration with industry and the public sector.

Since 2001, the Department has more than doubled in size. In doing so it has strengthened its work in information systems, the mathematics of OR, logistics & supply chain management and business & marketing analytics. With a complement of 35 research-active staff, the Department is now one of the largest of its kind in Europe.

In co-operation with Lancaster's Department of Mathematics of Statistics, the Department runs the STOR-i Centre for Doctoral training (CDT) in Statistics and Operational Research, funded by the Engineering and Physical Sciences Research Council (EPSRC). The Department is also a partner in the EPSRC-funded HighWire CDT to train doctoral students across information systems, computing science and design.

The Department hosts NATCOR, an EPSRC-funded scheme that provides a national training course for doctoral researchers in OR. It has also led the LANCS Initiative, from 2008 to 2014, which was an EPSRC-funded initiative based on a consortium of four universities (Lancaster, Nottingham, Cardiff and Southampton) to develop the foundations of OR. LANCS resulted in £13M of funding across the four universities, mostly from EPSRC.

As part of the Department's growing portfolio of external research funding, the Department currently hosts:-

- OptiFrame is a two-year SESAR 2020 Exploratory Research Project in partnership with airport safety organisations in Belgium, Italy and The Netherlands, focused on of Trajectory Based Operations across Air Traffic Management
- OR-MASTER (Mathematical Models and Algorithms for Allocating Scarce Airport Resources) is led by Professors Konstantinos Zografos and Kevin Glazebrook, in partnership with researchers

at Queen Mary University London (QMUL). The research has received GBP 2.8M funding from the EPSRC in response to growing concerns over airport capacity, rising demand, and the impact of congestion on both the travelling public and the air transport industry.

ACADEMIC STAFF (AS AT JANUARY 2017)

Professors	John Boylan	PhD Warwick
	David Brown	MA Lancaster
	Richard Eglese	MA Lancaster
	Matthias Ehrgott Head of Department	PhD Kaiserslautern
	Robert Fildes	PhD California
	Kevin Glazebrook	PhD Cambridge
	Linda Hendry	PhD Lancaster
	Adam Letchford	PhD Lancaster
	Martin Spring	PhD Stirling
	Mark Stevenson	PhD Lancaster
	Juliana Sutanto	PhD National University of Singapore
	Monideepa Tarafdar	PhD Indian Institute of Management Calcutta
	Mike Wright	PhD Lancaster
	Konstantinos Zografos	PhD Connecticut
Professors Emeritus	Peter Checkland	MA Oxford
	Mike Pidd	PhD Lancaster
Distinguished Visiting Professor	Barry Nelson	PhD Purdue
	Alan Hughes	PhD Cambridge
Senior Lecturers	Jerry Busby	PhD Lancaster
	Chris Kirkbride	PhD Newcastle-upon-Tyne
	Nikolaos Kourentzes	PhD Lancaster
	Stephan Onggo	PhD Singapore
	David Worthington	PhD Reading
Senior Teaching Fellow	Paul Dunning-Lewis	PhD Lancaster
	Steven Eldridge	
	Casey Wilson	PhD Derby
Lecturers	Roger Brooks	PhD Birmingham
	Burak Boyaci	PhD EPFL Switzerland
	Sven Crone	PhD Hamburg
	Trivikram Dokka	PhD K U Leuven
	Peter Jacko	PhD Charles III Madrid
	Zhan Pang	PhD Chinese University of Hong Kong
	Nicos Pavlidis	PhD Patros
	Kostas Selviaridis	PhD Lancaster
	Helena Wenninger	PhD Darmstadt
	Richard Williams	PhD York
	Ruilin Zhu	PhD Auckland
	Marta Zorzini Bell	PhD Milan
Teaching Fellows	Steve Barron	
	Adam Hindle	PhD Lancaster
	Mark Westcombe	
Visiting Professors	Mike Chiasson	PhD British Columbia
	Jim Scholes	PhD Lancaster
	Edward Truch	DBA Brunel

RESEARCH ACTIVITY

The Department has active research programmes spread across the broad areas of Information Management & Systems Theory, Operational Research and Operations Management. Its world-leading research record was a major factor in the Management School's excellent performance in the UK's 2014 Research Excellence Framework, being ranked first in the UK for 'research power and highly ranked on all other measures. More details are available here. This outstanding result follows three previous national Research Assessment Exercises in which Lancaster was the only full-spectrum business school to receive the top rating on every occasion.

Because we believe that the ultimate test of our research is its impact on the real world, most staff collaborate, in various ways, with external organisations. A common research theme is that model-based approaches are used to explore practical management problems experienced by IS, OR specialists and operations managers. The increasing complexity of decision making in modern economic and social systems and the power of IT to collect and analyse larger amounts of data has increased the need for and use of these approaches.

PhD research is a major feature of the Department and full details of the PhD programme are given in our web pages, including information about some of our many PhD students. We put considerable effort into the training of our PhD students, including the EPSRC-funded STOR-i and HighWire CDTs and our leadership of NATCOR. There are associated MRes programmes for students who are not fully prepared for PhD work.

Main current research activity

The Department's research is focused in three main areas: Operational Research, Operations Management and Information Management & Systems, though there is considerable overlap between these and many members of staff work in more than one.

Operational Research:

Richard Eglese, **Mike Wright and Konstantinos Zografos** all conduct research on solution techniques for discrete optimization problems. Richard Eglese concentrates mainly on heuristic methods for problems arising in logistics, such as vehicle routing and scheduling problems. Richard has a particular interest in Green Logistics, building on a recent research project funded by the EPSRC, and his 1990 paper on simulated annealing is one of the 30 most cited articles in the European Journal of Operational Research. Mike Wright specialises in meta-heuristic approaches for highly constrained, multi-objective problems, such as timetabling, scheduling and packing problems. Mike's work on sports scheduling has been particularly influential. Professor Konstantinos Zografos joined the Department in January 2013, from Athens University of Economics and Business, and is known for his work on logistics and transport. Konstantinos has particular interests in airport operations optimization, vehicle routing and scheduling with environmental considerations, hazardous materials transportation, emergency response logistics, itinerary planning and performance assessment of complex projects. Konstantinos leads the OR-MASTER Grant Programme (funded by EPSRC), which commenced October 2015. He has received the Presidents Medal from the Operational Research Society in the UK and the Edelman Laureate Medal from INFORMS for his contribution to Operations Research and Management Science.

Matthias Ehrgott and Adam Letchford undertake research in exact methods for hard optimisation problems. Professor Matthias Ehrgott joined the Department in 2013 from the University of Auckland, bringing his expertise in multi-criteria optimisation. Adam Letchford is a recognised authority on exact solution methods for optimization, especially those which use cutting planes. He is a frequent contributor to the Mathematical Programming journal and has collaborated with many overseas researchers, for example in Aarhus, Bologna, Heidelberg and Valencia. Professor Adam Letchford was the first OR academic to receive a 5-year, EPSRC advanced research fellowship and also received an IBM faculty award. Arriving in the department in 2013, **Trivikram Dokka's** interests span combinatorial optimization, integer programming, applications of operations research and approximation algorithms for NP-hard problems. His recent work focused on approximation algorithms and polyhedral results for multi-index assignment problems arising in scheduling and manufacturing applications.

Kevin Glazebrook and **Chris Kirkbride** work at the interface between statistics, applied probability and OR. Their research has included contributions to stochastic scheduling, queuing, sequential statistics and Bayesian decision theory; the latter including applications to research planning, screening methods and optimal search. A prime cohering theme is the optimisation and control of complex stochastic systems and, within that, the role of state based calibrations of decision options. Current EPSRC-supported activity involves several PhD students and includes work on inventory management, maintenance/reliability and dynamic resource allocation. Recent work has been the subject of papers in Operations Research, Management Science and Mathematics of Operations Research. Kevin has been awarded the Beale Medal of the Operational Research Society for his contributions. **Peter Jacko**, who joined the Department in 2013 under the LANCS Initiative, works at the interface of stochastic OR and performance evaluation of complex systems and networks. The leading theme of his research activities is modelling and designing tractable and well-performing strategies for efficient use of scarce resources in dynamic and stochastic environments, mainly with applications in business administration such as retail industry and contact centres, and in communications networks such as wireless data networks and the Internet.

David Worthington continues research into the behaviour of time-dependent queuing systems, using discrete time modelling and other analytical approaches to provide means of solving practical problems which are mathematically intractable. He applies such approaches to queuing models in healthcare, call centres and other service industries, where wiser use of resources can often lead to substantial improvements in service performance. Recent research themes have focused on developing ways to use analytical queuing models in combination with other modelling approaches, including forecasting and simulation.

Robert Fildes founded the Lancaster Centre for Forecasting over 20 years ago. The Centre is the largest academic research group in Europe working on a wide variety of forecasting and analytics problems from the technical to the organisational. As well as being heavily cited, this research has had significant commercial impact, with the Centre's impact case-study being assessed as 4* (world-class) in the recent REF exercise. Robert has been awarded the Beale Medal of the Operational Research Society for his contributions. The group was joined by **John Boylan** in 2015, who specialises in supply-chain forecasting. Other members include **Sven Crone** and **Nikolaos Kourentzes**. Sven and Nikos's interests include a concern to make non-linear Neural Network Methods more effective and applicable and, with substantial industrial support, include applications in method selection in manufacturing. The Forecasting Centre is building its research in Marketing Analytics and Modelling. The main research interests are in forecasting new product diffusion,

developing effective CRM tools, retail forecasting and online marketing strategy. **Nicos Pavlidis'** research is on machine learning and data mining. His primary interests are in unsupervised or weakly supervised learning, and data stream classification.

Roger Brooks, **Stephan Onggo and Richard Williams** conduct research in computer simulation, including discrete event and agent-based approaches. Their work ranges from the highly technical challenge of efficiently simulating large systems using high performance computers, to the study of how models are built and used, including work on conceptual modelling. Their work is summarised in research papers in leading OR journals, as well as the dedicated simulation and domain specific literature, and refereed conferences. Stephan Onggo enjoys collaborations with high performance computing colleagues in Japan and Spain. **Richard Williams** focuses on complex systems analysis within the two primary areas of project management, and operational research as applied to computational biology.

Operations Management:

Linda Hendry and **Mark Stevenson** both have an international reputation for their work on the management and planning of make-to-order manufacturing companies, with particular emphasis on the marketing/production interface, order acceptance and release policies. This has been achieved via the application of and further development of Workload Control, an approach to production planning and control in which Lancaster is recognised internationally as one of the leading research centres. This approach to production planning, which has influenced many active researchers in German, Dutch, Italian, Greek, North American and Portuguese universities and research institutes, has attracted international collaboration, including with the Universities of Groningen, Coimbra and Clemson for the dissemination of this work. In April 2016, LUMS hosted the 3rd EurOMA Sustainability Forum with a focus on 'The local versus global sustainability debate'.

Martin Spring's research has contributed to and shaped three prominent themes in operations management over the past twenty years. Most recently, his work has been in business service operations and business models; this built on work in the other two areas, supply chain management (notably with **Mark Stevenson**) and operations strategy, and the work has often been inter-disciplinary, linking particularly to industrial marketing. He held a prestigious AIM Services Fellowship (2008-2011), examining novel B2B business models and, amongst other things, this led to his contributing to the UK Government Office for Science's recent Foresight Study, 'The Future of Manufacturing'.

Jerry Busby's interests are in the areas of analysing risk and its management, examining systemic failure, human and organisational error, design organisations and design processes. His work is published in leading journals such as Risk Analysis and Risk Management, and has earned substantial funding from EPSRC. His work includes collaboration with the Dean, **Professor Sue Cox** in the area of safety, especially in the nuclear industry. He is also currently working with **Mark Stevenson** on the topic of product counterfeiting, including understanding how counterfeiters penetrate and take advantage of genuine supply chains and how supply chains can become more resilient to this threat.

Kostas Selviaridis' joined the Department in 2014 from Lund University Sweden. His research interests lie in the area of business-to-business (B2B) services outsourcing and contracting. His current work focuses on the design and management of performance-based contracts and their role in effective and efficient delivery of business services. Such research recently attracted external

funding from the Swedish Defence Research Agency for the project "Developing capabilities in performance-based contracting: A pre-study of Swedish Defence Acquisition" (2013).

Marta Zorzini Bell has research interests in sustainable supply chain management and specialises in social sustainability within supply chains, particularly those linked to emerging economies. Her focus on off-shoring, backshoring and sustainable sourcing are hot topics in the current Operations Management arena. The topic of sustainability, particularly Socially Responsible Sourcing, is of growing interest for several members of the Operations Management (OM) group – including **Linda Hendry** and **Mark Stevenson** – with a number of PhD students currently investigating this phenomenon. **Robert Fildes** continues to examine how uncertainty and forecasting errors impact such decisions in ERP systems. **Konstantinos Zografos** is known for his work on logistics and transport.

Together with other staff members interested in modelling this makes the OM group one of the largest in the UK with interests encompassing all aspects of the supply chain and operations.

Information Management and Systems:

The IS group has grown and broadened in scope and scale. Through collaborative research, including joint PhD students, the group is linked with other LUMS research groups in operations management, innovation, strategy, computing and organisation and technology. The IS group has a lead role in the HighWire doctoral training centre. The group uses a variety of research methods that include positivist, interpretivist, and critical approaches applied to qualitative (e.g. case and action research) and quantitative (e.g. surveys) data. Soft Systems Methodology (SSM), pioneered at Lancaster, continues to influence the field heavily. Peter Checkland and Sue Holwell's book provides a seminal contribution to the practice of systems specification. In recent research, Emeritus Professor Mike Pidd examined the links between hard and soft OR/MS, summarised in his book *Systems Modelling: theory and practice* and in the widely used text *Tools For Thinking – Modelling in Management Science* has provided wide exposure of the ideas.

Application of SSM and other information management concepts in the field of E-commerce has been instigated by **David Brown**, in a research programme originally funded by Hewlett Packard and SAP. David has also served as Director of the Lancaster China Management Centre, which conducts collaborative research with institutions in China.

Juliana Sutanto's research focuses on artefact design and behavioural analysis in digital communications and interactions. Phenomena such as online privacy, online attention allocation, users-generated content, online social production/collective intelligence, and online social influence are of her current research interest. Her research has been published in leading information systems journals. She won INFORMS' ISS Design Science Award for her empirical work on privacy-safe personalized offerings.

Monideepa Tarafdar's work focuses on the broad ambit of how information technologies (IT) and systems impact individuals and organizations. Specific research interests include individual and organizational adjustments required for effective IT use, maladaptive (e.g. technostress) uses of information technologies, technology-enabled business innovation and business strategy, impacts of technology in economically under-developed social contexts, and impacts of information management and IT use on product and service supply chain processes.

Helena Wenninger joined the Department in 2016 from the Technical University Darmstadt, Germany. Her research interests cover patterns of social media usage and online communication as well as their consequences for individuals, providers and society.

Richard Williams' work focuses on complex systems analysis within the two primary areas of project management, and operational research as applied to computational biology.
Casey Wilson joined the Department in 2013. Her interests focus on complexity and problem solving with a particular interest in the application of Soft Systems Methodology. She also has an interest in developing teaching cases for Problem Structuring Methods.
Ruilin Zhu also joined the Department in 2016. His research focuses on information systems security (ISSec) and privacy concerns. Specifically, he leverages the traditional technical view through integrating behavioural, economic, and legal perspectives in order to understand ISSec phenomena.

TEACHING

The Department offers undergraduate, postgraduate and post-experience courses and most staff are active in all three types of teaching.

Undergraduate
Lancaster University first degrees are based around major schemes of study in which students concentrate their efforts, accompanied by minor courses that also count towards the degrees. Thus, students who major with the Department might take minor courses such as accounting, marketing or industrial relations from within the Management School, or might choose topics from outside the School, such as computing, mathematics, statistics or some other suitable subject.
The Department offers the following major schemes of study to prospective undergraduate students.

- BSc in Business Analytics and Consultancy (including pathways in Management Science, Operations Management and Project Management)
- BSc in Management Mathematics
- (with effect from 2018) BSc in Mathematics, OR, Statistics & Economics (MORSE)

The course modules that make up these degrees range from the highly technical (such as mathematical programming and computer simulation), through applications courses (such as quality management, and developing business information systems) to courses that emphasise personal transferable skills, (such as the project management courses, e-business). The modules are also taken by students from elsewhere in the Management School and the University.

Postgraduate
The Department has a Master's Degree portfolio composed of the following programmes:

- MSc in Business Analytics
- MSc in E-Business and Innovation (EBIN)
- MSc in Logistics & Supply Chain Management
- MSc in Management Science & Market Analysis
- MSc in Project Management

The MSc programmes have a strong applied focus and take high quality first degree graduates and hone their skills and knowledge to make them more useful. Each degree includes a project, often with an external organisation, that runs for four months from May each year. Projects are closely

supervised by academic staff members, who (together with our students) find these one of the most rewarding aspects of the MSc portfolio at Lancaster. The Department is also host to the part-time MSc in Manufacturing Leadership, delivered in partnership with the UK's Manufacturing Institute.
The Department is a major contributor to other Masters programmes in the Management School, including the full-time MBA and the MSc programme in Information Technology and the Management of Organisation Change. It works on the MSc in Quantitative Finance with the Departments of Accounting and Finance, Economics and Mathematics and Statistics.
The Department also offers occasional post-experience open courses through the Forecasting Centre, including some organised directly for specific organisations to meet their particular needs.

LANCASTER UNIVERSITY MANAGEMENT SCHOOL (LUMS)

The Department is one of seven that make up the Management School (LUMS); the others being: Accounting & Finance; Economics; Entrepreneurship, Strategy & Innovation; Leadership & Management; Marketing; Organisation Work & Technology. LUMS also includes a number of interdisciplinary centres including: the Centre for Performance-led HR, the Centre for Strategic Management and the Lancaster China Management Centre. LUMS is a faculty of the university and Professor Angus Laing is the Dean. Within the School, teaching and research is conducted both within single departments, across departments and on a School-wide basis. In November 2012 LUMS was the winner of the inaugural Times Higher Education Award for the Business School of the Year.
School-wide taught programmes include:

- BBA (Bachelor of Business Administration)
- European BBA
- BSc in Business Studies
- Full-time MBA
- Consortial, part-time MBA
- Global MBA
- International Masters in Practicing Management
- MSc in Management

In addition, there are many specialist masters programmes run through the departments and the Executive Programmes Office also run programmes for external organisations.
LUMS, including the Department of Management Science, is housed in closely-located, purpose-designed buildings at the south end of the university campus. Working conditions are excellent and LUMS enjoys an attractive learning and social environment. The buildings include offices, teaching rooms, computer labs, fully networked study space, common rooms and a cafe; the most recent building, named after Sir Charles Carter, the University's first Vice-Chancellor, was opened in 2011. The current **LUMS Space Programme** will involve a major development of the LUMS estate, including a new main building, currently expected to be complete in mid-2019.

LANCASTER UNIVERSITY

The University was founded in 1964 and it has established itself as one of the UK's top research-led institutions. The Bailrigg campus is situated on the southern outskirts of Lancaster and is set in 250 acres of landscaped parkland, close to the lively, friendly and historic city of Lancaster. The campus is just 30 miles south of the beautiful Lake District and about the same distance from the Yorkshire Dales. It is about one hour's drive from Manchester International Airport and about two and a half hours by train from London.

From a distance the University is identified by the brilliant white spires of the Chaplaincy Centre and by Bowland Tower, a 14-storey residence block. The Lancaster campus is designed around the Spine - a covered walkway which runs the length of the site, from north to south. The residences, teaching rooms, research laboratories, library, and shops extend along and either side of the Spine, which gives a large and safe pedestrian area, with all cars confined to the perimeter road. Over £150M has been invested in the campus in recent years and a new £20M Sports Centre opened in 2011.

At the heart of the campus is Alexandra Square (named after the University's first Chancellor, HRH Princess Alexandra), which provides a focus for the life of the University. The central administration building (University House), the Students' Union offices, the Library, shops and banks are in or close to the Square.

As well as providing accommodation and academic facilities, the campus has eating places, a newsagent, supermarket, bakery, bookshops, Students' Union shop, hairdresser, gift shop, a Post Office, two banks, a dental surgery, Health Centre and pharmacy. Lancaster city centre is only a l0-minute journey away on the regular bus service which serves the campus.

Though its facilities are excellent, the university is, above all else, a place of academic enterprise in which its staff and students extend the boundaries of knowledge and develop their understanding of difficult issues. It has been outstandingly successful in research and teaching and is now in the top ten UK Universities as assessed by UK newspaper league tables, performing well in the National Student Survey.

Lancaster University’s mission to excel in research at the highest international level was boosted further by the results of the 2014 Research Excellence Framework (REF2014), which resulted in a rating of ‘world leading’ for the University.

The environs of the university

The university is situated in in the north west of England, close to the Lake District and Yorkshire Dales National Parks. The City of Lancaster encompasses three towns, Lancaster, Morecambe and Heysham, as well as a number of villages. The rural landscape is superb, with the Lakeland fells in full view across the expanse of Morecambe Bay. The River Lune runs from the Trough of Bowland, an area of outstanding natural beauty, past many of the villages, into Lancaster and thence to the sea. Two National Parks, the Lake District and the Yorkshire Dales, are within a few minutes’ drive.

Lancaster is an historic city with a 12th Century castle dominating the hill above the River Lune. It offers excellent shopping, a cinema, theatre and good restaurants, with many well-preserved older buildings. Morecambe is a seaside resort, which is undergoing something of a renaissance thanks to money spent on its regeneration. There are breath-taking views of the Lakeland mountains from its promenade. Heysham is the site of an ancient abbey, now owned by the National Trust, and ferries from its harbour sail to the Isle of Man.

The three towns and the villages have excellent schools and enjoy easy access to the M6 motorway, as well as to the main west coast railway line and Manchester International Airport. Housing is affordable and varied, ranging from country cottages through to town houses and flats. The City of Lancaster offers an excellent way of life for those who would rather avoid the noise and hassle of a major city, and yet who do not want to live in an isolated spot.