Institution: Liverpool John Moores University

Unit of Assessment: 16 Built Environment and Architecture

a. Overview

The 17.2 FTE Category A staff returned in this UOA. This submission reflects the membership of the University's Built Environment and Sustainable Technologies (BEST) Research Institute at the School of Built Environment. Staff are predominantly drawn from the Faculty of Technology and Environment, three staff are based within the Faculty of Science. BEST was initially designated as a Centre in 2006 and as a result of its achievements and developments, BEST was elevated to the status of a Research Institute by the University in November 2010.

The Institute encompasses an international, multidisciplinary team of established academics in their respective fields. Its research portfolio presents a unique integrated, holistic approach to energy, environment, water, construction and facility management, real estate, European urban affairs and consists of the following groups:

1. The Liverpool Centre for Environmental Technologies (Alkhaddar, Atherton, Riby)
2. The Liverpool Centre for Material Technology (Al-Nageim, Huang, Shah)
3. Facilities Management, Property and Planning (Tucker, Abdulai, Maliene, Couch)
4. Construction Management and Economics (Bryde, Ross, Ochieng, Byrne)
5. RF and Microwave Research Group (Al-Shamma'a, Shaw, Mason, Conlan)

BEST has three committees; (1) Executive Board Committee represented by the Dean of Faculty of Technology and Environment, School and BEST Directors and Chair of the Industrial Steering Committee. (2) Industrial Steering Committee represented by the industrial partners, School and BEST directors. (3) Management Committee represented by the Heads of the Research groups.

Overall, the research in UoA16 has demonstrated an excellent upward trend in terms of increasing research publications, rising income generation with increasing number of PhD student recruitment. These activities are now embedded in a healthy research environment which meets the increasing demands at both the national and international level.

b. Research strategy

The University strategic plan for 2007-2012, highlights research, scholarly activities and knowledge transfer as a priority. Subsequently the School responded to this plan, by prioritising research in BEST as a growth area. Six of key appointments were made to provide research leadership, and this together with significant resourcing has led to profound changes in the quality and quantity of research within BEST.

The main research aim for this assessment period is to consolidate and advance our research base. To fulfil the aim, a research plan was set out for BEST research groups related to excellence in delivering high quality research that by sustaining built environment activities (e.g. construction management, urban planning, facility management, real estate) coupled with civil engineering and environmental activities (e.g. water/wastewater treatments, pavement engineering and materials) and advance microwave technologies to provide a complete system solutions in the form of production energy from waste (e.g. recycling animal and sludge waste into biogas, contaminated biomass into bioethanol and waste oil into bio fuel) as well as non-invasive sensors systems for real time monitoring and detection (e.g. water quality, structure health monitoring, moisture and asbestos, material characterisation).

The main research progress made during this assessment period is highlighted below in comparison with the same UOA's performance in RAE 2008.

- £7.1M in research grants was awarded and £4.8M of income is spent during 2008-2013 in comparison with £750k in RAE08. The fund was awarded from the EU, Technology Strategy Board (TSB), Research Councils, Carbon Trust, Gas Safety Trust, and House of Parliament and directly from industry.
- The number of students awarded PhDs has increased from 5 (RAE08) to 32. Currently there are 45 PhD students are registered (11 students in the final year, 8 in the second year and the rest are in the first year of studies).

- An 80% increase in outputs including 171 refereed journal papers with national and international collaborators, 6 patents, 260 refereed conference papers, 10 books, 7 edited books, 41 book chapters/monograph and 65 industrial reports, totalling 560 outputs.
- Total of 17.2 FTE to be submitted in comparison with 8 in the RAE08 (5 of the submitted staff in RAE08 have left the University) i.e. 14.2 new staff to be submitted including 4 ECR.
- Sustained and established a strong Leadership in national and international networks and forums. This has been demonstrated by various activities such as:
  - Most of the submitted staff is influencing the international research agenda through their sustained quality and volume of published output. The Director of BEST (Al-Shamma'a), for example, is one of the EU-FP7 Scientific officers in the Energy theme to shape the development of various research activities and champion the disciplines and continuously evolving BEST research strategy and maintaining research income. Alkhaddar is currently the Vice President of The Chartered Institution of Water and Environmental Management (CIWEM) and will become President in 2015 for 1 year tenure. Shaw plays an active part of the Gas Safety Parliamentary Committee, shaping the UK policy in relation to Carbon Monoxide safety.
  - Development of strong external links through creation of structured industrial liaison and promotion of the BEST agenda with professional bodies is an important underpinning element of BEST research activities. As a result BEST has extremely strong industrial and professional connections with employers and professional bodies including: Royal Institution of Chartered Surveyors (RICS), Chartered Institute of Building (CIOB), Chartered Institute of Architectural Technologists (CIAT), Chartered Institution of Water and Environmental Management (CIWEM), Chartered Institution of Building Services Engineering (CIBSE), Institution of Civil Engineers (ICT), Institution of Engineering and Technology (IET), British Institute of Facilities Management (BIFM).
  - Participation in international conferences as a key note speaker (Al-Shamma'a-AMPER 2011 and 2013, Mason-IEEE Sensor 2012, Shaw-IMPI 2013, Ross-CIOB 2011), International conference chairperson on Pavement Engineering and Asphalt Technology (Al-Nageim-every year), Urban Design International 2011 (Maliene).
  - External collaboration acting as an external visiting Professor (14 days), for example, Al-Shamma'a (Universities of Malaya-Malaysia, Istanbul Technical Univ.-Turkey), Alkhaddar (Universities of Babylon-Iraq and Anadolu-Turkey), Ross (Univ. of Berlin-Germany) and Maliene (Vilnius Gediminas University).
  - Most of the staff are members of various Knowledge Transfer Networks (KTN's), Research Councils and TSB, editorial boards (Alkhaddar, Al-Nageim, Maliene, Abdulai, Couch, Ross, Bryde, Tucker, Al-Shamma'a), member of international advisory body-NATO (Al-Shamma'a).
- Development of external collaboration with international Universities and industries (as evidenced in sections d and e) in addition, international staff spent a period of three months at BEST Research Institute e.g. Dr. Angela Morales from CICAP/COVAP-Spain 2012, Dr. Stefania Gudrun Bjarnadottir from Animalia-Norway 2012, and Dr. Marion Fitzpatrick from SINTEF-Norway 2011, Dr. Dirgham Al-Khafajy from Babylon University-Iraq, 2010 and 2012.

For the next five years, the University, Faculty and the School believe that their long-term viability can only be assured if underpinned by world-class research and have therefore invested significant resources in people and infrastructure of BEST (sections c and d). Our strategy, underpinned by the University's Strategy Map 2012-17 that has research excellence and development of the research environment as the core aims, in the forthcoming period will therefore centre on:

- Continuation of expansion of the existing research groups in BEST, by appointment of new high calibre academic staff in accordance with the School's strategic plan (section c.1);
- Enhancement of the research profile and activities of the ECRs and researchers at the medium stage of their career;
- Increase in the number of PhD recruited (increase by 35%), completions (85%) and provision of sufficient external research funding, as well as internal funding for PhD studentships, equipment and conference travel;
- Continuation of existing and establishment of new research collaboration with leading

international partners;

- An expansion of the collaboration with industry, both directly and indirectly through partnerships on externally funded research projects, with the view of maximising the impact of the research.
- The research strategy regarding external funding will remain as in the REF period. External funding will be sought from the EU Horizon 2020 programs, TSB, Research Councils, Royal Society, British Council, directly from Industry and international grant awarding bodies (an increase by 30%). The policy being to submit novel and very original applications, with potential for high impact, and thus achieve a relatively high success rate. Future research topics will be selected using the following three criteria:
  (1) the solution to a problem must advance the level of fundamental knowledge and understanding on an international scale;
  (2) increase the number of quality outputs by 40% via traditional route and open access;
  (3) the topic must address the challenges faced by the society and industry, in order to achieve the impact.

In BEST Research Institute,

The Liverpool Centre for Environmental Technologies group will focus on the research related to the development of novel and efficient wastewater treatment systems, and maximising the collection and recycling of water used during industrial processes. Research on the development of bioreactors for the treatment of Metal Working Fluids, and advance oxidation systems for the water industry.

The Liverpool Centre for Material Technology group will focus on research and development into heavy building materials. The group will be committed to achieving a construction environment with a zero carbon footprint related principally to heavy building materials used in the construction sector. Innovation is the primary focus towards an improved understanding of structural and materials technology enabling research to be implemented successfully by industry.

Facilities Management, Property and Planning group will focus on research to the practice of facilities management in the international business environment. Key research themes related to the strategic position of FM in business, FM innovation, FM procurement and collaboration, International studies of FM and FM customer service and satisfaction. Other research will cover various facets of real property (landed property or real estate) and planning in the developed and developing world as well as influencing the European urban affairs.

Construction Management and Economics group will focus on research across a range of topics including: Lean and Agile construction, stakeholder management, project performance, quality management, risk management, sustainability attitudes and behaviours, and financial aspects in construction and multi-cultural project environments.

RF and Microwave Research Group will focus on the multidisciplinary activities related to environmental, sustainability and renewable energies using advanced microwave technologies as well as the development of real time non-invasive sensor for structure health monitoring, water quality and material integrity. The group will also see the development of the first Carbon Monoxide (CO) Centre of Excellence in the UK of which supported by the House of Parliament. This centre is set up on May 2012 by Baroness Finlay in response to the All Party Parliamentary Gas Safety initiative and supported by the Gas Safety Council, all gas industries, Fire and Rescue Services to monitor in real time the condition of CO emission throughout UK and provide prediction and statistical mapping for various authorities including public health. Future plans are in place to collaborate with other European research institutions and industry.

c. People, including:

1. Staffing strategy and staff development

The UOA's staffing strategy complies with the University's Research and Scholarship Strategy 2007-2012 and 2012-17 including measures for encouraging, supporting and rewarding staff for excellent research. Its implementation is evidenced at both University and School levels through the recruitment of 1 Professor (Al-Shamma'a-BEST Director 2010), 1 Reader (Shaw 2010), 5

senior lecturers (Mason 2010, Conlan 2012, Huang 2012, Byrne 2012 and Shah 2012). In addition to the recruitment of new staff, 1 existing staff member (Bryde) was promoted to Professorial position in 2011, and Senior Lecturers (Mason 2013 and Maliene 2013) promoted to Reader position.

The University is an active and committed member of the UK Vitae North West Hub, mapping its training provision against the Researcher Development Framework (RDF). As well as supporting researchers to attend Vitae skill development and networking events, the University hosts Vitae workshops that are open to researchers from other institutions.

The University was awarded the European Commission's HR Excellence in Research award in May 2012. The University has a robust action plan to continue to support researchers and researcher development which is delivered through the Concordat Task Group and overseen by the University's Research and Scholarship Committee. The RDF and the Concordat principles are at the heart of this action plan.

The University's overall research framework and strategy during the REF period have been formulated and managed by the Director of Research based in the 'Research and Innovation Services' (RIS) and implemented through Faculties. The development of and subsequent delivery of the Institution's research strategy is overseen by the University's Research and Scholarship Committee (URSC). This is chaired by a PVC, ensuring alignment and communication with the University's Senior Management Team. The Research Degrees Committee reports to the URSC as do Faculty Research Committees.

The provision and development of appropriate policies and support for staff and PGRs is primarily the responsibility of RIS (which hosts The Graduate School). This includes, for example, the Research Code of Practice, ethics and governance, pre- and post-award support (including costing and pricing). Support for Open Access and Data Management requirements are provided by RIS in conjunction with the Library and IT Services.

The University's RIS run a series of informal induction events for new research active staff, including early career researchers (on average four times each semester). Held in different locations across campuses, these events provide an opportunity for new starters to meet with existing research staff. A broad overview of the professional services, provided by the University to support research activity, is given, alongside the policies and procedural frameworks that underpin research at the University (e.g. research strategy, grant funding and support, research ethics, library resources, REF, Researcher Development Framework). The University also provides a range of career/skills development opportunities, targeted specifically at early careers researchers, such as for example 'Being an Effective Researcher'. The University's Research and Innovation Services provide a range of research-related training, skill development and networking opportunities for staff at all levels of experience and capability. It also disseminates information about internal and external training opportunities in a dedicated electronic research bulletin. Internal regularly organised training events include:

- Grant bid clinics (two-day events for principal investigators who are targeting competitive funding streams; attendees will generally have quite well-developed research proposals that would benefit from in-depth peer review to enhance quality prior to submission); (Mason 2011 and 2012, Huang 2013).
- Grant Incubator workshops (for researchers seeking guidance on how to develop their research ideas into more formal proposals); (Tucker 2010, Huang 2012, Shah 2012, Conlan 2012 and Byrne 2012).
- Research grant training (comprehensive training on all aspects of proposal development for those new to research and/or the University).

The School operates a mentoring system for new academics. Senior staff members (typically, research group leaders) are assigned as mentors and their main duty is to facilitate integration of young academics into the existing research culture and to help them to commence a successful research career.

The School provides a PhD studentship for the new academics and the Faculty Research Fund gives preference to their research project bids. New academics typically have a substantially reduced (50% maximum) teaching load during the first two years. This is monitored through an annual appraisal scheme Personal development and Professional Review (PDPR) and a workload

allocation model, which protect focused time for researchers, and monitors research performance. New staff were also given PhD students with full scholarship (up to £25k per student per year covering fees and living expenses) to pump-prime their research activities (e.g. Mason 2011, Tucker 2012, Ochieng 2012). The School operates a Conference Travel Fund, which provides funding for academics to present research at the leading international conferences. The travel grants (up to £1000) e.g. Alkhaddar 2009 and 2012, Al-Nageim 2008, 2010 and 2011, Tucker 2010, Mason 2011 and 2013, Abdulai 2012, Maliene 2012, Ross 2009 and 2011, Shaw 2013, Atherton 2009 and 2011 and Bryde 2008, 2011 and 2012.

The University organises regular training events on equality and diversity. All the senior staff of the School has taken the training. Academic appointments and promotions are routinely monitored and reported in terms of equality and diversity. The University holds a membership of the Athena SWAN Charter and is working towards the Athena SWAN Bronze award by 2014. Senior mentor roles were introduced by the University in 2012 to support female researchers.

2. Research students

Postgraduate research students are typically recruited by advertising the posts (when these are accompanied by a studentship) or through direct application of overseas fully funded students to the University. For all research students there is an induction session; it is compulsory and is provided by the University's RIS (induction sessions are run on six occasions throughout the academic year). All research student supervisors are required to complete the University's Research Supervisors workshop. Quality assurance and progress monitoring for PhD students are provided via a two-tier system, at the Faculty level (Faculty Research and Scholarship Committee) and the University (Research Degrees Committee).

All research students are encouraged to complete the Postgraduate Research Experience Survey (PRES), run every two years. The data are analysed at the Faculty level and are made available at School level. If and when deficiencies are detected, appropriate action is taken.

Research within the BEST has grown significantly since RAE08. This is also reflected in the number of PGR students. Due to extra funding, income generation, more collaboration and support from the University and the Industry, the number of PGR student has significantly increased. Since 2008, 32 managed to complete their studies successfully. Currently, BEST has 45 students registered for PhD studies with aspirations to increase the number by 35% in the next 5 years.
There are a number of support mechanisms organised by the University for all PhD students:

(i) Mandatory University-level induction and research methods training;
(ii) An additional one-week residential 'advanced research methodologies' workshop;
Generic Skills as well as Enhanced Career training for all PhD students; such as Staff Educational Development Association (SEDA), Supporting Learning Awards and also to achieve Associate Fellowship of the HEA.
(iii) BEST launched a new Built Environment PG research training programme in 2008, focusing on key research methods in Built Environment;
(iv) BEST has introduced Learning Agreements in 2008, to enhance the PGR student experience;
(v) BEST organises an annual internal PG research conference (BEAN) to monitor student progression. Each PhD student must present a paper on their annual progress.

Each PhD student is allocated a desk, a computer and access to labs. Some get additional home computers (based on their medical conditions). The University and School offer conference travel grants to enable PGR students to attend national and international conferences for the dissemination of their research findings. Normally, each student is funded to attend at least one international conference. 21 PhD students have benefitted from this excellent opportunity.

Student progress monitoring includes weekly meetings but also formal procedures in line with the University's Code of Good Practice, which are reported to the University Research Degrees Committee. This includes an annual progress report and an internal viva as part of transfer from MPhil to PhD registration, with assessment by an independent examiner. These measures have helped the School to achieve a 30% increase in the annual average of PhD awards since 2008.

The University signed a Memorandum of Understanding with the University of Malaya (Kuala Lumpur, Malaysia) in 2009, related to the organisation and delivery of a joint PhD degree. One

Malaysian student (fully financed by the University of Malaya), who commenced his part of research studies at BEST in 2013 to undertake studies related to design and construction of novel sensor system for the oil/gas/water industries.

d. Income, infrastructure and facilities

Since RAE08 the School has had a substantial increase in its research activities through the BEST Research Institute. This is reflected in the large number of funded projects secured with an income generation of £4.8M, the novelty and uniqueness of the research work, by the increased number of staff involved in research, and by the number of PGR students. The external research fund in the REF period has continued to be provided through the EU-FP7 programs, TSB, Research Councils, Carbon Trust, Gas Safety Trust and directly from industry. **Examples of some the awarded grants are;**

EU funded project via FP7 programs:

- A Multipurpose Industrial Chemical Reactor using Tuneable Frequency Microwaves, €1.1M (2006-2009). This project was jointly with Univ. of Rennes1-France, Shelling Plough-France, Dipolar-Sweden, FELDEC-UK. This project has demonstrated for the first time a breakthrough in the use of high microwave frequencies in the delivery of green chemistry for the benefit of the pharmaceutical chemistry.
- Release of Sugars from Cellulosic Biomass by Microwave Plasma Technology for the Production of Bio-ethanol, €1.05M (2010-2012). This project was jointly with Fraunhofer Research Institute-Germany, PERA research group-UK, Technosam-Romania, Biofuel Wales-UK. This project has demonstrated at industrial level the use of microwave plasma technologies as a cost effective system for the breakdown of lignin of contaminated grass into sugar for the production of bioethanol. Biofuel Wales have already risen £1.2M to exploit the system and currently in negotiation with the University for license agreement.
- Advanced Microwave Plasma Gasification of Pig and Cow Manure for Cost-Effective Biogas Generation, €1.135M (2012-2014). This project is jointly with Ashleigh Farm-Ireland, Sairem-France, Technosam-Romania, HERI-UK, Acondaqua-Spain. This project has already demonstrated successfully the use of microwave plasma as a new source for the reduction of waste, converting animal waste into bio gas at fraction the cost of the conventional anaerobic digesters.
- Marie Curie Intra-European Fellowships (IEF), “water spotchek”, €270k (2012-2013). This project is to develop a non-invasive sensor to determine the water quality in real time. The project has already been taken up by Mechan Controls to manufacture the sensor system and commercialise it.

Technology Strategy Board (TSB):

- Investigating the feasibility of using highly efficient microwave induced plasma for advanced gasification technologies, £112k (2010-2011). This project is jointly with Stopford to prove of concept of using microwave plasma for recycling of biomass waste and sludge.
- Development, Design and Deployment of a Demonstration Scale Microwave Plasma Gasification Plant for the Generation of low Carbon Energy from Waste-Pre market demonstrator, £1.7M (2012-2015). This project to build the industrial system based on the successful results achieved in the proof of concept. This project is jointly with Stopford United Utilities, Finnings.
- SAVE Water (Subaqua Assessment Vehicle for Water Infrastructure), £743k (2012-2014). This project is jointly with Balfour Beatty, JD7 and United Utilities. The project is to develop for the first time an industrial spot check system for on line monitoring and detection of water pipe leak using electromagnetic waves sensors. The University has obtained a patent in 2009 and now Balfour Beatty planning to exploit the technology to all the water industry nationally and internationally.

TSB Knowledge Transfer Partnership (KTPs):

- Removal of Phosphorus from water with United Utilities, £140k (2008-2010). The project is to provide the water industry a new technique of removal of phosphorus.

- Real time monitoring of oil/water pipe conditions with Cokebuster, £176k (2013-2016). The project is to empower the company with sensor knowledge and make them world leader in the field of real time monitoring and detection of various hydrocarbons in oil pipe line.
- To Assistant the Trust to Develop Knowledge and Capabilities for Building and Maintaining Near Zero Carbon Buildings, £124k with Alderhey Hospital (2010-2012).

Direct fund from industry:

- Ministry of Defence, joint venture with the UK and US in developing a complete system for the real time detection of activated carbon mask in battle field, £185k (2010-2012).
- Microwave Plasma Pyrolysis for Recycling Waste, supported by the Merseyside Investment Fund, £113k (2008-2009).
- Recycling of CO2 into Syngas, Inventure Energy Ltd, £175k (2012-2013).
- Liverpool One, design and development new Facility Management software, £10k (3 months).
- Neodyme-France, €100k, real time monitoring of catastrophic failure of bond wall.
- Wastewater membrane technology, Hydro International £100k EPSRC PhD student case award EP/H50138X/1.

The School of the Built Environment has the following facilities available to its students and staff :

- **Sensors Laboratory** for Structure health monitoring, real time monitoring of buildings condition including asbestos and moisture, smart energy meters for various applications related to built environment, aerospace, automotive, construction. State of the art facilities including Microwave spectrum and network analysers (£500k), Sensor PCB multilayer machines (£25k), Microwave sources and detection (£70k).
- **Biological Science/Chemistry Laboratory** for Energy from waste using unique microwave solutions to recycling waste from biomass, chemicals, grass from contaminated land and animal wastes. Microwave sources (£150k), Gas detectors (£20k), Automation and control (£40k), HPLC unit (£30k), CEM microwave unit (£35k), Fermenter/ bug lab (£50k), Digital Microscope (£50k).
- **Engine Testing Laboratory Pollution monitoring**, Geographical Information Representation using GIS software (£25k), Pollution reduction. House a fully controlled engine (£100k). **Environmental Testing Chambers** (£300k) for testing and evaluating systems, materials and sensors at control temperatures (-20 to 50 degree C).
- **Concrete and Materials Testing Laboratory** for Pavement and road engineering, asphalt, aggregates. Mixing equipment and cement making (£70k).
- **Geotechnics Laboratory** for Material characterisation, units (£100k).
- **Hydraulics Laboratory** for Water and waste water treatments. Industrial prototype systems (£45k) for testing and evaluation.

These labs are spread over two sites. The Henry Cotton site includes sensors, water, materials, and pavement design. The Byrom Street site includes water, environmental, recycling and energy from waste laboratories.

Further investment of £250k has been planned for the next two years to expand the range of high added value research facilities related to the creation of a low carbon innovation hub for the Liverpool City Region part of the European Research Development Fund. This is a £1.1M pilot project to be completed in June 2015. Currently under discussion with Liverpool and Lancaster Universities as well as industries at national and international level to develop a global low carbon innovation forum with estimated budget of £20M.

e. Collaboration or contribution to the discipline or research base

One of the main characteristics of the research within BEST has always been a substantial degree of international collaboration, in addition to joint work at national level. Collaborations are based on complementary expertise of the partners. Research directions are set by the awarded externally funded projects, by overseas partners, or by the submitted academics, as appropriate.

As shown in section d**,** BEST encourages and supports research collaborations in the identified

areas related to the five groups. Successful collaborations are valuable in terms of making more significant research findings and creating more opportunities for research funding through concerted efforts, complementary expertise and established research networks. During this assessment period, staff returned in this UOA has also demonstrated their leadership and contribution to the discipline and research base. For example;

(1) 35 advisory/standard body/council chairs and memberships, e.g. EPSRC Peer Review College Members, TSB, EU (Al-Shamma'a, Ross, Al-Nageim, Shaw, Alkhaddar, Bryde, Tucker, Mason), IET (Mason), BIFM (Tucker), ARCON (Ross), CIB (Maliene, Bryde);

(2) 54 conference/workshop chairs, e.g. CIOB, IET, International conf. 'Advanced Construction', International and interdisciplinary Symposium of European Academy of Land Use and Development, ARCOM, American Real Estate Society, World Association for Sustainable Development, Environmental Engineering, IEEE conferences, AMPERE, IMPI, CIBSE, ECTP, Pacific Ass. of Quantity Surveyors Congress;

(3) 61 invited keynotes/talks, e.g. House of Commons (Shaw), AMPERE/IMPI (Al-Shamma'a), ARCOM (Ross), IOP (Mason), CIBSE (Al-Shamma'a), ECTP (Bryde), RTPI (Couch).;

(4) 21 journal editorships, e.g. J. of Construction procurement (Ross), J. of International Real Estate and Construction Studies (Abdulai), J. of Civil Engineering and Construction Technology (Abdulai, Alkhaddar), Int. J. of Pavement Engineering and Asphalt Technology (Al-Nageim), Urban Design International (Maliene);

(5) NATO Advisory Board (Al-Shamma'a);

(6) Chair of IET northwest group (Mason);

(7) Organising and International Urban Design Conference (Maliene-Chair), Liverpool 2011;

(8) Organising a national CIBSE conference, (Al-Shamma'a-keynote speaker), Liverpool 2013;

(9) US-UK Fulbright with Georgia Institute of Technology, Tucker, (2012/2013).

Collaboration with the following academic institutions and industry have been well established through joint research programs, publications and exchange programs including;

Universities/Institutions:
Malaysia (Malaya, Tan Hussein, Technology Mara), USA (Clemson, Pennsylvania State, Georgia Inst. of Tech.), Turkey (Anadolu, Istanbul Technical University, Yaldiz, Yeditepe), Germany (Fraunhofer Institute, Berlin, Rostock, Wasmar, Augsberg, Achen), France (Rennes1), Ireland (Limerick, Cork), Canada (Victoria, Calgary), Japan (RIKEN, Wasada, Yamaguchi), Qatar University, Egypt (Cairo, Aim Shams), Thailand (Mahidol), Iraq (Baghdad, Babylon, Al-Anbar).

Industries:

United Utilities, NHS, Balfour Beatty, Jaguar, Wirral Partnership Homes, Stopford, Liverpool Vision, Biofuel Wales, Longma Green Energy, MedePad, Angel Investors, Liverpool City Council, Severn Trent, Amey group, Redrow, Tarmac, Carillion, NHS, Grosvenor Estates, Cross-Rail, Road Surface Treatment Association, Network Rail, Hydro international-USA, Sairem-France, Technosam-Romania, , Manros-France, Cemex-Mexico, Lafarge-France, Neodyme-France, Shelling Plough-France, Acondaqua-Spain, Nortura-Norway, Faccsa-Spain, Sintef-Norway, CICAP-Spain, 2020 Liverpool, ABER Trusted Technology, Air Products PLC, Aeroflex, AM Technology, Atkins Global, Archibald Bathgate Group Ltd, Astra Vehicles, BAM Construction UK Ltd, Biomass Engineering, BOC, DSoFT Solutions, Dipolar AB, EnviroSystems, F-MEX, Fraunhofer, Gas Sensing Solutions Ltd, Golden Grass Inc., Haarsley UK Ltd, ICL Industrial Products, Industrial Microwave System Ltd, EC Harris, Innovas, Inventya, Isis Innovation, Kleen Air, Ledwood, Michael Dyson Associates, Mira, Modernwater, Optic Technium, PERA, P.W. Circuits Ltd, Rohde & Schwarz UK Ltd, TMD Technologies Ltd, Xpertrule and Animalia-Norway.