Institution: University of Wolverhampton
Unit of Assessment: 16 Architecture, Built Environment & Planning
a. Context

Safe, cost effective and environmentally sustainable procurement and maintenance of infrastructure assets are at the heart of ABE research. Our target research users include: construction project participants and their professional advisers; owners of proprietary interests in the products of the industry; organisations that support the industry by providing the necessary finance, insurance or other financial instruments; and construction dispute resolution practitioners. Cost effective procurement of infrastructure assets of high quality not only leads to affordable prices of goods and services produced with the infrastructure but also enhances reduction in the risk of harm to people, property and the environment. These benefits cascade into improvement in human wellbeing and the competitiveness of UK goods and services in the global marketplace.

The impacts achieved and the underpinning research are summarised below. Underpinning research is identified by Output Identifiers for relevant submitted outputs whilst references for other outputs are listed in two submitted case studies.

Table 1: Summary of Impact and Underpinning Research

Research Theme	Impact	Underpinning Research
Health and Safety	Influence on professional standards and practice, training and CPD; stimulation of practitioner debate.	DO 4; DH 4, SS 1-3, Ndekugri (2013)
Contract and Conflict Management	Improved effectiveness of workplace practices; improvement in legal framework; Influence on dispute resolution; stimulation of practitioner debate.	IN 1-4,NA1,NA 4, SR 3 ,Ndekugri and Rycroft (2009), Ndekugri and Russell (2005, 2006)
Culture, Collaboration, and Supply Chains	Major contribution to improved effectiveness of workplace practice through adoption of groupware and 4D planning technology.	NA 1, NA 2, PG 2, DH 1, EC1, EC3
Technology, Sustainability and Biodiversity	Intellectual underpinning to EU funded retrofit projects for which members of our team (Fullen and Chinyio) are the academic coordinators.	EC 2, EC 4, JK1-4, MF 1-4,PG1, PG 3, AB 1-4, SR 1, 2 & 4.
Advances in ICT tools	Improved effectiveness in workplace practices in relation to health and safety and project planning; adoption of new technology; improved business performance.	IN 1, IN2, DH 1, DH 4,IN1, PG 2, PG 4
Real Estate Policies in Sub-Saharan Africa	Stimulation of policy debate on real estate policy which may have led to change of policy direction in Ghana.	FH 1-4

b. Approach to impact

The unit's approach to ensuring impact was built on: maximum engagement with industry and other potential users of our research in the design, implementation and dissemination of research; internal research management processes that reflect the importance of impact; collaboration with leading researchers from other HEIs not only in the UK but also overseas; supporting the long term career interests of our research students; and working collaboratively with expert practitioners. The activities through which staff in the unit engaged with industry included: KTPs, workshops, other CPD events, employment of leading practitioners as visiting faculty, maintenance of websites for special interest groups, and joint authorship of books and journal articles with industry-based practitioners; and research-informed postgraduate taught courses.

Engagement with industry

ABE has very close links with the primary professional institutions such as the Royal Institute of British Architects, the Institution of Civil Engineers, the Royal Institution of Chartered Surveyors, and the Chartered Institute of Building. As part of our interaction with these bodies for the

purposes of maintaining accreditation of our courses, we have to demonstrate that we conduct research relevant to the needs of their members and challenges in the construction industry. We also work closely with professional societies such as the Society of Construction Law, the Adjudication Society and the Chartered Institute of Arbitrators. Ways in which these professional institutions and societies have contributed relevance to the needs of industry include: providing feedback on draft research proposals; providing representatives to research steering committees; contribution to our research resources such as funding for journal subscriptions; facilitating access to their members for data collection; and dissemination of our research. In line with the University of Wolverhampton's industry-facing orientation, staff research outputs are available online to the general public through the Wolverhampton Intellectual Repository and E-Theses (see http://wlv.openrepository.com/wlv/).

Workshops and Other CPD Events

We have a huge reputation for putting on workshops that are more responsive to the needs of industry than traditional academic conferences. These workshops have been aimed at: showcasing our research on issues of topical interest to industry; obtaining preliminary feedback on on-going research projects; and stimulating debate on controversial issues. Participants are normally requested to complete a feedback form to indicate the extent of satisfaction/dissatisfaction with the event. It is our intention to revise this form to capture evidence of impact.

Collaboration with Individual Practitioners

In many areas of change forced on the industry by new legislation or revised standard form contracts, individual practitioners deeply immersed in such change are often invited to contribute to our research far beyond the role of a research informant. Such practitioners have continued as co-authors of publications. For example, Oloke worked with practitioners to produce the Institution of Civil Engineers' Health and Safety Manual (ISBN: 978-0-7277-4056-4) whilst Suresh and Renukappa contributed to the Association for Project Management's competence framework (ISBN: 978-1-903494-18-9) which has been adopted by the BBC (http://downloads.bbc.co.uk/careers/documents/overview-of-competency-framework.pdf). Michael Rycroft, a director of a multinational contracts and dispute resolution consultancy, has collaborated with us for over two decades in research and design and delivery of training. The combination of Ndekugri's intellectual rigour and Rycroft's outstanding experience of practice accounts for the huge success of their joint book as a contract administration and dispute resolution handbook (ISBN 978-1-8561-7629-3). Ndekugri's submitted outputs and other outputs listed in Case Study 1 identify other practitioners with whom we have collaborated to produce publications with significant impact on practice: Peter Chapman (Past President of the Dispute Resolution Board Foundation, Chairman of the FIDIC Adjudication Advisory Panel, and Chairman of the Disputes Panel for the Olympic Delivery projects); Victoria Russell (Past President of the Society of Construction Law and Partner in Fenwick Elliott, for many years adjudged the No. 1 Construction Law Firm in the UK); and Hannah Daeche (Construction insurance in-house expert in Legal Department of Galliford Try Contractors).

Long Term Careers of Research Students

We have made significant impact by adding to the pool of staff in HEIs that produce managers and leaders for the construction industry not only in the UK but also in many other countries. HEIs that have been supported in this way include Brunel (Dr Braimah), West of England (Professor Proverbs, Dr Booth and Dr Lamond), Coventry (Dr Soetano), Calgary, Canada (Dr Ikpe), Glasgow Caledonian (Dr Manase); Curtin, Australia (Dr Suntrisna), University of Santander, Columbia (Dr Rios Reyes); Ajman University of Science and Technology,UAE (Dr Boudiaf); Heriot Watt (Dr Seth) Bells University Nigeria (Dr Ojohwomu); State University of Manahao, Sao Luis, Brazil (Dr Bezerra); and Oxford Brookes (Dr Wei Zhou); Derby (Dr Oraifige); University Centre Yeovil (Dr Bailey); University of Science and Technology, Ghana (Dr Ahadzie); Liverpool JMU (Dr Abdulai); and Northumbria (Dr Samwinga).

Postgraduate Taught Courses

Our MSc courses in Construction Law and Dispute Resolution, Programmes and Project Management, Construction ICT and Construction Project Management attract mostly middle/senior managers in industry studying part-time. They have therefore been an important route to impact for us. A total of 66 part-time students from middle/senior management in construction industry organisations were awarded MSc degrees during the assessment period.

Knowledge Transfer Partnerships

Research in the area of advanced ICT, visualisation and BIM at the University has directly benefitted a range of companies. This work was combined with Ndekugri's studies into delayed completion of projects and shortcomings in time management practices to develop interventions for industry with funding from the European Social Fund. The combined research has also led to KTPs which have increased the turnover of the companies engaged with. Our KTP activity is outlined in Case Study 2.

Joint Academia-Industry Research Networks

The team have established two EPSRC-funded research networks. The performance of construction contracts is often shrouded in secrecy because of commercial confidentiality. FIDIC-NET is an international network of experts on and users of international construction contracts established to counter the barriers thus posed to research. Our work with FIDIC-NET is outlined in Case Study 1. The second network (FLOODREPAIR-NET) is an international network of experts and the flood damage repair industry practitioners. ABE researchers continue to play an active role in the activities of the network although the lead has moved to another university.

c. Strategy and plans

A review of our impact strategy during most of the assessment period indicated that it needed improvement to capture more fully evidence of the extensive impact made by our research activities. A more formal impact strategy has now therefore been developed and implemented. The elements of this strategy are: internal organisation and procedures for impact; maximum engagement with industry; building impact into research proposals and designs; an Industrial Research Advisory Panel (IRAP); systems for capturing and maintaining records of evidence of impact; and annual reviews of the impact of individual and group research. It is anticipated that this proactive stance on impact will become an important part of the culture of the group. The IRAP will comprise five industry leaders who meet twice a year to offer advice on: the responsiveness of the Department's research portfolio to industry needs, the likely effectiveness of the arrangements for impact, and appropriate remedial action.

d. Relationship to case studies

The full range of types of impact made by our research as a whole are summarised by research themes in the Table 1. Two case studies are submitted to demonstrate how some of the relevant types of impact were achieved. Case Study 1 focuses on improved practice in contract management and dispute resolution in the construction industry. This impact was underpinned by research in the "Contract and Conflict Management" theme. It highlights how impact was achieved through international collaboration with professional institutions and societies, business organisations and expert practitioners. Case Study 1 also demonstrates how research networks with membership drawn from industry and academia can be an effective route to impact.

Case Study 2 highlights how our research led to greater adoption of ICT and improvements in workplace practices. It demonstrates the effectiveness of an integrated approach to impact. Whilst the research was undertaken in separate themes for "Health and Safety", "Culture, Collaboration and Supply Chains", "Advances in ICT Tools" and "Contract and Conflict Management" we discovered that industry was more receptive to interventions based on a combination of the insights from the separate themes. For example, research within the "Contract and Conflict Management" theme identified shortcomings in industry practice in relation to project planning and control. This was integrated with the work of the "Advances in ICT Tools" research cluster to develop training on project planning using the latest technology which takes greater account of the fragmentation of the construction industry than has been possible with established planning software.