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Expanding Knowledge and Practice Of Construction Management Systems and Procedures

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Abstract

This submission is a highly focused collection of research-based and scholarly publications in the specialist field of Construction Management. Emphasis is placed on management systems and procedures involved in the procurement and production phases of the total building process. A coherent, original, independent and significant contribution to the advancement and application of knowledge has been made through applied research and dissemination of findings to academic peers, construction industry professionals and students in higher education. This has been achieved through: academic, professional and research-based textbooks; research monographs; refereed papers in learned journals; refereed papers to premier national and international conferences; and papers to foremost construction industry professional institutions.

Textbooks have been published by Macmillan, Thomas-Telford in collaboration with the Engineering and Physical Sciences Research Council (EPSRC), Longman and Palgrave with three commissioned by and contributing to the Chartered Institute of Building (CIOB) 'Education Framework' for construction industry. Peer-reviewed papers have been published by eminent journals based within the UK, North America, Australia, Hong Kong and China whilst refereed conference papers have been published both in the UK and internationally at leading research symposia. Among the refereed journal and conference papers presented, a number have merited prestigious awards reflecting *"the outstanding contribution to research knowledge and communication within the construction industry"* (CIOB, 1988) and in recognition of *"making a practical and lasting contribution towards the improvement of standards in building practice and education in building"* (CIOB, 2004).

This submission reflects a distinguished level of dissemination of applied research and scholarship over a twenty year period. The body of work presented has established a highly significant and authoritative contribution to the better understanding of construction management systems and

procedures. Furthermore, it has influenced, where applicable, thinking and practice within the subject field within research groups, higher education, the professions and the construction industry.

References

CIOB. (1988). *Educating the Industry's Managers.* Building Technology and Management, Oct ed. The Chartered Institute of Building, Ascot.

CIOB. (2004). *Innovation and Research Awards 2003/2004.* The Chartered Institute of Building, Ascot.

Critical Appraisal

Aim of the Submission

The aim of this submission is to present a highly focused collection of research-based publications which have made a significant, distinguished and original independent contribution to the advancement, dissemination and application of knowledge in Construction Management within academic higher education, research peer groups, the construction professions and the construction industry. Furthermore, this submission provides substantial evidence that the research and publications presented have influenced thinking and practice among these groups. The research and publications presented have helped to move forward the boundaries of knowledge and application within both the particular specified sub-field of study and the wider applied field of construction management.

Specialist Field of Study

The collection of publications comes within the academic, professional and industry applied specialist field of *Construction Management*.

Sub-field of Study

The particular sub-field of construction management which the publications address is that of *management systems and procedures implemented during the procurement and production phases of the total building process.*

Within the construction industry, the systems described are generally referred to as "soft" management systems. These provide a framework of structured, documented and, in specific applications, standards-based procedures that are implemented when managing construction processes. The prominent

examples within this submission are: quality management systems (QMS); environmental management systems (EMS); health and safety management systems (H&SMS); and the combination of these in integrated management systems (IMS). In addition, soft systems are seen in application to the procurement process through research into systems and procedures of buildability {constructability}, small building works management, and design-build through D&B tendering systems.

Scope and Context of the Submission

The scope of the submission is explicitly focused on 'post-doctorate' level applied research and its dissemination through recognised published sources held in the public domain. The submission reflects those publications which have resulted from major competitive government grant funded research, such as EPSRC, and from scholarship closely linked to the research. From a range of published works exceeding well over one hundred, the sixty publications selected are those which relate directly to or have developed from funded research, those of a high standard, and those which have made a significant and valuable contribution to expanding the specific knowledge base of construction management systems and procedures and its application within relevant aspects of the construction industry. Research and publications in important areas that are related but considered peripheral to the focus of this submission, such as education and training within construction, have been consciously omitted.

The various research environments which have shaped the profile of this submission present an important context. Over a twenty year period, research has been conducted at a number of academic institutions in the traditional and new-university academic sub-sectors. These institutions have supported a range of research infrastructures from highly established to developing to embryonic. This is significant in terms of their respective and differing research cultures and strategies, the critical mass of research activities present, and the opportunities and capabilities to support research

from internal and external sources of funding. Embracing these characteristics as challenges, the focus has always been to optimise the level of engagement in applied research and scholarship within each academic environment and, moreover, to actively disseminate appropriate, meaningful and practical knowledge to intended recipients through good quality outputs.

Research Methodological Approaches Used

It is not intended within the scope of the submission to detail the research methodological approaches that have been used to conduct research as they form an integral part of the published works themselves where applicable. However, it is appropriate to note that studies have predominantly applied a triangulated qualitative-quantitative approach. This has involved: (i) the development of theory from data, or grounded theory, and processes of iteration and evaluation of data, or analytic induction; and (ii) empirical investigation of data using recognised sampling methods and database coding and analysis.

These approaches have facilitated a greater awareness and understanding of the concepts, principles and processes associated with construction management systems and procedures and provided a good insight to applications and practices within the industry. From this, the contribution to augmenting and expanding the knowledge base of construction management within academia and helping industry to enhance its practices has been perpetuated.

Process Approval for the Submission

A first-draft of this submission was scrutinised by two internal non-subject specific professorial level rapporteurs, the University's Research Degrees Sub-Committee (RDSC) and an external subject-specific rapporteur, an internationally renowned Professor of Construction Management based at The University of Reading. This process confirmed the prima facie case for

submission. As advised by the University's RDSC, the detailed comments and suggestions made by the external rapporteur have been carefully considered and addressed and are reflected in this submission. This targeted the submission to those publications based on funded research and associated scholarship where a major contribution to knowledge development and application is clearly evidenced.

Contribution to the Body of Knowledge and Its Impact

The focus of the publications and the breadth, depth and value of research and scholarship underpinning them has been to augment, expand and, where amenable, evolve the boundaries of academic knowledge and practice within the specialist field of construction management. The active communication of research knowledge has been fundamental to this. Appropriately therefore, dissemination of research findings to vocational undergraduate, postgraduate and mature-professional students in construction-related higher education and also researchers and academic peers has been very important. Equally, communication to construction professionals, practitioners and end users, through professional bodies, such as The Chartered Institute of Building (CIOB), has also been very important and prominent.

It is not always easy to gauge the impact of research upon any intended recipients. Notwithstanding, evidence from high profile recognition by professional bodies such as the CIOB, through research networks such as the International Council for Research and Innovation in Building and Construction (CIB) and the practical application of research findings by public and private sector industry organisations clearly suggests that the presented research and scholarship has met its intended audiences. Moreover, it has had a real impact upon their perspectives, thinking and, in many cases, their practices. Examples of this are explained subsequently when discussing the set of publications submitted.

Distinguished Contribution to Research and Its Dissemination

The research underpinning the publications presented in this submission has been funded by major academic, governmental and industry sources. These are: the Science and Engineering Research Council (SERC) Specially Promoted Programme in Construction Management; the Department of the Environment (DoE) / SERC 'Link' Programme in Construction Maintenance and Refurbishment; the Engineering and Physical Sciences Research Council (EPSRC); the British Council; the Higher Education Funding Council for England (HEFCE) Research Assessment Exercise (RAE); the House Builders Federation; employer-funded research studentships; and the Hong Kong Universities' Grants Council Research Grants Committee (RGC). All of the aforementioned supported applied-research through funding grants.

In addition, international research has been funded by: The British Council; the Overseas Development Agency (ODA); and The Fulbright Commission. These have supported inter-institutional collaborative research between universities, conducted in the USA and Brazil.

Research has also been supported by a number of prestigious personal fellowships and scholarships from: The Chartered institute of Building (CIOB) 'Queen Elizabeth II Silver Jubilee Scheme'; The Fellowship of Engineering 'Overseas Research Fellowship', and The Carnegie Trust for the Universities of Scotland 'Overseas Visiting Research Fellowship'.

The funding which enabled the research to be conducted together with the support of professional institutions in disseminating research findings is gratefully acknowledged.

A number of papers disseminating the findings from these grant funded research projects have received the distinction of literary and research awards from professional industry bodies. These include the Chartered Institute of Building (CIOB) 'Ian Murray Leslie' Award, the CIOB, Hong Kong,

'Building Award' (CIOB, HK, 1994) and the premier CIOB 2003-2004 'Innovation and Research Award' and 'CIOB Medal' in recognition of a research paper entitled *Enhancing Design-Build Tendering Procedures through Research Collaboration and Dissemination* (CIOB, 2004). This work was based directly on the findings of the EPSRC funded research project and from the EPSRC endorsed research textbook *Best Practice Tendering for Design and Build Projects* published by Thomas Telford.

Original and Independent Submission

Whilst this submission reflects a personal, independent and original contribution to the body of knowledge in the specialist field of construction management and its active dissemination, it would be inappropriate to suggest that research work and publication outputs over the years could be achieved without the contribution and support of colleagues, research supervisors, editors of academic and professional journals and the professional institutions. Their contributions have been gratefully received. Co-authors, in particular, are credited in the co-author surnames related to publication titles.

Many of the publications presented are the result of single authorship reflecting personal work, research and academic development over many years. This was gained at a number of academic institutions in the UK and overseas. This is consolidated with research conducted in collaboration with international academic institutions. Such work has been mirrored in career advancement from lecturer, through senior-lecturer/associate professor to professor in the eleven year period 1984 to 1995.

Following professorial attainment in 1995, much research and dissemination has focused on assisting and enabling young and up-and-coming researchers and less experienced academic staff members to acquire, conduct and supervise research contracts and studentships together with facilitating joint publications and indeed their own independent outputs. Such activities have

provided a number of jointly authored high quality refereed outputs identified in this submission. In addition, contribution to a number of academic textbooks has been invited to younger colleagues, again to provide a route to high quality publication, assisting them with their own academic and career development.

Central Theme and Sub-themes of the Publications

The overriding central theme of the publications presented can be categorised within 'management systems which influence the construction processes', for example quality, safety and, most prominently, environment. In addition, the following sub-themes related to 'construction procurement' are evident: buildability {constructability}; small building works; and design and build tendering. These have, over many years, taken an evolving and developing character such that, for example, research in quality, safety and environmental management has transformed into integrated management systems (IMS). Likewise, research into the procurement processes has made synergistic links between buildability {constructability} and particular forms of procurement such as design and build tendering and management. Small building works, reflected in a number of the presented publications, has developed strong links between procurement approach and systems management of project site activities. The evolution of these sub-themes is important as it reflects the contribution of the research and dissemination to moving both the sub-themes forward and, in the wider context, the field of construction management systems and procedures.

Categories of Publications and Dissemination Routes

The publications presented in this submission come within the following categories:

1. Books and research monographs
2. Refereed journal papers
3. Refereed 'award winning' papers
4. Refereed conference papers
5. Refereed / Edited journal articles

There has been a conscious commitment since a first paper published in the early 1980s to author publications of the highest quality and standing within the academic and construction industry communities. Moreover, commitment has been given to ensure that publications reflect sound and recognised research underpinnings.

To facilitate this, papers have been directed towards the premier refereed journals, both in the UK and overseas, and high-order refereed conference papers whilst academic and research-based textbooks have been directed towards commercial publishers of very high standing. Commensurate with this specific aim, particular journal titles appear prominently: *Construction Management and Economics; Engineering, Construction and Architectural Management; Construction Papers (CIOB); The Australian Institute of Building (AIB) Papers;* and *The International Journal of Construction Management* whilst specific book publishers are: Macmillan; Thomas Telford in association with EPSRC; Palgrave; and Longman in association with The Chartered Institute of Building.

Such publications have delivered effective routes of dissemination and the communication of research findings to fellow researchers and academics, industry practitioners and both undergraduate and postgraduate students in construction management and, more widely, across the spectrum of built

environment. Moreover the geographical dispersion of publications has allowed research dissemination to researchers, academics, practitioners and students worldwide.

The Published Works

Introduction

The publications are presented in the five categories previously identified. Each category comments on the nature and significance of the publications contained therein within the field of construction management knowledge and its application. Moreover, evidence of how the research and scholarship underpinning the publications has contributed to and influenced the development of knowledge, thinking and practice in the subject is discussed. This is achieved by highlighting how the works have been used by the construction professions and within the construction industry, and how educational establishments, both national and international, have used the knowledge and material in the development and delivery of their academic courses and associated activities.

1. Books and Research Monographs:

Nine academic textbooks are presented, four published by Macmillan, one by Palgrave, one by Thomas Telford in association with EPSRC and three published by Longman, the latter commissioned by and in association with The Chartered Institute of Building (CIOB) as part of the CIOB 'Education Framework' for Construction.

Quality Assurance in Building (1990) and *Environmental Management in Construction* (1994) were at the forefront of their respective fields at the time of publication and led the way for a multitude of academic and industry publications based on and around quality and environmental standards and

management systems implementation. *Quality Assurance in Building* was, in the early part of the 1990s, adopted extensively as core and additional reading on many construction-related courses. It was used as the module text for The Hong Kong Housing Authority's development training in quality management conducted at Heriot-Watt University in 1991 and 1992. Likewise *Environmental Management in Construction* was used extensively by academic institutions as core and additional reading. In particular, it formed the base material for new environmental-related modules to BSc programmes at Sheffield Hallam University, University of the West of England, North-East Surrey College of Technology (NESCOT) and Dundee College of Technology.

Small Building Works Management (1992) and *Constructability in Building and Engineering Projects* (1995), co-authored with Professor Anthony Sidwell, Director of the Construction Industry Institute, Australia (CIIA), followed. These focused on the better understanding of their respective concepts, principles, procedures and practice. *Small Building Works Management* led the way to securing the DoE/SERC 'LINK' Programme in Construction Maintenance and Refurbishment research project. The book was adopted widely in the 1990s by public sector local authorities in Glasgow, Edinburgh and Middlesbrough as a systems guide to procurement and management.

Constructability was recognised at the time as leading-edge in the field and having significant international relevance. The book emanated from a series of SERC SPP in Construction Management research projects between 1982 and 1986. This research also enabled the publication of a considerable number of refereed conference papers through CIB at major international symposia. The research work in the field of buildability/constructability has been referenced by other authors continually over the last two decades. It was referenced in the prominent research-based publication *The Constructability Manual* (CII, 1996), most recently in *A Model for Buildability Assessment in Hong Kong* (HKPU, 2006), and was included in a review of

buildability in the popular academic textbook *Construction Management: New Directions* (McGeorge and Palmer, 1997). The SERC funded research projects contributed significantly to the better understanding of the concepts and principles of buildability and played an important part in shaping subsequent thinking and applications. Although the concepts and principles of buildability/constructability have not been applied traditionally within the UK construction industry, successful implementation in the USA and, in particular in Australia through the research by Sidwell at the CIIA (CII, 1996) has followed leading to excellent case-studies of successful applications within the construction industry.

The Procurement and Management of Small Works and Minor Maintenance: The Principal Considerations for Client Organisations (1997), co-authored with Jeremy Headley of the John Lewis Partnership, capitalised on the earlier book *Small Building Works Management* to provide a concise 'client guide' to small works procurement systems and management procedures. This book, a listed text within the CIOB 'Education Framework', was popularly applied by a number of public sector local authorities and large private sector client organisations who procure small works, prominent examples being the John Lewis Partnership and British Telecom (BT), the latter being a collaborator on the research project. The work was based wholly on the findings from the major research project conducted within the DoE/SERC 'LINK' Programme in Construction Maintenance and Refurbishment undertaken between 1991 and 1994. The book informed the development of new modules within the MSc Degree Maintenance Management Programme at Heriot-Watt University and the BSc Building Surveying Programme at Sheffield Hallam University.

Management Systems for Construction (2000), co-authored with Paul Stephenson and Paul Watson, and *Construction Health and Safety Management* (2001), co-authored with Timothy Howarth, were commissioned and published by the CIOB as core-reading textbooks for a number of modules within the CIOB 'Education Framework'. They focus on the corporate and project organisations of large principal contracting companies

when embracing the evolving and increasingly stringent requirements of current legislation. The principal theme throughout the two books is the systems management of specific construction management concepts such as quality, environment, and health and safety, together with their application within large contracting organisations.

Due to its topical nature *Construction Health and Safety Management* has been popular among industry organisations and was used as a dedicated module for a Sheffield Hallam University in-company MSc award-bearing executive training programme for Henry Boot Plc. It was also used by the private sector training organisation 'Professional Construction Skills' (PCS) in their accredited project management provision for the Association of Project Management (APM) and in their CPD health and safety training programme for Crown House.

Management Systems for Construction has proved popular within construction organisations internationally. It has been published by Longman, as a Russian language edition (2006, ISBN 5-9693-0053-5) and has also been translated into a Chinese language edition for overseas industry and academic markets (2006, ISBN 7-5624-3622-3).

Extending the knowledge base developed in *Management Systems for Construction*, specific aspects were further examined in *Construction Management: Principles and Practice* (2004), co-authored with Paul Watson. This is a substantial work focusing on the practical procedures for managing the construction process by principal contracting organisations. This text is used extensively by the Association of Building Engineers (ABE) accredited collaborative BSc degree programme as a core module text. It is also a module text for Sheffield Hallam University's BSc (Hons) Building Construction Management Programme run in collaboration with Tunku Abdul Rahman College (TARC), Malaysia.

These books incorporate chapters examining management systems and procedures for project quality, safety, and environment together with integrated management systems. In addition, material has been based upon research conducted within a series of HEFCE funded studentships undertaken between 1998 and 2004.

Endorsed by the Engineering and Physical Sciences Research Council (EPSRC) and published by Thomas Telford, *Best Practice Tendering for Design and Build Projects* (2003), co-authored with Andrew Knight and Andrew King, resulted directly from the major EPSRC funded research project conducted between 2000 and 2002 and a HEFCE RAE funded research studentship between 2002 and 2003. These extended the knowledge base of thinking in design-build procurement systems and presented meaningful and workable guidelines for client organisations commissioning construction work using the continuum of design and build procurement variants. The book has augmented working procedures for procurement management in the private sector within Bluestone Plc and the British Airports Authority (BAA), and in the public sector by local authorities including Rotherham Metropolitan Borough Council and South Kesteven District Council. Bluestone Plc, a collaborator in the EPSRC research project, is currently evolving their tendering procedures for application throughout the project supply-chain and this will form the basis for further collaborative research.

Of the two research monographs presented, the most significant is *Buildability: The Effect of Design and Management on Construction* (1985). This was acknowledged as the first commissioned SERC research dissemination publication from the SPP in Construction Management. This publication formed the basis for a series of national research-based lectures and represented part of the dissemination programme of the SPP aimed explicitly at communicating SERC funded research to the research community and construction industry. Together with the subsequent textbook *Constructability in Building and Engineering Projects* (1995) mentioned previously, this publication, resulting from a series of SERC funded research

projects undertaken between 1982 and 1986, was at the forefront of thinking in the subject and led the way for much subsequent research and industry-based developments in the subject field.

Environmental Management Systems: An Outline Guide for Construction Industry Organisations resulted from a Hong Kong Research Grants Committee (RGC) funded research project undertaken at The Hong Kong Polytechnic University. In association with the Construction Industry Training Association (CITA), its aim was to provide an informative and useable guide for Hong Kong construction firms when considering environmental aspects. This project stimulated ongoing research into environmental management systems and helped support a HEFCE funded part time studentship between 1998 and 2002. This provided the basis for considerable research and a series of refereed journal papers described in the following section of the submission.

2. Refereed Journal Papers:

The papers presented have been published predominantly in premier and high order refereed journals within the field of construction management. Papers were grouped into sub-themes and submitted in sequences of published works as the research evolved. For example, refereed papers developing 'small works' concepts, principles and practice, based on the DoE/SERC 'LINK' research project, and evolving over a ten year period, have been published as a series in the distinguished journal *Construction Management and Economics*.

Within the sub-theme of management systems (quality, environment, health and safety, and integrated systems), which features extensively throughout the presented works in this submission, sequences of papers have been published in *Engineering, Construction and Architectural Management,* the

Australian Institute of Building (AIB) Papers and *The International Journal of Construction Management,* all distinguished journals.

HEFCE funded research at the forefront of the development and implementation of integrated management systems (IMS) has been conducted in recent years and led to the significant number of refereed journal papers. It has also featured in the textbooks *Management Systems for Construction,* and *Construction Management: Principles and Practice.* Research contained in the presented papers has been applied in collaboration with a major UK contracting company based in South Yorkshire, AMCO Plc. This has involved the successful integration of their quality and environmental management systems through developed and applied management procedures to its organisation at corporate level and at production site level. Research is extending to integrate health and safety procedures into the integrated management system.

Extending the understanding of IMS within the construction industry more widely, a recent completed HEFCE funded PhD programme examined *The Application of Integrated Management Systems (IMS) by Contracting Organisations* (Bhutto, 2004). This work was used directly to inform a collaborative research project between Northumbria University and ROK Construction addressing IMS application. The student involved in the PhD research at Sheffield Hallam University has progressed to work on developing integrated management systems as part of a Knowledge Transfer Partnership (KTP) project involving the University of Birmingham and the engineering company MLM Consulting Engineers based in Ipswich. The focus of their work is to provide knowledge and assistance to companies for applications of single, dual and triple certificated quality, health and safety and environmental systems and much of the HEFCE funded research in IMS has formed a basis for these activities.

The aspect of environmental management, with particular reference to the environmental management of demolition works, is reflected in a prominent

series of papers published by The Chartered Institute of Building (CIOB) in *Construction Papers.* These have been accompanied by invited papers extending environmental management and integrated management systems into the area of sustainability. These papers were published by *The International Journal of Environmental Technology and Management* in a special volume and by The Chartered Institute of Building as an invited contribution to their 1999 *Millennium Project Compendium - Sustainable Construction: Building for a Sustainable Future.* The CIOB series of papers have contributed to in-house environmental awareness training within Henry Boot Plc and Totty Construction.

These refereed journal papers and the research underpinning them have contributed not only to extending the boundaries of research within their specific sub-fields of construction management but shared research findings with peer academics worldwide through effective dissemination. In addition, they have served to bring applied research to the attention of the professions and industry practitioners. Through the use of the publications in higher education, company training and industry applications the research has contributed significantly to thinking and practice within academia and construction.

3. Refereed 'Award Winning' Papers:

Among the collection of refereed journal papers are a number of award winning submissions. These have been honoured by The Chartered Institute of Building (CIOB) 'Ian Murray Leslie' Award for their outstanding contribution to knowledge and communication of research within the construction industry. These papers focus on the sub-themes of quality management systems and the influence of the design-build procurement system upon buildability. Two further applied research papers, the first focusing on construction health and safety management, merited the CIOB, Hong Kong, 'Building Award' (CIOB, HK, 1994) whilst *Enhancing Design-Build Tendering Procedures through Research*

Collaboration and Dissemination was awarded the premier CIOB 2003-2004 'Innovation and Research Award' and 'CIOB Medal' (CIOB, 2004).

The aforementioned papers are pleasing not only for their recognition within the wider construction industry through the awards received from professional institutions but because they have been widely received by researchers, academics, students and construction industry practitioners alike. They have made a significant contribution to the international body of knowledge of construction management practice not only through the research itself but by its effective dissemination and communication.

4. Refereed Conference Papers:

The early refereed conference papers presented are single authorship and were an intrinsic and important part of evolving research activity and dissemination together with early career development. These embrace a range of construction management aspects including early SERC funded research work in buildability and its associated productivity studies and HEFCE funded research into quality management systems. In pursuing research dissemination routes of high standing the papers reflect publication at premier international conferences, predominantly symposia of the *International Council for Research and Innovation in Building and Construction (CIB)*.

Later works, of dual and multiple authorships, reflect the direct supervision of and encouragement to the funded projects of research assistants and PhD students. These embrace topics associated with procurement systems such as design-build novation and integrated management systems for quality, safety and environment. These publications resulted from EPSRC-grant funded projects, HEFCE 'RAE' funded projects and study scholarships to individuals from overseas academic institutions. Refereed papers were submissions to the Association of Researchers in Construction Management

(ARCOM) annual conferences and the Royal Institution of Chartered Surveyors (RICS) Construction and Building Research Conferences (COBRA). These are recognised as a sound and effective springboard for encouraging younger and developing researchers to publish research findings within a conducive and unthreatening academic-research environment. A number of successful research studentships in these topics have led to recent PhD awards to UK and overseas candidates (Chileshe, 2004; Bhutto, 2004, Hassan, 2005).

These peer-reviewed conference papers have served to add to the weight of knowledge in their particular sub-fields of construction management. In specific themes such as buildability, design-build procurement and integrated management systems for quality, safety and environment, the publications and the research underpinning them has had an influence on thinking and practice. When combined with the body of knowledge of the refereed journal papers and textbooks presented in this submission the conference papers have contributed to expanding the understanding of concepts, theories and principles and extending the boundaries of research. Moreover, they have laid foundations for other researchers to build on.

5. Refereed / Edited Journal Articles:

The *Shui On Construction Review* has been an established annual publication within the Hong Kong construction industry. Whilst reviewing the past and forecasting future commercial markets within Hong Kong it also examines topics of major interest and concern. The 1994 edition invited a specialist contribution to the Review's Focus on the Environment and was commissioned whilst working at The Hong Kong Polytechnic University during 1994-95. This edited article is included because it subsequently led to several research projects funded by the Hong Kong Research Grants Committee (RGC) and provided material for a number of refereed journal papers and the academic textbook *Environmental Management in Construction.* The Shui On Review paper was also used as the basis of a

series of CPD presentations at The Construction Industry Training Association (CITA), Hong Kong, on environmental awareness for construction companies in Hong Kong. The research reflected in the Review continues to be referenced regularly and some of the environmental management concepts and principles developed were referred to in the recent HKPU publication *Key Issues of Sustainable Performance for Construction Projects* (HKPU, 2006).

Summary

The applied research and scholarship described in this submission has established a highly significant, authoritative and valuable contribution to the understanding of construction management systems and procedures within relevant research communities, academia, higher education and the construction industry. They have served to move forward the boundaries of awareness and understanding both within the specified sub-themes and the wider field of construction management knowledge and practice.

Research in quality, safety and, in particular, environmental management has been prominent and evolved into significant advancements in the knowledge and application of integrated management systems. Likewise, research of design-build procurement systems, and small building works management has extended knowledge boundaries and practices and been acclaimed by industry and the professions whilst earlier research of buildability and constructability concepts continues to be recognised internationally.

The published academic and research-based textbooks have made a most substantial contribution to the understanding of construction management systems and procedures by undergraduate, postgraduate and vocational students, researchers, academics and industry practitioners. They have been actively used by the professions, construction industry organisations, and by educational establishments in developing material for academic provision. There is good evidence that these publications and the applied research

underpinning them have influenced thinking and practice in the subject of construction management. Furthermore, the many papers, published in leading international research and professional journals and conference proceedings, reflects the high level of recognition received from academic peers and from industry professionals both within the UK and worldwide. This is further exemplified by notable awards for research and dissemination received from the foremost professional body for construction management in the UK construction industry - The Chartered Institute of Building.

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Glossary

ABE – The Association of Building Engineers

AIB – The Australian Institute of Building

ARCOM – The Association of Researchers in Construction Management

CIB – The International Council for Research and Innovation in Building and Construction

CIIA - The Construction Industry Institute, Australia

CIOB – The Chartered Institute of Building

CITB – The Construction Industry Training Association, Hong Kong

COBRA - The Royal Institution of Chartered Surveyors (RICS) Construction and Building Research Conferences

CRIOCM – The Chinese Research Institute of Construction Management

DoE – Department of Environment (former title)

EMS – Environmental Management System

EPSRC – Engineering and Physical Sciences Research Council

HEFCE – The Higher Education Funding Council for England

H&SMS – Health and Safety Management System

IJCM - The International Journal of Construction Management

IMS – Integrated Management System

ODA – The Overseas Development Agency

QAA – Quality Assurance Agency

QMS – Quality Management System

RICS – The Royal Institution of Chartered Surveyors

SERC – The Science and Engineering Research Council (former title)

SPP – Specially Promoted Programme

Contents

LIST OF PUBLICATIONS

This list is presented in reverse chronological date order in each category of publication and numbered throughout.

1. Books and Research Monographs

1 **Griffith, A.** and Watson, P. (2004). *Construction Management: Principles and Practice.* Palgrave-Macmillan. ISBN 0-333-96878-6, 508 pg.

2 **Griffith, A.,** Knight, A.D. and King, A. (2003). *Best Practice Tendering for Design and Build Projects.* Thomas Telford. ISBN 0-7277-3218-8, 164 pg.

3 **Griffith, A.** and Howarth, T.A.P. (2001). *Construction Health and Safety Management.* Longman. ISBN 0-582-41442-3, 274pg.

4 **Griffith, A.,** Stephenson, P. and Watson, P. (2000) *Management Systems for Construction.* Longman. ISBN 0-582-32917-7, 353pg

5 Headley, J.D. and **Griffith, A.,** (1997). *The Procurement and Management of Small Works and Minor Maintenance: The Principal Considerations for Client Organisations.* Longman. ISBN 0-582-28873-8, 75pg.

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