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3RD INTERNATIONAL CONFERENCE

REVALUING CONSTRUCTION 2007

CROSSING BOUNDARIES

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Revaluing Construction 2007 - Crossing Boundaries

Third International Revaluing Construction Conference

Kim Haugbølle
Roger Courtney
Karina Sandfeld Jensen

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Preface

Dear delegate

The building and construction sector is facing great challenges. Customers are becoming ever more demanding, globalisation leads to ever increasing competition, and building and construction are becoming more and more complex, both technically and in terms of the processes involved. How will the building and construction sector deal with these challenges?

Nearly 50 international executives and experts will answer a range of questions at the third international conference *Revaluing Construction 2007 - Crossing Boundaries*.

The conference provides a forum for exchange of ideas and experience from all over the world, both from the business sector and the research community. We hope you will be enlightened and inspired at the conference!

We do not hesitate to claim that this will be *one of the most important conferences of the year in the international building and construction sector*.

Therefore, we are very happy to welcome you in Copenhagen and Malmö on 8-10 October 2007.

We would like to take the opportunity to thank all of the speakers, chairmen and panellists who will do their utmost to make the conference a success for you. We also like to thank the sponsors of the conference. Without their support it would not have been possible to gather such an impressive range of expertise from all around the world.

Yours sincerely

Lone Møller Sørensen
Managing Director
Danish Building Research Institute, Aalborg University

Sven Landelius
Chairman
Swedish Association of Construction Clients

Knud Erik Busk
Chairman
Danish Association of Construction Clients

Bengt Hansson
Professor
Lund University

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Introduction

Construction is facing great challenges

Clients have rising expectations; globalisation brings new pressures but also new opportunities; buildings become more complex. How can the industry rise to these challenges? How can it become more efficient and productive, more attuned to customer expectations and more able to take advantage of new technological and business opportunities? In short, how can it create more value for all stakeholders? These are the issues that Revaluing Construction 2007 – Crossing Boundaries will address.

Why ‘Crossing Boundaries’?

Because satisfying future client and social needs and maximising value for all stakeholders will require construction to innovate in its organisational structures and its products and to use resources wherever they may be found. Traditional boundaries - within project organisations, between product functions and imposed by geography – are breaking down. Revaluing Construction 2007 will look at the implications for construction and will even question whether ‘construction’ as we know it will continue into the future.

Revaluing Construction 2007 – Crossing Boundaries will bring the experience and understanding of nearly fifty international speakers, mostly from business but also from government and research bodies, to bear on the issues of change and performance improvement in construction. Its aim is to help everyone who attends to understand the changes that are happening internationally, so that they are better able to lead and guide their firms or other organisations in the future. It will enable everyone to learn from the experience and the insights of their colleagues in the industry who are facing similar challenges.

The conference themes

The conference will have parallel sessions centred on the following themes:

- Crossing geographical boundaries: how construction firms operate in and learn from other countries.
- Crossing organisational boundaries: overcoming traditional divisions to enhance project performance.
- Crossing product boundaries: how new technological developments and changing client requirements are transforming the nature of construction operations and output.

These will be complemented by plenary sessions in which prominent speakers from the industry, and expert observers, will discuss the conference themes and look to the future.

There will be ample time for informal discussion and networking, and the development of new contacts will be promoted through different mechanisms.

Previous Revaluing Construction conferences

The first Revaluing Construction conference took place in Manchester, UK in February 2003. It was the first conference to bring together leaders of construction reform programmes from around the world. The conference attracted some 125 people and was organised by the University of Manchester Institute of Science and Technology (UMIST). Under the title "Revaluing

Construction – the International Agenda" it focused on three interrelated themes:

- Change through construction reform programmes.
- The restructuring of business and project processes.
- The concept of value.

The second Revaluing Construction conference took place in Rotterdam, the Netherlands in March 2005. The conference attracted some 225 people from 19 countries. It was organised by the Foundation for Building Research (SBR) with financial support from PSIBouw - the Dutch construction reform programme initiated by government and the industry. Under the title "Revaluing Construction 2005 – the Challenge for Change in Construction" it dealt with issues of change in the industry:

- Radical change is on the agenda. But how can it be achieved?
- How can a traditional industry like construction be transformed to an efficient, technologically advanced and valued contributor to a modern economy?
- How does one achieve lasting change in an industry with so many small enterprises and specialist groups?

These conferences as well as Revaluing Construction 2007 - Crossing Boundaries form part of the broader revaluing construction initiative by CIB which supports initiatives for change and improvement in construction.

Biographies

A

Almstead, Karl

Vice President, Turner Construction, USA

As Vice President of Preconstruction and Estimating, Mr Almstead focuses on project development, risk management and the application of technology during crucial phases of the construction process. Additionally, Mr Almstead is responsible for preparing the Turner Construction Company's *Building Cost Index* and frequently speaks to industry organisations on construction costs and cost escalation. He is a member of Turner Construction's Information Steering Committee and Hochtief's Corporate Research and Development Committee and has served as a Board Member for construction project management software leader, Meridian Systems Inc. Previously, he served as the General Manager of Turner's Philadelphia business unit and has held a variety of engineering, operations and management positions during his 37-year career in the construction industry.

B

Bakens, Wim

Secretary General, CIB, The Netherlands

Wim Bakens graduated in 1975 as Architectural Engineer from the University of Technology in Eindhoven, The Netherlands, where in 1992 he successfully completed his PhD study with a dissertation on 'The future of construction'. He joined the Dutch Ministry for Housing, Construction and Physical Planning, where he was responsible for building and construction-related research and regulatory systems. After around seven years, he became first a senior consultant and later a partner with one of the biggest Dutch management consultancies. In that position, he was responsible for some 11 years for a group of consultants that focused on research and consultancy in the construction industry. During that time, he also was Coordinator of CIB Working Commission W82 - Future Studies in Construction. Since 1994, he has been the Secretary General of CIB - The International Council for Research and Innovation in Building and Construction.

Baldwin, Andrew

Formerly Dean, The Hong Kong Polytechnic University, Hong Kong SAR, PR China

Professor Baldwin is a civil engineer by profession. He worked as an engineer on a number of major civil engineering and infrastructure projects including motorways, off-shore oil platforms and flood defence systems as well as building works. He then moved to academia and before moving to Hong Kong in 2003 he was Head of Department of Civil and Building Engineering at Loughborough University, United Kingdom. In industry and in terms of academic research, the dominant focus of his career has been construction and project management including business processes, decision analysis, design management, and management information systems. He has now re-

turned to Loughborough as Professor of Construction Management. Professor Baldwin has been a Board Member of CIB.

Bang, Henrik L

Head of Secretariat, Danish Association of Construction Clients, Denmark

Henrik L Bang has been heading the secretariat of the Danish Association of Construction Clients since 2002. Previously he worked as senior research fellow at the Danish Building Research Institute, as research fellow at Copenhagen Business School and as market analyst at European Construction Research. He was educated at Copenhagen Business School (PhD), University of Reading (MSc) and the Technical University of Denmark (MSc).

Barlow, James

Professor of Technology and Innovation Management, Imperial College London, United Kingdom

Professor Barlow is a Director of the newly established Health and Care Infrastructure Research and Innovation Centre within the Tanaka Business School at Imperial College London. His work focuses on the adoption and implementation of innovation in complex sectors of the economy, especially the construction, housing and healthcare sectors. He leads a research team currently working largely on questions relating to ICT and built infrastructure in health services. His previous research on construction and housing includes a major study of mass customisation in housebuilding, and the first in-depth exploration of the management processes involved in partnering in the UK construction industry.

Barrett, Peter

CIB President & Pro-Vice Chancellor, University of Salford, United Kingdom

Professor Barrett is a long-time member and former Director of the University of Salford's 6* (top)-rated Research Institute for the Built and Human Environment. He is also Chairman of the university's Salford Centre for Research and Innovation, a £5M programme of research funded by the UK Engineering and Physical Sciences Research Council. After becoming the first Chartered Building Surveyor to gain a PhD, he established the postgraduate programme of research at Salford which now supports around 160 research students. He has led numerous construction management research projects over the last 15 years and has published over 160 single volume reports and refereed papers. Professor Barrett has been active in CIB for many years, particularly as Coordinator of Working Commission W65 (Organisation and Management of Construction) for which he received the "CIB Best Coordinator Award 2001-2004". He was Chair of the CIB Programme Committee in 2004-7 and became President of the CIB in May 2007. He is champion for the CIB proactive theme of Revaluing Construction, an important element of which is "Awareness of the Systemic Contribution" of the built environment.

Blakstad, Siri Hunnes

Professor, Norwegian University of Science and Technology, Norway

Siri Hunnes Blakstad teaches and conducts research and development projects at the Centre for Real Estate and Facilities Management in the university. She holds a PhD in adaptability and office design, and was formerly Research Director at SINTEF. Her research is focused on how buildings can be adapted to accommodate new requirements consequent on changing user organisations, and how such changes in requirements can be handled during the planning and design of new buildings. Her current research aims at using knowledge from both organisational development and workplace

design to gain new insight into how organisational and individual performance is affected by design and by changes in the physical environment.

Blight, Ian

Project Director, Halcrow, United Kingdom

Ian Blight has over 25 years' experience of project management and ground engineering in the UK and overseas. He has worked on the Channel Tunnel Rail Link Project (CTRL) intermittently since 1991, helping to take the project from initial route selection, ground and contamination investigations, Parliamentary approval, preliminary and detailed design, tender and award of construction contracts using the New Engineering Contract, through to construction and completion. In 2001/2 he led the multi-disciplinary team responsible for the delivery of design specifications, drawings and planning approvals for the Stratford Box. From 2003 to 2005, he was a member of the CTRL Area 200 (Stratford Box and London Tunnels) Alliance Board, covering four construction contracts with a total value of some £560m, in his role as manager of the field engineering multidisciplinary team.

Bowers, Gerald "Steven"

President, Global Safety Management Consultants, USA

Steve Bowers has more than 28 years of environmental, health and safety management experience in the petrochemical, semiconductor and construction industries and maintains a Certified Safety Professional designation. After ten years leading the world class safety performance of Intel Corporation's global construction safety programme, Steve funnelled his passion for improving global construction safety performance by starting his firm, Global Safety Management Consultants. By focusing on senior management leadership and implementing industry-leading programmes, Steve has enabled construction contractors across the globe to obtain world class safety performance.

Bougrain, Frédéric

Researcher, Centre Scientifique et Technique de Bâtiment, France

Frédéric Bougrain works in the Economics and Human Sciences Department at CSTB, which is a state-owned industrial and commercial research centre responsible to the Ministry of Housing. His research is concentrated on social issues with a particular focus on innovation in the building and construction industry and on public-private partnerships. He previously lectured at the University of Orléans where he defended a thesis on innovation, small and medium-sized enterprises and the consequences for regional technology policy. He has published a number of papers on innovation in small and medium sized enterprises and public-private partnerships.

Brockmann, Christian

Professor of Construction Management, University of Applied Sciences, Bremen, Germany

Christian Brockmann holds degrees in civil engineering, management and economics, and a doctorate from ETH Zurich. He practised for 16 years as a professional in the construction industry, working in Denmark, Germany, Thailand, and the USA, mostly on heavy civil engineering projects including the Benjamin Franklin Hall of Congress, the Potsdamer Platz in Berlin, Dame Point Bridge in the USA, and the Great Belt Tunnel in Denmark. He was project manager for the design and construction of the world's longest bridge, in Thailand. He has held his present position for nine years and is

also a visiting professor at Stanford University and at the Asian Institute of Technology, Bangkok. He has published 40 papers.

C

Chen, Chengde

Chairman, Sino-Infrastructure Partnership, PR China

Prof Chengde Chen is the non-executive Chairman of SIP Group, and has been with the company since its foundation in 1993. He is an honorary professor at Shanghai University, where he taught philosophy of science for ten years before moving to England. As a philosopher pioneering philosophy-poems, he is the author of *Five Themes of Today*, with works appearing in the literary and philosophical journals in the UK, including *The Guardian*, *Acumen*, *Envoi*, *The Philosopher*, and *Philosophy Now*. He has been a visiting professor at Queen's College Oxford and columnist for *Philosophy Today*.

Cheong, Chit-Sun (Jackson)

Vice President, China State Construction Engineering (Hong Kong) Ltd, Hong Kong SAR, PR China

Cheong Chit-Sun has more than 30 years experience in heavy civil construction and the construction of buildings - in Hong Kong, China and other locations. He also has international business development experience, for example, setting up an equity joint venture company in Beijing. Mr Cheong joined China State Engineering (Hong Kong) Ltd in 1999 and is now in charge of overseas business development, notably in India, South East Asia, the Middle East and China, as well as commercial matters of the company. He is currently developing the company's overseas project and procurement management systems as well as undertaking research at Hong Kong Polytechnic University. Mr Cheong holds an MBA from Hull University and is a Member of the Institution of Civil Engineers in the UK and of the Hong Kong Institution of Engineers.

Connaughton, John

Director, Davis Langdon Consultancy, United Kingdom

John Connaughton has over 27 years experience in the construction industry, 22 of which have been spent in management and related consultancy. He leads Davis Langdon's Management Consulting services, and has a particular interest in sustainability, innovation in construction and in improving the procurement process. He has undertaken research and consultancy for a wide range of clients including the European Commission and UK public bodies: Department of Trade and Industry, HM Treasury, the Ministry of Defence and many others. Dr Connaughton has authored a range of reports and guidance for both clients and consultants. He writes and lectures widely in the areas of construction management and procurement, client demand, sustainability and international construction. He was a founder member of the UK Board of the Movement for Innovation (M4I), and was an independent Board member of the Genesis Housing Group from 1999 to 2004.

Courtney, Roger

Professorial Fellow in Construction Innovation, University of Manchester, United Kingdom

Roger Courtney holds degrees in physics and operational research. He joined the Building Research Station in 1969 and conducted research into

building services and energy use. From 1976, he spent ten years contributing to government policy, including six years at the Cabinet Office. Returning to the Building Research Establishment in 1986 as Deputy Director, he became Director in 1988 and Chief Executive in 1990. After BRE moved out of the public sector in 1997, he was Deputy Chairman. He was a Board Member of CIB from 1988 to 1995 and again from 1998 to 2004. Since 1999, he has been a consultant in international construction research and innovation, particularly in the fields of construction performance and reform, and the impact of climate change. He currently holds academic appointments at the University of Manchester and at University College London.

D

Dithmer, Michael

Permanent Secretary, Ministry of Economic and Business Affairs, Denmark

Michael Dithmer is the Permanent Secretary of the Danish Ministry of Economics and Business Affairs. His active participation in several boards and councils include the positions as Vice Chairman of the Committee of Directors of the Danish Central Bank and as Alternate Governor of the European Bank of Reconstruction and Development (EBRD). He holds an MA from the Institute of Economics at the University of Copenhagen.

H

Hansson, Bengt

Professor, Division of Construction Management, Lund University, Sweden

Bengt Hansson is currently the head of the Division of Construction Management, Lund University, Sweden. His main research interest today is project management and procurement of construction works. He has many years of experience in the construction industry as a project manager and an arbitrator. His current focus now is on the teaching and development of educating clients. He is member of the board of the Centre of Real Estate management and the Building Council – the two organisations that support co-operation between the university and construction industry.

Hawkins, William

Policy and Operations Manager - Design Quality, Construction Industry Council, United Kingdom

William Hawkins joined the Construction Industry Council in September 2001 after completing the architecture programme at the University of Liverpool. He has a MSc in Construction Economics and Management from University College London, gained through the CIC Research Associate bursary. Previously, he worked in architectural practice.

van der Horst, Henk

Chief Executive Officer, PSIBouw. The Netherlands

Henk van der Horst graduated in civil engineering at the Technical University of Delft in 1973. He then worked as a project manager at Aronsohn, consulting engineers, Rotterdam. From 1975 until 1978 he was a manager at the Ministry of Transport, Public Works and Water Management, responsible for the design and construction of State Highways in the Netherlands. He then became Chief Executive Officer at the Engineering Division of Public Works for the City of Rotterdam. In 2001, he was appointed Managing Director at

Ballast Nedam, a major construction company in the Netherlands, before moving in 2006 to become CEO of PSIBouw, the Dutch programme for process and system innovation in the construction sector.

Huovila, Pekka

Chief Research Scientist, VTT – Technical Research Centre of Finland, Finland

Pekka Huovila has been active in international research on decision support tools for performance based building in the sustainable knowledge society. He joined VTT in 1988; prior to that he was Scientific Attaché in the Finnish Embassy in Paris and held positions in building design and construction in Finland and in Africa. He has contributed to 15 EC-funded research projects and has been a Visiting Professor at the University of Salford since 2003. He was Co-coordinator of CIB Working Commission W082 (Future Studies in Construction) from 2002 to 2006.

I

Ingvaldsen, Thorbjørn

Senior Researcher, SINTEF, Norway

Thorbjørn Ingvaldsen graduated from the Technical University of Norway in 1968. He worked for 12 years as project manager in the leading Norwegian contracting company Ing F Selmer AS (now Skanska Norway AS) - and for seven years as project director in a major real estate company. He then joined the Norwegian Building Research Institute (Byggforsk) which has now become part of SINTEF. In his 15 years at SINTEF/Byggforsk, his research has been within the field of construction processes, mainly with reference to ISO 9000 Quality Systems. He is an EOQ Quality Auditor. Prior to 2001 when he turned his attention to the challenge of productivity measurement, he spent much time on the development of methods for measuring building defects, as well as practical training of project managers in the industry.

K

Khoza, Ronnie

Chief Executive Officer, Construction Industry Development Board, South Africa

Ronnie Khoza started as a revenue clerk and teacher at a local high school, then proceeded to higher education, completing a National Diploma in Chemical Engineering and a degree in Chemistry and Applied Chemistry. He was employed as laboratory analyst for Unilever. He moved on to join African Products, a division of the Tongaat-Hullet group, as Production Manager, and then was a confectionery factory manager. He transferred to the built environment sector as Director and Business Development Manager for Ninham Shand Consulting Engineers, becoming a Board member. After completing a Masters in Business Leadership (MBL), he started his own management consultancy specialising in institutional oversight, strategy development, marketing and business development, research and procurement. He started working for CIDB as a consultant, then in 2006 joined the Board as Programme Manager for Procurement and Delivery Management and in February 2007 was appointed CEO.

Kragh, Mikkel

Associate, Arup, London, United Kingdom

In 1998, after being awarded his PhD in Building Physics from the Technical University of Denmark, Mikkel Kragh joined the R&D + Engineering Department of the Permasteelisa Group (customised curtain walling) in Italy. Since 2002, he has been with Ove Arup & Partners in London, first with Arup Façade Engineering and currently with the Environmental Physics team in Arup's Buildings Group. He currently manages the Integrated Building Envelope, a development project, which is supported by Building Lab DK and the Realdania Foundation. With his background in research and specialist contracting, Mikkel Kragh's main interest is the design-focussed application of building physics and holistic design approaches to architectural projects. He is Vice Chairman of the Society of Façade Engineering and a Board Member of the UK Chapter of IBPSA (International Building Performance Simulation Association).

Kummert, Christian

Managing Director, Infrastructure Finance Unit, DEPFA BANK plc, Ireland

Christian Kummert joined DEPFA in July 1999 with primary responsibility for arranging and financing European infrastructure projects. Prior to joining DEPFA, Christian worked for ABB Structured Finance, where he was in charge of project finance transactions in power and air transport. Before then, he worked as a consultant for the economic department of Lahmeyer International, involved in areas such as energy, telecoms and real estate development. He also gained significant experience in the international electricity markets from his former post as Deputy Head of the tariff section of the German Association of Electricity Utilities (VDEW).

L

Landelius, Sven

Chairman, Swedish Construction Clients Forum, Sweden

Trained as an engineer, Sven Landelius has developed an extensive experience and knowledge of construction and real estate through his many years as consultant and as manager of real estate businesses. He has previously been the CEO of the Öresund Link and chairman of the FIA development programme for civil engineering. Sven Landelius is a member or chairman of several boards.

Larsen, Jacob Norvig

Senior Researcher, Danish Building Research Institute – Aalborg University, Denmark

Jacob Norvig Larsen holds a PhD in business economics and a MSc in economic geography and sociology. He specialises in the study of innovation, knowledge production, technological development and organisational change in construction, consulting engineering and professional service industries. His expertise also includes urban and regional studies. Currently his work focuses on partnering in the construction industry and in urban management.

Løe, Haakon

Director, Buildings, Ramboll, Denmark

In his role at Ramboll Denmark, Haakon Løe is responsible for more than 220 specialists in the largest planning and design environment for buildings under one roof in Northern Europe. His division operated in the Danish capi-

tal and in a broad international context. The Ramboll Group employs more than 6,500 specialists who operate in many countries and regions throughout the world. Mr. Løe seeks to promote an international debate in the area of buildings, culture and creativity through www.buildingseurope.eu.

M

van der Merwe, Jack

Chief Executive Officer, Gautrain Management Agency, South Africa

Jack van der Merwe, Fellow of the South African Academy of Engineers, graduated in civil engineering from the University of Pretoria and is also a graduate of Harvard Business School's SED programme. Before 2004 he was the Chief Executive of the Gauteng Department of Public Transport, Roads and Works. This included being project leader for the Gautrain Rapid Rail Link, one of 11 key long-term economic development projects of the Province. In April 2004, he was redeployed to head a newly established Public-Private-Partnership Department in the Province. He is implementing the Gautrain and the GPG Government Precinct. In 1998, he received the Chairman's Award for Meritorious Service to the Transportation Profession from the Engineering Division of the South African Institution of Civil Engineering. In 2003, he was elected Vice President for Africa of UITP (a World-wide association of urban and regional passenger transport operators, authorities and suppliers).

Moavenzadeh, Fred

Fred Moavenzadeh, James Mason Crafts Professor & Director, Massachusetts Institute of Technology, USA

Fred Moavenzadeh was the founding director of the Center for Construction Research and Education at MIT. During his directorship the centre offered an academic program on construction management at the graduate level. Over the past 30 years, he has directed a series of research programs and has served as consultant to major construction firms on international construction finance; merger and acquisition in the construction industry; and strategic planning, construction technology, and building materials. He served as the Editor-in-Chief of "Construction Business Review", a journal for construction executives. He is the author and co-author of five books and more than two hundred professional articles. He has served in advisory capacity and consultant to several institutional agencies including the World Bank, UNIDO and UNCHP. He is a specialist adviser to the Engineering and Construction Section of the World Economic Forum.

Mosey, David

Partner and Head of Projects and Construction, Trowers & Hamblins, United Kingdom

David Mosey has over 25 years experience providing legal advice to clients, contractors, consultants and project teams across a range of building and infrastructure projects including residential, office, hotel and hospital projects in the Arabian Gulf. He specialises in UK and international construction and engineering law with particular expertise in procurement strategies, risk analysis, standard and bespoke contracts and professional appointments. He is author of the widely used PPC2000 Project Partnering Contract and co-author of the TPC2005 Term Partnering Contract and was recognised in the construction section of the Chambers Guide (2005) as a "*partnering guru*" who "*gives something to the industry*". His firm, Trowers & Hamblins, won the prestigious 'Law Firm of the Year' Award 2007.

N

Neumann, Markus

Manager, Purchasing Strategy and Cost Management, Volkswagen AG, Germany

Markus Neumann joined Volkswagen Group in 1996 and has since gained a comprehensive knowledge and international business experience in various functions in purchasing and quality assurance within the Group. His current focus is on global purchasing methods, processes and strategic alignment, including benchmarking and the development of purchasing methodologies.

P

Petersen, Lars Holten

Vice President, Carlsberg A/S Properties, Denmark

Lars Holten Petersen graduated in 1975 from the Technical University of Denmark with an MSc in civil and structural engineering. He has worked in planning, engineering and supervision since 1979, and was previously CEO of Carl Bro A/S, Technical Director of Carl Bro Gruppen A/S, and CEO and President of Birch & Krogboe A/S before he joined Carlsberg A/S Properties in 2006. In his present capacity, he is heading the project that is transforming 33 hectares of land in the heart of Copenhagen from a brewery site, into a dense, vibrant and pulsating city centre in a contemporary setting, respecting the history of the area and at the same time reaching for the future.

Q

Quant, Stephen

Human Resources Director, Skanska Rashleigh Weatherfoil Ltd, United Kingdom

Stephen Quant is a specialist in Human Relations who has spent most of his working life in the construction industry, both for private and public sector clients. He is now responsible for HR in Skanska Rashleigh Weatherfoil, a leading mechanical and electrical engineering company within the industry, and is also a Director of Skanska Building. He has introduced an innovative Code of Practice for the Conduct of Industrial Relations at all major Skanska projects. At the national level, he is Chairman of the Construction Industry Joint Council which regulates the terms and conditions for operatives in the construction industry in the UK and the chief negotiator for the Employers' side in the Heating Ventilating and Domestic Engineering Agreement (Construction Mechanical Engineering sector).

R

Riese, Martin

Director, Gehry Technologies Asia, Hong Kong SAR, PR China

Martin Riese is a licensed architect in Canada and the USA and has 20 years experience in professional practice. For two years, he was a senior architect in the office of Santiago Calatrava and for ten years, a project director at London-based Foster and Partners. He was a founding partner of the New York-based architecture and engineering firm Front Inc.

S

Saaby, Tina

Partner, WITRAZ Architects, Denmark

Architect MAA Tina Saaby is educated at the Royal Academy of Art, School of Architecture in Copenhagen. She is a partner in the office WITRAZ Architects, a company working with urban development and social housing. The office aims to create architecture with a human touch. In order to achieve this, it employs a wide range of competences from landscape architects to anthropologists and from visionary architects to materials and construction experts.

Sandesten, Stefan

Chief Executive Officer, the Swedish Construction Clients Forum, Sweden

Stefan Sandesten has a Master of Science from the Royal Institute of Technology (KTH) where he later was assistant professor. He has wide experience of construction, having been research secretary at the Swedish Council for Building Research (BFR), Secretary General of the Swedish Association for Heating and Air Conditioning Engineers, Technical Director at National Board for Public Building (KBS) and Technical Director at Vasakronan AB (Real Estate Company). Currently, Mr Sandesten is an Associate Professor at Luleå Technical University and CEO of the Swedish Construction Clients Forum. He is also a Board Member of BQR, the Swedish Council for Constructing Excellence.

Scheublin, Frits

Director, BAM Engineering, The Netherlands

Professor Scheublin graduated in 1972 from Delft University of Technology as an architect. He worked from 1972 till 1982 for OGEM International contracting in The Netherlands and in the Middle East. His major projects were the design of facilities for King Abdul Aziz University in Jeddah and design management for a high-rise housing project in Dammam, Saudi Arabia. From 1982 until 1993 he was a director and partner in Starke, a construction management firm in the Netherlands. In 1993, he was appointed a Director of HBG Engineering, which became BAM Engineering after a merger. BAM is the largest Dutch contractor. In 1993 also he was appointed Professor of Construction Engineering at Eindhoven University of Technology where his research focuses on sustainability, safety, adaptability and client focus in the construction process. He was member of the Board of CIB from 2000 to 2007 and remains a member of the CIB Programme Committee and Coordinator of Task Group 57: Industrialisation in Construction.

Scuderi, Peter

Chief Operating Officer, Research and Commercialisation, Cooperative Research Centre for Construction Innovation, Australia

Peter Scuderi provides development and commercialisation leadership, and management of the Centre's research projects, to ensure that scientific and commercial outcomes are enhanced and promoted. He is responsible for strategic and operational plans for research activities, and contributes to the development of the Centre through the formation of effective research teams and in the application of research outcomes through its education, training and technology transfer programmes. His career has spanned industry and government both in Australia and internationally and he has earned a reputation for his project management and industry development skills.

Silinga, Mninawe (Pepi)

Chief Executive Officer, Coega Development Corporation, South Africa

Pepi Silinga is a professionally registered Civil Engineer, Project Manager and Chartered Director. He is a member of various professional associations: the South African Institute of Civil Engineers (SAICE), Engineering Council of South Africa (ECSA), Institute of Directors (U.K. and South African Chapters) and the Project Management Institute (PMI) and has been elected a Fellow of South African Academy of Engineers (SAAE). In addition to his professional qualifications, he holds an MBA from Heriot-Watt University and has successfully completed various management and executive development programmes, for example with Unisa (MDP), Stellenbosch (CMP), Oxford and INSEAD (AMP). He has extensive experience in corporate governance responsibilities of Boards having served in various public sector boards in different capacities including being the outgoing Chairman of the Construction Industry Development Board (CIDB).

Skavang, Egil

Chief Executive Officer, The Building Cost Programme, Norway

Egil Skavang has 30 years experience mainly within the construction industry, the energy sector and the oil and gas industry in Norway - from working as carpenter and running a small building company, to project manager in Skanska and Selmer on larger offices and housing projects, and then as senior advisor and manager in the Holte Group providing project management, quality assurance and risk management consultancy to major investment projects in the industry and to the Norwegian Government.

Sørensen, Lone Møller

Director, Danish Building Research Institute – Aalborg University, Denmark

Lone Møller Sørensen became Director of Danish Building Research Institute (SBI) in 2001. She previously held leading positions, with international responsibility for research, development and communications, in Rockwool and Velux. Lone Møller Sørensen is President of the European Network of Building Research Institutes (ENBRI), a Board Member of CIB (International Council for Research and Innovation in Building and Construction), a member of the Coordination group for European Construction Technology Platform (ECTP) and Chair of ECTP Advisory Group 'Clients and Users', a member of 'Vision 2020 for construction' and of the Board of the Swedish research programme 'Competitive Building'. She has wide experience of national and international research programmes and projects, and of policy development.

T

Thomas, Stephen R

Associate Director, Construction Industry Institute, USA

Stephen R Thomas holds a BS degree in engineering from the United States Military Academy, and MSc and PhD degrees in engineering from the University of Texas at Austin, and is a registered professional engineer in California. He has directed the Benchmarking and Metrics Program at CII for nearly ten years and recently assumed wider responsibilities for CII's research programme which covers industry-based engineering and construction research at more than 30 universities throughout the United States and Canada. Dr. Thomas is also research professor in the Department of Civil Engineering at the University of Texas at Austin and teaches in the univer-

sity's Construction Engineering and Project Management Program. Prior to joining CII, Dr. Thomas served in the US Army Corps of Engineers for more than 20 years with assignments throughout Europe, the Middle East, the United States, and Asia.

Tuor, Nancy

Vice Chair, CH2M HILL, USA

Nancy Tuor has had a distinguished 27-year career with CH2M HILL. Currently, Ms Tuor serves as Group Chief Executive for the Federal Client Group, and oversees CH2M HILL's business groups in the federal and international government client sectors, including nuclear, environmental services, and government facilities and operations. The Group has annual revenues of US\$ 2billion. She also holds the position of Vice Chair at CH2M HILL, and is responsible for strategic planning, technology commercialisation, mergers and acquisitions, governmental affairs, and communications. She has also served two terms on CH2M HILL's Board of Directors and currently serves on the Executive Committee of the Board of Directors for the Denver Metro Chamber of Commerce and Co-chairs the Metro Denver Economic Development Corporation. Her most recent project assignment was as President and Chief Executive Officer of Kaiser-Hill Company, which was responsible for the historic Rocky Flats Closure Project, the first large nuclear weapons facility to be cleaned and closed anywhere in the world. Under Nancy's leadership, CH2M HILL successfully saved 60 years and \$30 billion from DOE's 1995 estimates, making CH2M HILL an industry leader in the nuclear decommissioning market.

W

Widén, Kristian

Assistant Professor, Division of Construction Management, Lund University, Sweden

Dr Kristian Widén is currently employed at the Division of Construction Management, Lund University, Sweden, as Assistant Professor. His main research interest is the development of innovation theory for construction and other project-based sectors, innovation diffusion in construction and other project-based sectors and the effect public procurement has and may have on the development of construction.

Williams, Bernard

Consultant, Bernard Williams Associates, United Kingdom

Bernard Williams qualified as a Chartered Quantity Surveyor and re-trained as a Building Economist. He has over 40 years experience of predicting, controlling and benchmarking the costs and value of construction and associated services. The consultancy he founded in 1969 now works with some of the world's largest organisations across a very diverse range of activities and disciplines. He is author of several standard reference works.

van Woudenberg, Wilfred

Chairman, ENCORD Virtual Construction Platform, The Netherlands

Wilfred van Woudenberg is an IT Engineer at the Royal BAM Group. His principal areas of experience are in the field of Virtual Construction; collaborative engineering, collaboration platforms and protocols, estimation, production planning and instant access of data on the building site. BAM is currently deploying the power of 3D data models for different purposes and ex-

ploring ways to cover entire product life cycles, across the extended enterprise. It is also addressing organisational issues. Mr van Woudenberg is active in several national and international networks and in some pre-competitive R&D projects.

Y

Yakubu, Armstrong

Partner, Foster + Partners, United Kingdom

Armstrong Yakubu studied at the Architectural Association in London before joining Foster + Partners in 1987. His initial projects were The Canary Wharf Station of the Jubilee underground line, London, the American Air Museum, Duxford, UK and Century Tower, Tokyo. He moved to Hong Kong in 1992 where he contributed to key airport and Mass Transit projects. He returned to London in March 1999. Since then he has been involved in various projects including the new HSBC Headquarters in London, the Elephant House at Copenhagen Zoo, Aleph (a mixed-use development in Buenos Aires, Argentina) the new World Trade Centre Tower at 200 Greenwich Street, New York, and mixed-use developments in London, Washington, New York, St Moritz, Copenhagen and the Canary Isles. He is currently a partner and Deputy Group Leader, overseeing the day-to-day work of one of six Design Groups in the practice.

Yun, Bai

Chief Engineer, Shanghai Urban Construction Group, PR China

Dr Bai Yun has 24 years experience of civil engineering in China, Singapore, India, Vietnam and other countries. He has worked on a wide range of projects including elevated expressways, tunnels and stations for mass rapid transit rail networks, water treatment facilities, road bridges etc. He has been author or co-author of more than 40 technical papers and has also contributed to more than ten books as an author, co-author or editor. He is deputy editor or a member of the editorial board for four technical magazines (three in China and one international).

Summaries of presentations 9 October 2007

8.30 – 10.30

Welcome and opening

Chair

Wim Bakens, Secretary General, International Council for Research and Innovation in Building and Construction (CIB), The Netherlands

Speakers

Welcome

Lone Møller Sørensen, Director, Danish Building Research Institute - Aalborg University, Denmark

Revaluing Construction – the double challenge of looking inward and outward

Peter Barrett, CIB President and Pro-Vice Chancellor, University of Salford, United Kingdom

Opening the conference

Michael Dithmer, Permanent Secretary, Ministry of Economic and Business Affairs, Denmark

Solutions without boundaries – lessons from the clean-up of the Rocky Flats nuclear facility, and other successful projects

Nancy Tuor, Vice Chair, CH2M Hill, USA

Revaluing Construction – the double challenge of looking inward and outward

Peter Barrett, CIB President and Pro-Vice Chancellor, University of Salford, United Kingdom

Revaluing Construction (RC) is a CIB Proactive Theme that is purposely wider and looser than the well known notion of “re-engineering”. Although there has been a long and interesting history in construction research of “looking in” on the industry to make the processes more efficient, the RC initiative has joined to this the idea of “looking out” in order better to understand the role and contribution of construction within the broader society in which it operates.

Central to this is a broad perspective that includes all elements that lead to the creation and delivery of the built environment (BE) within which people work and play. Thus, there is a shift in viewpoint from ‘the construction industry’ to ‘the BE sector’. This has important policy implications; UK statistics, for example, indicate that construction accounts for about 7% of the national GDP, whereas the BE sector amounts to about 20%. This view now explicitly infuses the UK Construction Technology Platform strategy and greatly adds to the political significance of the sector. It also leads to a much wider range of players being involved in efforts to stimulate research and innovation.

Within the UK, construction is becoming part of a campaign to obtain recognition for sectors that are very significant economically and socially, but which are not concentrated or patently science driven, in contrast for example to pharmaceuticals, biotechnology or the nuclear sectors, where most policy attention is typically invested at present. An illustration of this slow shift in emphasis has been a recent report by the National Endowment for Science, Technology and the Arts (NESTA) that highlights the importance of “hidden innovation” in several sectors, including construction. This report provides a basis for understanding some less obvious aspects of the value produced by construction and questions the general utility of the type of innovation measures currently used.

At the other extreme, it can be seen that the holistic sensory impact of spaces on the individual is a fundamental building block in the consideration of the value derived by users of the built environment. This was debated at a recent multi-disciplinary, international workshop in Salford (reference in the presentation). The initial findings exemplify both the potential for achieving significant human benefits through improved spaces, but also the challenge of addressing the complexity of multidimensional sensory interactions in practicable design solutions.

One way of expressing future directions is through the five ‘Es’. Construction has in general moved past the basic criterion of *efficacy*. However, we clearly need more *efficient* construction processes, but these must be orientated to *effectively* meeting client and user needs. Given the centrality of built environments to economic success and positive human experience there will always be an *ethical* dimension to consider, but ultimately we must strive for built solutions that *elegantly* resolve all of these, often conflicting, aspirations. The RC ‘infinity’ model, introduced in the presentation, is a contribution to how both looking outwards and inwards can be linked to support progress in this direction.

Solutions without boundaries – lessons from the clean-up of the Rocky Flats nuclear facility, and other successful projects

Nancy Tuor, Vice Chair, CH2M HILL, USA

The Rocky Flats Plant was a top-secret, high-security factory that processed and machined plutonium and enriched uranium into detonators for nuclear weapons. The site consisted of more than 700 structures located on a 385 acres (160 ha) industrial area, surrounded by 6,200 acres (2600ha) of controlled open space. Almost 40 years of nuclear weapons production left behind a legacy of highly contaminated facilities, soil, and groundwater, all upwind of approximately 3 million people in Denver, Colorado.

In 2000, DOE and Kaiser-Hill (KH) signed a first-of-its-kind incentive fee contract to complete the safe, accelerated cleanup by December 2006, at a cost of \$3.96 billion. KH's mission was to ship hundreds of thousands of cubic metres of radioactive materials, demolish nuclear and non-nuclear facilities, clean-up contaminated soils and groundwater, preparing the site for transformation into a national wildlife refuge.

Throughout the project, DOE and KH remained committed to meeting or beating the 2006 closure date while ensuring full compliance with safety, health, and environmental regulations. KH utilised a wide variety of project management tools to help accomplish this job. The Rocky Flats team completed the cleanup in October 2005 (14 months ahead of schedule) at a cost of \$3.443 billion (more than \$550 million under cost).

11.00 – 12.30

Crossing organisational boundaries: Value through globalisation – company strategies and operations

Chair

Roger Courtney, Professorial Fellow in Construction Innovation, University of Manchester, United Kingdom

Speakers

Achieving success in China – the experience of a UK construction management company

Chengde Chen, Chairman, Sino Infrastructure Partnership, PR China

Successful expansion of overseas business in India and Dubai – the experience of a Hong Kong contractor

(Jackson) Chit-Sun Cheong, Vice President, China State Construction Engineering (Hong Kong) Ltd, Hong Kong SAR, PR China

The Federation MultiComplex – how does a foreign contractor achieve success in Moscow?

Karl Almstead, Vice President for Pre-construction and Estimating, Turner Construction, USA

Achieving success in China – the experience of a UK construction management company

Chengde Chen, Chairman, Sino Infrastructure Partnership, PR China

SIP is a British construction management company operating in China – helping Western investors build their facilities there. It was founded in 1993 by Geoff Mills, who mobilised a group of UK construction-related companies to tackle the China infrastructure market together. This alliance funded SIP to set up offices in Beijing and Shanghai to seek infrastructure projects. After fourteen years, SIP has become a multi-disciplinary project management company with a turnover exceeding £4 million, some 120 staff (85% local) and three regional offices. SIP has helped hundreds of Western companies build their facilities in China or enter the market, including many world brands. Its Chinese client base is also growing rapidly through hosting ICE (Institution of Civil Engineers) training and development in China. It has recently been chosen as the Western team member in the project management team acting for Shanghai Municipal Government, looking after the international relationships with the 15 countries investing in the “2010 Shanghai Expo” pavilions.

Managing construction projects in China, from planning, designing, construction, to approval, may be considered one of the most complex and challenging businesses, and all the more so for a British company with cultural and language barriers. The core to the success of this venture is its partnership approach. The partnership of a group of UK companies with business synergy going to China together provides efficiency and strength in tackling the foreign investment market. The partnership between a British family and a Chinese family provides the loyalty and stability that are crucial if a foreign business is to surmount changes and hardship. The partnership between SIP and Chinese professional organisations developed through FIDIC and ICE training provides the vigour for the mutual beneficial development. Successful business is about enjoying the difficult art of working together, whether domestically or internationally.

Successful expansion of overseas business in India and Dubai – the experience of a Hong Kong contractor

(Jackson) Chit-Sun Cheong, Vice President, China State Construction Engineering (Hong Kong) Ltd, Hong Kong SAR, PR China

China State Construction Engineering (HK) Ltd. (CSCHK) is a Hong Kong-based contractor which since 2003 has expanded into overseas markets. CSCHK successfully entered the Indian and UAE construction markets in 2005. To date, the total value of the overseas projects secured in India and the UAE is approximately US\$900 million.

British influence remains in both India and UAE since both countries retain and use English as their main business language. Both countries are also experiencing a high level of development in their economies. However, there are significant differences in their construction markets owing to their strategic development paths being quite different; in India, CSCHK is focusing on infrastructure projects while in the UAE the focus is on high-rise building projects.

The construction management systems established by CSCHK have been amended to suit the local environment. Having implemented the amended systems, CSCHK has found that the most difficult issue in managing overseas construction activities is the management of people, particularly when mind-sets of people need to be changed in order to accommodate cross-national cultural differences and to promote and establish team working. Through training, suitably adapted to the local environment, and the development of a culture of collaboration, CSCHK is achieving a certain degree of success in developing harmonious working across multi-national staff in overseas markets. Such training and the sharing of a culture of collaboration cannot be built up quickly; it is rather a process of development over time. However, the culture of collaboration and risk management has now been successfully implemented.

There is not a big difference in principle between construction management practices in overseas market and Hong Kong but there are some differences and CSCHK's top management has taken a practical approach to resolve these from a perspective of human factors. CSCHK's approach has adapted information collection with detailed assessment and analysis and selected innovative management systems that have not been commonly used in Hong Kong. Hence the top management of CSCHK has been able to balance risk and opportunity together with consideration of sustainable development in a multinational business environment. CSCHK has thus demonstrated its ability to shake off the shadow of being a state-owned Chinese company through a new approach to construction management and taking all necessary steps to become a fully effective international contractor.

The Federation MultiComplex – how does a foreign contractor achieve success in Moscow?

Karl Almstead, Vice President for Pre-construction and Estimating, Turner Construction, USA

Moscow recently celebrated its 860th anniversary, but it is still a relatively new city as far as high-rise construction is concerned. However, as the Russian Federation continues to exhibit a strong and dynamic economy, more and more incredible projects are emerging as part of the Moscow skyline.

As developers struggle with the complexity, timing and speed of decision-making, maximising success lies very often in identifying a clear marketing concept, organising an experienced team of professionals and, most importantly, insisting on a collaborative work environment. As might be expected, this has created a strong need for architects, engineers and contractors experienced in cutting-edge design and execution.

Turner is currently providing construction management services for the Federation MultiComplex, a mixed-use, high-rise development that will be located in the new central business district of Moscow. The Federation MultiComplex includes a 63-storey tower and a 93-storey tower, on a common podium and linked together by sky bridges. The structure will be one of the first buildings in Moscow built of steel with glass curtain wall. It will house offices, retail areas, a five-star hotel, and luxury apartments encompassing nearly 418,000m². Upon completion, Federation MultiComplex will be the tallest building in Europe at 354m.

The presentation will discuss Turner's role in this vibrant international market and the skills needed to succeed in Moscow, including the importance of planning and sharing experiences and management systems that benefit of the entire building team

11.00 – 12.30

Crossing organisational boundaries: Successful project teams – the client as leader and integrator

Chair

Stefan Sandesten, Chief Executive Officer, Swedish Construction Clients Forum, Sweden

Speakers

Partnering in the Nordic countries

Jacob Norvig Larsen, Senior Researcher, Danish Building Research Institute – Aalborg University, Denmark

Achieving World Class teams through a focus on safety

Steve Bowers, President, Global Safety Management Consultants, USA

Creating a successful contractual framework for partnering – in the UK and Arabian Gulf

David Mosey, Partner and Head of Projects and Construction, Trowers and Hamblins, United Kingdom

Partnering in the Nordic countries

Jacob Norvig Larsen, Senior Researcher, Danish Building Research Institute
– Aalborg University, Denmark

While partnering was originally introduced in the US and UK as a means to avoid conflict and costly arbitration, partnering in the Nordic countries is promoted as a way to increase user value, shorten building time and diminish defects. Nevertheless, there are distinct differences in the way partnering is implemented in the different Nordic countries. The presentation provides an overview of different partnering models, analyses their strength and weaknesses and discusses future prospects for partnering in the Nordic building industry.

Achieving World Class teams through a focus on safety

Steve Bowers, President, Global Safety Management Consultants, USA

Every construction company strives to hire the brightest; most educated and experienced employees possible. Ideally, they would hire high performing, dedicated and committed employees who require little supervision or oversight. While some companies are fortunate to find great employees, others have the ability to attract great employees. The companies that attract great employees have a competitive advantage – a safety advantage. If your loved ones had a choice to work either for a company with an average safety record, or one with an excellent safety record – whom would you choose for them?

This presentation will discuss the advantages that a World Class safety programme brings to both the company and its employees. The material will discuss the dividends that safety pays as well as how world class safety adds to the bottom line.

Creating a successful contractual framework for partnering – in the UK and Arabian Gulf

David Mosey, Partner & Head of Projects and Construction, Trowers and Hamblins, United Kingdom

Partnering has achieved a revolution in the procurement and project management of UK construction projects. Early contractor involvement in design and risk management under a two-stage contractual structure has produced significant savings and other improvements in projects such as schools, hospitals, offices, hotels, housing and highways. A similar upsurge of interest is now occurring in the Arabian Gulf.

So what does partnering mean, what are the keys to its success and does it offer a model that can be used in any country?

Based on experience with the widely-used partnering contract PPC2000, developed by the author, the presentation will illustrate through UK and Middle East case studies the ways in which such a contract describes and supports the successful planning, design and construction of any project. It will explain how partnering has been successful both in the UK and the Arabian Gulf in establishing successful teams, ensuring buildability and affordability of designs, meeting deadlines at each stage of a project and saving both time and money.

It will first review the key features of partnering and the importance of team integration, programmed processes and efficient communication systems combined with commercial incentives to improve performance. These include improvements to sustainability and reduced carbon emissions. The presentation will go on to describe the structure used for the \$40m Bermondsey Academy Project, which won the UK Prime Minister's Better Public Building Award in 2006 and achieved successes in risk management and sustainable design. It will also review the US\$900m University Hospital Project in Dubai and explain how a partnering approach achieved an early start on site and value engineering contributions from the main contractor and its key specialist subcontractors.

11.00 – 12.30

Crossing product boundaries: From short term delivery to life-time service

Chair

Bengt Hansson, Professor, Division of Construction Management, Lund University, Sweden

Speakers

Delivering first class rail services through partnerships – the example of Gautrain

Jack van der Merwe, Chief Executive Officer, Gautrain Management Agency, South Africa

A European approach to whole life costs and performance

John Connaughton, Director, Davis Langdon Consultancy, United Kingdom

Strategies to improve adaptability in office buildings

Siri Hunnes Blakstad, Professor, Norwegian University of Science and Technology, Norway

A European approach to whole life costs and performance

John Connaughton, Director, Davis Langdon Consultancy, United Kingdom

This presentation provides a summary account of a project undertaken by Davis Langdon Management Consulting under contract to the European Commission during 2006 and the early part of 2007. The aim of the work was to develop a common European methodology for Life Cycle Costing (LCC) in construction, incorporating the overall sustainability performance of building and construction. More specifically, the project was intended to:

- Provide an analysis and evaluation of the different national approaches for LCC across Europe.
- Develop a common approach for the estimation of LCC in construction, in the form of a common methodology for use by clients, their advisers and others across Europe.
- Support the new common methodology with appropriate guidance and case studies of LCC in practice, with a particular focus on use by public sector clients.

The presentation reviews key findings from our analysis and evaluation of national approaches to LCC. In particular, it identifies the approaches and parameters adopted in different countries. It also identifies the conceptual framework adopted and outlines the key challenges encountered in developing a common European methodology for Life Cycle Costing.

The key features of the common methodology are reviewed and explained, and the overall framework for the new methodology is introduced. The methodology validation process is also described. Key linkages to sustainability assessments are discussed, together with the challenges of integrating Life Cycle Costing (LCC) with Life Cycle Assessment (LCA).

The presentation also summarises the new guidance material that supports the Common Methodology, and presents a set of short case studies of the use of LCC in different European countries that are consistent with that Methodology.

The presentation concludes with some recommendations for further work, including the adoption and further development of the Methodology.

Strategies to improve adaptability in office buildings

Siri Hunnes Blakstad, Professor, Norwegian University of Science and Technology, Norway

This presentation focuses on the value of office buildings to the user organisation as seen from a life-cycle perspective.

Office work has changed during the last decade, from small offices, to large open plan, landscapes, cellular offices, and combi-offices. Today we are facing a variety of possible solutions, and the shifting trends and requirements remind us that we have to consider how different solutions can be accommodated within the office building. This means that the buildings must be able to adapt to changing needs and trends.

There is a dialectic relationship between buildings and users, where the two sides are believed to mutually affect each other. When the organisation changes, the building must be adapted in response to the new situation. On the other hand, the organisation will adapt itself to the possibilities and constraints in the building. The relationship between a building and its users is not necessarily only concerned with one user. It can also be seen as the relationship between the building and several users or between the user and several buildings. Major and continuous changes and adaptations will happen in both cases both to the building and in the user organisation.

The relationship between buildings and user organisations changes over time. This means that continually there is a mismatch between what organisations need and what buildings can provide. The presentation will present several strategies to manage this mismatch and to enhance adaptability. Adaptability is defined as the ability to change, responding to unexpected internal or external changes; in the process, in the building, in the use of a building, in contracts, and in finance. Four different ways to act strategically to manage the mismatch will be discussed. The presentation will give examples of all these strategies:

- 1. Adaptability in the process: To manage the mismatches, one has to consider planning and decision-making under uncertainty. An understanding of the direction of change and of the future on the demand side (the user organisation), as well as a strategy for developing the supply side (the building) must be developed. Scenarios and a layered decision-making process are presented.
- 2. Adaptable strategies in the use of the building: Adaptable strategies in use are mainly concerned with strategic management of the day-to-day relationship between user organisations and their use of space over time. This will require proactive actions and understanding of the relationship between work and space, with strategic facility management and flexibility in space and time. Aspects might include: home offices; a move from cellular to open plan; increased density; new functions; fewer designated workplaces with more common spaces and desk-sharing; better places for interaction.
- 3. Adaptable financial and contractual strategies: This covers the distribution of the organisation across owned / leased / rented facilities and the supply of alternative locations, etc.
- 4. Adaptable building strategies: These strategies aim to achieve adaptability through: flexibility, 'partitionability', multi-functionality, and extendability.

13.30 – 15.00

Crossing geographical boundaries: Taking advantage of international resources

Chair

Kristian Widén, Associate Professor, Department of Construction Management, Lund University, Sweden

Speakers

Using international skills – a UK contractor's experience of the European labour market

Stephen Quant, Director, Skanska Rashleigh Weatherfoil Ltd, United Kingdom

Success factors in international joint ventures

Christian Brockmann, Professor of Construction Management, University of Applied Sciences, Bremen, Germany

European PPP road projects from a lenders perspective

Christian Kummert, Managing Director, Infrastructure Finance Unit, DEPFA BANK plc, Ireland

Using international skills – a UK contractor's experience of the European labour market

Stephen Quant, Human Resources Director, Skanska Rashleigh Weatherfoil Ltd, United Kingdom

A brief explanation of the structure of the UK construction labour market will be given, since it differs substantially from European models. Particularly, the position of labour agencies in the labour supply chain will be highlighted. The industrial relations infrastructure for construction and the importance of the National Working Rule Agreements will be discussed. These factors contribute to both the labour market's flexibility and the resulting ease of entry into the market for overseas workers.

The historical experience of the UK construction market in absorbing large numbers of overseas workers and its reliance for many years on immigrant labour will be discussed. This will principally concentrate on the absorption of the Irish construction workforce up until the early 1990s and also of entry of Commonwealth immigrants into the construction workforce in the period 1950 to 1990. The effects of the severe recession in the UK construction market and the resulting changes in the composition of the workforce will also be highlighted.

Poor border security and control of immigration will be discussed and will illustrate the relative ease of illegal migrants to gaining access to the labour market.

The UK's experience of the entry of the East Europeans into the European Union will be discussed in terms of both numbers and skill levels.

The contribution of migrant workforce to both the UK economy in general and to the UK construction industry in particular will be discussed.

Finally the situation concerning the position of those workers from Bulgaria and Romania wanting to work in the UK will be highlighted.

Success factors in international joint ventures

Christian Brockmann, Professor of Construction Management, University of Applied Sciences, Bremen, Germany

International joint ventures (IJVs) in construction are normally formed to build mega-projects. These are the most complex endeavours that civil engineers undertake, and in them complexity manifests itself as multi-dimensionality, inter-relatedness of decisions and the diverse consequences of decisions. Such ventures often embody different cultures and this increases complexity because different processes of understanding take place at the same time within each cultural group.

Success factor research has developed into one of the primary research strategies in management science. Since a seminal conference in Pittsburgh in 1977, there has been a hunt for laws that govern social settings. Those engaged in this hunt have sought to find an elegant formula that would allow the manipulation of outcomes of social interactions in line with our intentions. The variables that produce a positive outcome would be the success factors. However, the hunt has so far not produced results and in complex situations the reason is self-evident: A situation that can be expressed by an equation cannot be complex to begin with, or else it will have been so over-simplified as to lose all meaning and content.

On the contrary, research into IJVs in construction show that their success factors are those that reflect the full complexity of the situation. They are in fact shared cognitive maps of all members in an IJV. Developing shared cognitive maps is an on-going process, transferred from project to project and may be regarded as a common 'mega-project culture' transcending individual tasks and national cultures.

The resulting model for IJV management is complex and reflects the original situation. Project execution involves a repetitive set of tasks which civil engineers are well trained to solve: design, project organisation, work preparation, site installation and construction. These need to be managed by planning, organising, staffing, directing, and controlling (management functions). While doing all of the above, project knowledge must be acquired, trust and commitment built and understanding processes guided. These are basic functions. Decisions are being made all the time, communication is on-going, co-ordination continuously required, and learning progresses (meta-management functions) similarly evolve. At the same time, however, all actions are being judged from the perspectives of different national cultures. Success comes about by paying attention to all factors of the model simultaneously, by being aware of the different cognitive maps depicting the factors and their interaction, and by communicating these cognitive maps to all members of the IJV continuously and with purpose.

13.30 – 15.00

Crossing organisational boundaries: Promoting integration through virtual construction

Chair

Lone Møller Sørensen, Director, Danish Building Research Institute - Aalborg University, Denmark

Speakers

Constructing Swire's One Island East Tower with the aid of new collaborative technologies

Martin Riese, Director, Gehry Technology Asia Ltd, Hong Kong SAR, PR China

How European contractors are using virtual construction

Wilfred van Woudenberg, Chairman, ENCORD Virtual Construction Platform & IT Engineer at the Royal BAM Group, The Netherlands

Revaluing Facilities Management through the Sydney Opera House Exemplar Project

Peter Scuderi, Chief Operating Officer, Research and Commercialisation, Cooperative Research Centre for Construction Innovation, Australia

Constructing Swire's One Island East Tower with the aid of new collaborative technologies

Martin Riese, Director, Gehry Technology Asia Ltd, Hong Kong SAR, PR China

Design and construction of One Island East Tower in Hong Kong for Swire Properties Ltd involved one of the most substantial Building Information Model (BIM) implementations ever undertaken. The owner commissioned Gehry Technologies to put into place a robust implementation of new BIM technologies and working methods to help to realise at least a 10% saving in the cost of construction by enhancing efficiency and reducing waste across the entire process.

The owner, architect, structural and mechanical engineers, quantity surveyors, Gehry Technologies and the project contractors collaborated in the same room to create a single 3D BIM project database. Using BIM, over 2000 clashes were identified and resolved prior to tender. Tender prices were lower and within 1% of each other, owing to the enhanced quality of information.

The contractor assumed full responsibility for the BIM model during the construction phase and ensured that all the 2D information that went to site had been vetted in the virtual 3D prototype prior to despatch. The project design and construction team used the new technologies and working methods to automate cost control, production of 2D drawings and visualisation of the construction methodology.

During construction, the virtual prototype became the central management tool for identifying and coordinating thousands of clashes and construction sequences before previously unidentified problems reached the site. The internet-based 3D project data base provided stakeholders, the project team and the entire project supply chain with the capacity for instant real-time examination of the entire building life cycle process.

When the One Island East project is completed in March 2008, Swire Properties in Hong Kong expect to see a 10% saving on construction cost and a substantial improvement in construction time resulting from the implementation of BIM.

The implementation of Digital Project software and Gehry Technologies' working methods on this project have demonstrated the added value that is now achievable by design, construction and facilities management teams. As this technology and working methodology is adopted globally by the construction industry, substantial improvements in cost, safety, build time and quality will be realised universally.

How European contractors are using virtual construction

Wilfred van Woudenberg, Chairman, ENCORD Virtual Construction Platform and IT Engineer at the Royal BAM Group, The Netherlands

Construction industry is in steady and accelerating change. Driven by new market demands and innovations in the field of virtual construction our business processes are being re-designed.

How Virtual Construction is enabling contractors and partners to cross organisational boundaries will be illustrated by best practices, implementation strategies and new challenges. The presentation is based on experiences at Royal BAM Group, and in Dutch and European networks. Several reality checks regarding Virtual Construction will be included.

The conclusion of the presentation is that practical solutions, target oriented R&D at construction companies, conceptual vision oriented R&D and market driven software developments need to be deployed in order to cross and explore new boundaries.

Revaluing Facilities Management through the Sydney Opera House Exemplar Project

Peter Scuderi, Chief Operating Officer, Research and Commercialisation,
Cooperative Research Centre for Construction Innovation, Australia

Sydney Opera House is recognised throughout the world as an icon of 20th century architecture. The CRC for Construction Innovation and the Australian Government's FM Action Agenda chose this iconic symbol as the focus of the Facilities Management (FM) Exemplar Project and partnered with industry, government and research to develop innovative strategies across three research themes: 1) Digital modelling; 2) Services procurement; and 3) Performance benchmarking. The presentation will provide an overview of the applied research leading to industry development in this exciting project - demonstrating methods for improving FM performance through a better alignment of service and performance objectives.

13.30 – 15.00

Crossing product boundaries: Moving towards zero-defects: Getting it right – the first time!

Chair

Henrik L Bang, Head of Secretariat, Danish Association of Construction Clients, Denmark

Speakers

Reforming the building industry: The Norwegian Building Cost Programme
Egil Skavang, Chief Executive Officer, The Building Cost Programme, Norway

Modular systems: Raising quality through industrialised manufacturing of housing

Anders Larsson, Managing Director, Open House Production, Sweden

Supplier Management as a Key Element of Performance

Markus Neumann, Manager, Purchasing Strategy and Cost Management, Volkswagen AG, Germany

Reforming the building industry: The Norwegian Building Cost Programme

Egil Skavang, Chief Executive Officer, The Building Cost Programme, Norway

Through the Building Cost Programme, the government of Norway and the Norwegian Council of Construction and Real Estate Business aim to reduce the construction faults and damages and to improve the quality of buildings and the profitability in the industry.

A sum of 16m NOK (2.1m Euros) annually for five years has been granted to the programme by the Ministry of Local Government and Regional Development, provided the industry contributes accordingly. Starting in 2005, the programme currently finances 30 different projects and is already bringing major changes and innovation to the industry as a whole.

The programme has taken a strategic approach which emphasises on broad cooperation and participation in each project, sharing of results as an absolute condition, and a major information and implementation project in the end. The three main themes are: improving the client's knowledge both of buildings and processes; increasing the productivity in projects and in companies; and enhancing the responsibility of each person working in the projects and companies.

In some projects, records are being kept of errors and flaws in engineering and construction. These are analysed to produce data for national databases to support both public control and project control systems. Some projects are removing boundaries between activities to improve cooperation in the project processes. Some projects are developing BIM/IFC for the different parts of the construction and real estate sector. Websites are being developed both to present project results and as interactive information sites for the public and for professionals.

Already, the projects are pushing boundaries, and attitudes are beginning to change. The focus on project-related issues is having an impact on profits and we see a new paradigm in communicating building information. The industry is about to reform!

Supplier Management as a Key Element of Performance

Markus Neumann, Manager, Purchasing Strategy and Cost Management,
Volkswagen AG, Germany

The Volkswagen Group is the largest vehicle manufacturer in Europe, with 129 different models and producing around 24,500 vehicles per working day in 44 plants worldwide.

In 2006, its purchases totalled some €66bn. Materials for vehicle production accounted for approximately 85% of this sum while the remaining 15% was for indirect materials such as production equipment (machinery) and office supplies. The Volkswagen brand accounted for 60% of the Volkswagen Group's purchasing volume.

Global sourcing is a process which plans, steers, implements and controls sourcing activities in order to enhance the quality, service and competitiveness of serial parts on a sustainable basis. This process may be used to find new suppliers to compete with existing suppliers, or to supply parts to new production locations. The process allows Volkswagen in addition to improve its competitiveness, quality and service levels, as well as to increase capacity and change production locations. The global sourcing process is coordinated in such a way that decisions can be made within ten weeks of request-for-quotes. It uses regional sourcing offices to evaluate offers before they are presented to a purchasing committee at the Group's headquarters in Wolfsburg.

Customers dictate the prices of vehicles, and therefore they only will pay for components they believe bring the most benefits for their own purposes.

Therefore Volkswagen has established 'Supplier Forums' in order to cultivate long-term cooperation with suppliers. A Supplier Forum event in October 2005 identified various areas with potential for improvement. Some 38 suppliers participated jointly with teams from Volkswagen who contributed their know-how in order to achieve optimisation. The themes included cost-reduction efforts (adopted by management) and commitment to a more consistent use of vehicle modules, innovative materials and new design solutions in module architecture. The main factors in the success of this initiative were the positive response from suppliers and the support of experts provided by Volkswagen bring their experience and know-how.

A positive echo came from suppliers: "This convention is new and innovative – Volkswagen and the supplier provide the know-how in order to develop cost optimisation proposals in a very short period of time. Volkswagen can reduce its own costs and at the same time the supplier is in the position to improve its competitiveness in the market."

Summaries of presentations 10 October 2007

9.00 – 10.30

Crossing geographical boundaries: Land development in an international marketplace

Chair

Kristian Widén, Associate Professor, Department of Construction Management, Lund University, Sweden

Speakers

Transforming an industrial area into an internationally competitive urban landscape

Lars Holten Petersen, Vice President, Carlsberg A/S Properties

Constructing Coega – an integrated deep water port and economic zone for world markets

Pepi Silinga, Chief Executive Officer, Coega Development Corporation, South Africa

Investment in Infrastructure in Shanghai and its impact on the construction sector

Bai Yun, Chief Engineer, Shanghai Urban Construction Group, PR China

Transforming an industrial area into an internationally competitive urban landscape

Lars Holten Petersen, Vice President, Carlsberg A/S Properties, Denmark

By the end of 2008, all Carlsberg brewing activities in Denmark will be relocated to newly upgraded and technologically advanced facilities at Fredericia. This will result in 33 hectares of land almost in the heart of Copenhagen being open for regeneration. The site has been an important part of Copenhagen for more than 150 years and is, owing to the brewery Founder's enthusiasm for science, arts and architecture, almost regarded as National Heritage. Therefore the redevelopment of the area is more than an internal Carlsberg matter – it has a high degree of public and political awareness and has to be handled accordingly. The interests and objectives of all stakeholders have to be taken into consideration and respected in the Development Strategy.

In this development, Carlsberg has two main objectives:

- To unlock the value of the site and maximise the economic outcome.
- To support and enhance the Corporate Brand in the process.

For politicians, the project is an opportunity to pursue political goals and position Copenhagen as an important European metropolis, while the primary concern of the public is the conservation of its historical significance.

The idea is to convert the former brewery site into a dense, vibrant and pulsating city centre in a contemporary setting, respecting history and at the same time reaching for the future. The ambition is NOT just another mainstream "hit and run" urban development scheme. To achieve this, our Development Strategy will aim to:

- Consult the public and invite dialogue from the very start.
- Secure maximum transparency and insight from A to Z in the Development Process.
- Be honest about our objectives and accept that in a political environment one has to share with others to produce results.
- Set new standards for best practice.

Immediately after the decision to move production was announced, on 22 February 2006, Carlsberg entered into informal consultations and dialogue with the public asking for advice and opinions as to the future use of the site. An international Ideas Competition was announced and 221 proposals received. The winner was appointed in May 2007, and the work for a new zoning regulation is at present being carried out in close collaboration with the City Council of Copenhagen. The new Outline Plan for the area is expected to be in place by the end of 2008.

Constructing Coega – an integrated deep water port and economic zone for world markets

Pepi Silinga, Chief Executive Officer, Coega Development Corporation,
South Africa

The presentation will cover three broad themes.

First, the construction sector background. South Africa is experiencing an unprecedented surge in construction projects. The government is spending billions of dollars in mega-infrastructure projects across a number of sectors. For example, approximately US\$12bn is being spent to roll out additional generation capacity for electricity infrastructure. South Africa has also won the right to host the FIFA Soccer World Cup in 2010. This has led to additional infrastructure projects, notably building and upgrading of stadiums. An associated project, known as the the Gautrain Rapid Rail Link, is a state-of-the-art rapid rail network planned in the province of Gauteng. The effect of these multiple construction projects has been a shortage of building materials, notably cement. South Africa is currently a net importer of cement, particularly from the Far East, as the local industry is not able to keep up with local demand. Prices of building materials have also risen sharply, with year-on-year increases of up to 35% for certain categories of materials.

Secondly, an overview of the Coega Project and its achievements. The Coega Project has successfully developed a deep water port – the only one of its kind in the region. In addition, the Development Corporation has also been able to roll out world-class infrastructure, enabling it to attract global investment. Importantly, the South African government has been able to clearly show its commitment by investing heavily in the provision of enabling infrastructure. This has made it easier for the country to promote the Industrial Development Zone (IDZ) as an investment destination. The presentation will review the core competencies that have underpinned how Coega, as an organisation, has been able to realise major milestones, especially with regards to the mega-infrastructure projects.

Thirdly, a summary of the geographic advantages presented by the strategic location of the Coega IDZ. The geographic location of the Coega Project is strategic when viewed in the context of the global flow of Foreign Direct Investment (FDI). South Africa is an emerging market with promising growth prospects. Furthermore, South Africa has access to deep reserves of various natural resources such as coal and iron ore, which are in great demand, particularly in countries such as China. Lastly, South Africa serves as an entry point to the rest of the African continent with respect to natural resources, as well as access to a vast market. Hence the Coega project has been able to attract investment from other continents, including from Canada, India and Singapore.

Investment in Infrastructure in Shanghai and its impact on the construction sector

Bai Yun, Chief Engineer, Shanghai Urban Construction Group, PR China

In the first part of this presentation, the author briefly introduces the location, land area, population, climate, geology and the history of Shanghai. Then the authors describe the sources and amount of investments that Shanghai received in the last twenty years. The investments in infrastructure include road projects, MRT projects, water supply and treatment projects, a new international airport, deep harbour project and others.

In the second part of this presentation, the author introduces and discusses some of the impacts of investment on the construction sector. These impacts cover the area of structure and operation changes in relevant Shanghai Government departments, owner companies and contractors. The changes taking place within Shanghai Government, Shanghai Metro Corporation and Shanghai Urban Construction Group are used as three examples here. It should be emphasised that the changes of the structure and operation in relevant Shanghai Government departments, owner companies and contractors are not only because of investments, but also because of China's political and economical reform.

In the third part of this presentation, the author points out some of the management problems in Shanghai's construction sector. Some suggestions for Shanghai's tomorrow, based on today's problems, are also provided.

9.00 – 10.30

Crossing organisational boundaries: Construction reform programmes

Chair

Lone Møller Sørensen, Director, Danish Building Research Institute – Aalborg University, Denmark

Speakers

Reforming the Dutch construction sector: lessons from PSIBouw

Henk van der Horst, Chief Executive Officer, PSIBouw, The Netherlands

From reflection to emergence – lessons from South Africa

Ronnie Khoza, Chief Executive Officer, Construction Industry Development Board, South Africa

Crossroads of Change: Hong Kong's response to the 'Construct for Excellence' report

Andrew N. Baldwin, Formerly Dean, Hong Kong Polytechnic University, Hong Kong SAR, PR China

Reforming the Dutch construction sector: lessons from PSIBouw

Henk van der Horst, Chief Executive Officer, PSIBouw, The Netherlands

The national Dutch research programme 'Process and System Innovation in Building and Construction' (PSIBouw) was established in 2003 as a joint initiative of industry, government and research institutes. The Programme will operate until the end of 2008. At the Revaluing Construction conference in Rotterdam in March 2005, a paper was presented about the goals and organisation of the Programme. In this presentation, an overview will be given of the results so far.

When PSIBouw started, the degree of trust among the parties in the construction process had reached an absolute minimum after a Parliamentary Inquiry into large scale fraud. This caused a sense of urgency for improvement and reform to the Dutch building and construction sector. One of the first tasks was to repair the trust among the parties involved; they all realised that trust is essential in a process of renewing a sector.

PSIBouw has given strong input in the development of the sector by undertaking research and developing new knowledge by application of this knowledge in practice and so further developing new knowledge.

A comparison will be made with the original goals and the development in the Programme so far. An insight will be given of the lessons learned in the programme as well as an overview of the results of the programme predicted to be achieved by the end of 2008. Also, ideas relating to the continuation of PSIBouw after 2008 will be presented

From reflection to emergence – lessons from South Africa

Ronnie Khoza, Chief Executive Officer, Construction Industry Development Board, South Africa

The presentation reviews the South African experience of creating and working within a regulatory framework for the construction industry. It gives the historical context for the formation of the Construction Industry Development Board (CIDB) and then discusses the current challenges of the CIDB and explores the future direction of the industry.

South Africa has a unique social and economic heritage. The combined effects of centuries of colonialism and decades of apartheid have created socio-economic anomalies that remain part of our operating landscape. The need to improve the performance and the contribution of the construction industry to social goals led to the creation of the CIDB. Key milestones along the transformation pathway are presented to illustrate how a sustainable solution was developed through an engagement process with industry and the public at large. The presentation will summarise the legislative process and the mandate and governance structure of the Board. Its organic growth will be reviewed.

The challenges of the South African construction industry will be presented within the local and global contexts. The orientation of CIDB's challenges is to be understood in the context of the objectives of the South African Presidency. The exponential growth in the registration of construction companies in South Africa will be illustrated and gaps in development objectives discussed.

The impact of the current unprecedented growth of the Register of Contractors has impacted on CIDB's capacity and capability to provide a consistent level of service to the industry. Future capacity requirements are extrapolated based on expected economic growth.

The path ahead for South Africa is presented as one of success through collaboration and partnerships between public and private bodies and civil society. The CIDB has already engaged in several successful collaborations. These are discussed and lessons learnt will be presented.

The presentation concludes with an emphasis on developing South African contractors into entities that are capable of competing in the global arena.

Crossroads of Change: Hong Kong's response to the 'Construct for Excellence' report

Andrew N. Baldwin, Formerly Dean, Hong Kong Polytechnic University,
Hong Kong SAR, PR China

On 18th January 2001, Henry Tang, Chairman of the Construction Industry Review Committee, presented to the Chief Executive of the Hong Kong Special Administrative Region a report entitled, "Construct for Excellence", (CIRC, 2001). This report, the result of a nine month intensive study against the background of an industry beset with problems, made 109 recommendations for a "modern, safe, innovative, efficient, environmentally and client orientated construction industry". Its key themes reflected earlier studies in the UK and elsewhere: fostering a quality culture; achieving value in construction procurement; nurturing a professional workforce; a safer workplace and environmentally responsible industry; the production of an efficient, innovative, and productive industry and an institutional framework for implementing change. Henry Tang stated in his accompanying letter to the report, "The construction industry is now at the cross-roads of change. There is wide acceptance within the community at large of the need for prompt action. The climate for change is here, and this unique opportunity should be seized. A reformed construction industry that strives for excellence will provide firm support to our efforts in making Hong Kong a world-class city".

Six years later, what progress has been made towards the industry envisaged in the report? The ability of the Hong Kong construction industry to build world-class construction projects to the highest standards cannot be doubted. However, despite the recommendations within the report and the work of some major clients such as the Hong Kong Housing Authority in addressing the issues raised, the desired transformation cannot be said to have taken place. Some consider the opportunity to have been lost. Others point to the newly formed Construction Industry Council (one of the key recommendations of the report) and argue that progress, although slower than anticipated, has been made. Against a background of falling workload and an ageing workforce, and migrant labour, the industry now faces structural changes as the construction opportunities in nearby Macau, mainland China, and other parts of Asia and the Middle East attract construction clients, construction organisations, and construction professionals. Issues such as the economic and social consequences of change, whether change is 'advisory' or 'statutory', and the economic growth in neighbouring countries and regions, highlight that industry change cannot be implemented in isolation and must take full consideration of economic change, social issues and business opportunities elsewhere.

9.00 – 10.30

Crossing product boundaries: Designing for people – user-driven innovation

Chair

Henrik L Bang, Head of Secretariat, Danish Association of Construction Clients, Denmark

Speakers

Working with people – participatory design-tools

Tina Saaby, Partner, WITRAZ Architects, Denmark

ACCOR – an example of client/user driving innovation

Frédéric Bougrain, Researcher, Centre Scientifique et Technique du Bâtiment, France

Optimising design with client and user inputs – experience of using the Design Quality Indicators

William Hawkins, Policy and Operations Manager - Design Quality, Construction Industry Council, United Kingdom

ACCOR – an example of client/user driving innovation

Frédéric Bougrain, Researcher, Centre Scientifique et Technique du Bâtiment, France

In the building and construction industry, the client's role in the innovation process is more or less proactive. The spectrum is wide. Some clients are risk-averse and are not ready to support innovative solutions which are more costly and may have unknown results. Other clients drive the innovation process. These clients display the characteristics of lead users. Lead users usually experience needs for a new product or service months or years before the bulk of the marketplace. Moreover, they expect significant benefit from developing an innovation.

The case of the ACCOR Group which operates on five continents with a portfolio of more than 4,100 hotels and the experience of more than 40 years in the hospitality business illustrates this 'lead user' concept. It also shows how a company can pursue innovation to increase value. For the last 20 years, ACCOR has been very innovative, becoming the European leader in hospitality. Instead of looking within the accepted boundaries of its business, it looked across them and created new market space.

Its 'Formule 1' concept is considered as a breakthrough by the profession. This is a new hotel concept based on particularly innovative construction and management techniques which provides a budget hotel offering functional rooms for up to three people. Similarly the Suitehotel brand offers an innovative, contemporary lodging concept, providing 30m² modular suites for the price of a conventional mid-scale room. The group has also been a pioneer in the field of environment management. It was among the first hotel groups to set up a specific environmental organisation. One of its best known actions was the implementation in 1998 of the Hotel Environment Charter while in 2002 it signed the first energy saving guarantee contract in France.

Optimising design with client and user inputs – experience of using the Design Quality Indicators

William Hawkins, Policy and Operations Manager - Design Quality, Construction Industry Council, United Kingdom

The Design Quality Indicator (DQI) is an approach to measuring the design quality of buildings. The DQI Toolkit uses customer sampling and focus group methodologies initially to establish client and users' hopes and aims for a building project and then to measure how well emerging designs and completed buildings are meeting these aspirations. It was developed in the late 1990s by the Construction Industry Council (CIC), a UK industry 'umbrella' body for construction professionals, with support from UK government agencies.

The Toolkit was launched in 2002 and has now been used on over 850 building projects. It is a requirement on all large public building projects in the UK, and is being taken up by overseas agencies including New York City.

DQI applies a structured approach to assess design quality based on the classical model of the Roman engineer Vitruvius who described design in terms of *utilitas*, *firmitas* and *venustas*, interpreted by DQI as Functionality, Build Quality and Impact. Assessments are completed at different stages from briefing, through design and once the building is in-use in facilitated workshops with a range of stakeholders including:

- Building users (or potential users).
- Building clients.
- Facilities managers (or future facilities managers).
- Architects.
- Structural and building services engineers.
- Quantity surveyors.
- Project managers.

The presentation will reflect on the experience gained from five years experience in use of the DQI Toolkit. It will consider this at two levels; first the project level and secondly a more strategic level. In the first, there will be a discussion of two projects which have used DQI, while the second will consider how using DQI is giving an insight into the whole project cycle and transforming the briefing stage.

Overall, the use of DQI is enhancing our understanding of how stakeholders perceive the quality of buildings and ultimately helping to achieve better project outcomes.

11.00 – 12.00

Keynote presentation: International collaboration: Experiences from the Elephant House in Copenhagen Zoo

Chair

Stefan Sandesten, Chief Executive Officer, Swedish Construction Clients Forum, Sweden

Speakers

Armstrong Yakubu, Partner, Foster + Partners, United Kingdom
Haakon Løe, Director, Buildings, Ramboll, Denmark

International collaboration: Experiences from the Elephant House in Copenhagen Zoo

Armstrong Yakubu, Partner, Foster + Partners, United Kingdom
Haakon Løe, Director, Buildings, Ramboll, Denmark

Set within a historic royal park, Frederiksberg Have, the Copenhagen Zoo is the largest cultural institution in Denmark, attracting over 1.2 million visitors a year. The presentation reviews the authors' experience from the Copenhagen Zoo project and discusses their main findings on how to act as an international team.

The presentation starts by addressing the client's perspective, and how the authors understood the project as engineers and architects. Crossing organisational boundaries, collaboration technologies became fundamental. In the process, the collaborators tackled how to get the job done; working from London and Copenhagen offices, and a combination of proximity and working at a distance was a central part of the collaboration arrangements. Getting the right start involved getting to know elephants and international research was done into the social patterns of elephants and travelling to zoos, transferring this knowledge into architecture and construction.

One of the main geographical and organisational boundaries to cross was replacing a structure dating from 1914 and restoring the visual relationship between the Zoo and the Royal Park to provide these magnificent animals with a stimulating environment, with easily accessible spaces from which visitors could enjoy them. Technical challenges, design, and securing public and financial support before commencing construction were some of the issues the collaborators faced. The Elephant House was an exercise in crossing boundaries of both architecture and construction. As architects, Foster + Partners designed lightweight, glazed domes creating spaces which maintained a strong visual connection with the sky and changing patterns of daylight. As engineers, Ramboll faced the challenge of constructing a house which would survive elephant impacts.

The authors discuss the successes and the areas of the project with room for improvement. The Zoo was careful about the choice of team, and the key success factor was appointing an international team with creative competence in culture building and architecture. The speakers will consider with the audience how to engage in the challenge of establishing an international team which crossed boundaries, with the ambition of bringing the Copenhagen Zoo into the elite of European zoos.

13.00 – 14.30

Crossing geographical boundaries: International performance metrics

Chair

Roger Courtney, Professorial Fellow in Construction Innovation, University of Manchester, United Kingdom

Speakers

Comparing EU construction industries – lessons and issues

Bernard Williams, Consultant, Bernard Williams Associates, United Kingdom

Ten years of benchmarking American engineering and construction firms

Stephen R Thomas, Associate Director, Construction Industry Institute, USA

Measuring productivity amongst Norwegian contractors

Thorbjørn Ingvaldsen, Senior Researcher, SINTEF, Norway

Comparing EU construction industries – lessons and issues

Bernard Williams, Consultant, Bernard Williams Associates, United Kingdom

The presentation summarises the findings of a pilot benchmarking project funded by DG Enterprise of the European Commission in 2004/5 and carried out by the presenter and his colleagues in Bernard Williams Associates.

The object of the research was primarily to develop a methodology by which the efficiency of the use of construction resources could be compared across EU national boundaries and to demonstrate how this would work with the inclusion of actual data.

As well as developing such a methodology, however, the project concluded that there were very significant differences in the ways in which buildings were designed and constructed in the various countries studied and that these differences were translated into varying levels of efficiency in the use of each country's construction industry resources. Specifically, it found that Belgium, The Netherlands and the Nordic countries appeared to have more efficient processes than most of the larger countries such as UK, France, Italy and Spain.

These conclusions were drawn from comparative costs of construction and employment in 13 EU countries and were supported by the results of a comprehensive study of previous reports and case studies together with in-depth interviews with leading industry experts.

The researchers had not specifically been expected to draw any hard conclusions with regard to the comparative efficiency with which resources were used. Hence the 'hard' conclusions which were able to be drawn were therefore somewhat of a bonus!

Ten years of benchmarking American engineering and construction firms

Stephen R Thomas, Associate Director, Construction Industry Institute, USA

After ten years of benchmarking, the CII Benchmarking and Metrics Program has matured, producing valuable metrics for engineering and construction firms. The presentation will give the author's insights into critical lessons learned in developing and implementing benchmarking teams based on his experience over these years in guiding the programme, working with CII's Benchmarking and Metrics Committee. After a brief review of CII's benchmarking journey, he introduces the CII model. Important considerations in selecting the benchmarking group are discussed and the role of the third party facilitator will be presented. Through a review of organisational and scoping issues, the importance of alignment of interests and goals is stressed. The governance plan defining rules for participation and establishing procedures and agreements reached during scoping will be outlined. The framework for metrics development is next introduced; this ensures flexible assembly of benchmarking data thus producing data-efficient and logical comparisons. Trade-offs between effort of data collection and value received are discussed and metrics and survey issues are summarised. Following a brief discussion of validation and quality issues, the "scorecard" is used to introduce reports. The presentation concludes with a few critical considerations and an illustration of how benchmarking can be used to drive process improvement.

Measuring productivity amongst Norwegian contractors

Thorbjørn Ingvaldsen, Senior Researcher, SINTEF, Norway

Construction industries in many countries regard low productivity as a problem. Reliable information is lacking, presumably owing to the measurement challenges. A Norwegian research project (2002 -2006) developed a method for measuring productivity and benchmarking of efficiency and applied it to a sample of projects where blocks of flats were being constructed. The goal was to establish a solid foundation for systematic improvement in the companies concerned. This was done by measuring the productivity/efficiency of each project, and based on this, identifying typical managerial priorities for the Best Practice projects.

A critical success factor for the research project was establishing a data-set in close cooperation with more than 100 project managers from 38 companies. Gaining their confidence was essential. Therefore anonymity and data security were a main concern.

The study approach used both 'shrink-wrapped' and custom-made computer programs in the statistical analysis. The efficiency of 122 building projects was measured using data envelopment analysis (DEA). The efficiency range was between 50 % and 100 %, meaning that the worst project incurred twice the costs that were necessary.

Initially, approximately 400 hypotheses of efficiency were established, mainly related to environmental and managerial factors. These hypotheses were tested against the efficiency scores of the projects. In the final multivariate regression model, 14 variables were found to have statistically significant empirical relevance for efficiency.

In addition to reporting the findings of the project in the traditional way (a report and referred papers), a report generator for two types of individual reports has been created. The first type gives feed-back to each of the project managers informing them how their project performed. The project's location in the efficiency diagram is revealed, together with facts related to the performance of this project compared with the rest of the sample. The intention is to make it possible to reflect on whether their way of managing the project is optimal. The second type of individual report is for line managers in companies that have contributed more than one project to the sample. The average score for the company is presented against data on the rest of the sample. This makes it possible for the line manager to evaluate the performance of their portfolio of projects.

The intention is to supplement the development of experience with fact-based learning processes. Hopefully, improved productivity will be the result.

13.00 – 14.30

Crossing organisational boundaries: Spectacular projects – a source of inspiration and innovation

Chair

Stefan Sandesten, Chief Executive Officer, Swedish Construction Clients Forum, Sweden

Speakers

Highlights from Henning Larsen Architects' international portfolio

Louis Becker, Architect, Director and Partner, Henning Larsen Architects, Denmark

Delivering the London Tunnels for High Speed 1, the Channel Tunnel Rail Link

Ian Blight, Project Director, Halcrow, United Kingdom

Creating world-class stadiums – making the impossible happen through innovative design and financing

Frits Scheublin, Director, BAM Engineering, The Netherlands

Delivering the London Tunnels for High Speed 1, the Channel Tunnel Rail Link

Ian Blight, Project Director, Halcrow, United Kingdom

The Channel Tunnel Rail Link (CTRL) is being built by London & Continental Railways Ltd (LCR) and will open fully in November 2007 as 'High Speed 1'. Halcrow is a member of Rail Link Engineering, a consortium of LCR's engineering shareholders comprising Arup, Bechtel, Halcrow and Systra. Rail Link Engineering is the designer and project manager for the CTRL and is responsible for managing the construction.

HS1 will be Britain's first major new railway for over a century - a high-speed line running for 109km (68 miles) between St Pancras station in London and the Channel Tunnel where it will connect with the growing European high-speed rail network. The new line has been built in two sections. Section 1 further from London opened on schedule in October 2003 while Section 2, the approach to London, began in July 2001 and will open on 14 November 2007.

The new railway will bring major transport and economic benefits:

- Eurostar journey times between London and the Channel Tunnel will be halved to only 35 minutes. Paris will be 2 hours and 15 minutes from London St Pancras.
- Growth of the 'Thames Gateway' region will be boosted by fostering additional development. High Speed 1 has leveraged more than £10bn of investment in regeneration schemes around the new international stations of Ebbsfleet, Stratford and St Pancras.
- In 2009, domestic high-speed services will be launched on HS1, dramatically shortening journey times from London to the Thames Gateway and Kent.

The London Tunnels and Stratford Box (Area 200) of the CTRL forms part of Section 2 and connects St Pancras with the surface part of the line at Dagenham, Essex. Four major civil construction contracts delivered this part of the route; three tunnelling contracts comprising 17.5km of twin bore pre-cast concrete lined railway tunnel, and one contract at Stratford comprising a sub-surface reinforced box approximately 1.1km long, 37-54m wide and 13-23m deep. Spoil from two of the tunnel contracts and the box has been used to form a development platform at Stratford on which the 2012 Olympics village will be built.

The 'Area 200 Alliance' was formed when all four Contracts, together with Rail Link Engineering and the Client, effectively became one Contract; it represented a major change in traditional contractual relationships. The Alliance was dedicated to delivering this major piece of civil infrastructure in a spirit of cooperation and without contractual conflict. It was a huge success.

Creating world-class stadiums – making the impossible happen through innovative design and financing

Frits Scheublin, Director, BAM Engineering, The Netherlands

Exploitation of football stadiums is an almost impossible task. A major league team plays only once a week. Half of the matches they play in the stadiums of opposite clubs. In summer the competition stops. As a result such a team plays only 18 matches on their own grounds. If a club is very successful they may also play some matches in the European football league. Together with an incidental tournament and some friendly matches an average stadium is never used more than 25 times a year. The size of a football stadium must be sufficient to host a national champion and its supporters. But most teams are not world famous and therefore most matches in the league are played with a far from overcrowded stadium.

BAM is specialised in building and refurbishment of sport facilities. BAM Engineering was involved in the architectural, structural and financial engineering of several football stadiums. I suppose that Ajax Amsterdam, Feyenoord, and PSV Eindhoven are names you heard before. We have built their stadiums. Also internationally less famous names like Vitesse are on our clients list. And German clubs like Schalke 04, Hannover and Mannheim contracted us. Actually we work in South Africa to prepare stadium for the next World Championship. In all these cases the client had a big problem in drafting a feasibility plan. And in most cases, we, the contractors, were asked to come with innovative solutions for basically financial problems.

The most successful solutions were found in multifunctionality. Stadiums may also be used for pop-concerts, Davis Cup tennis, political rallies, travelling preachers etc. The technical problem is that grass needs daylight and fresh air. And the public at most of the mentioned events would stand on the grass and damage the grass beyond repair if it were not covered with wooden sheets. Covering 10.000 sq m of grass takes a full day of hard work. Uncovering takes another day. After 3 days the covers have to be removed. Otherwise the grass will get yellow and it cannot recover from that. Once the financial manager of one of our clients sighed: *"I could make a good profit with this stadium if I was allowed to refuse the football club occasionally."*

Some years ago BAM was invited to come up with a solution for this problem. The client promised us a design and build contract if we could solve his exploitation problems and present him a technical solution with a feasibility study. We realised that the only solution was in a quick covering and uncovering of the field or alternatively the complete removal of the field out of the stadium. We choose the latter. The pitch had to be removed, but how? We studied a floating pitch, a pitch on wheels, a pitch on jacks to lift it high above the underground. And finally we choose a sliding pitch. The technology to slide heavy loads came from the ship building industry, where ships are built in sections. These sections are slid together for assembly. The only problem was that our pitch weighted 12.000 tons. About twice the maximum load ever slid before. The client accepted our proposal and we got the contract. And a year later we even got our second contract for the same, meanwhile properly patented, system.

The example shows how innovative thinking, understanding clients' needs, borrowing technologies from other industries and cooperation with new partners generates profitable contracts for us and a profitable building for our client.

13.00 – 14.30

Crossing product boundaries: Emerging technologies – redefining the product

Chair

Bengt Hansson, Professor, Division of Construction Management, Lund University, Sweden

Speakers

The integrated building envelope – lessons learned from a development project

Mikkel Kragh, Associate, Arup, London, United Kingdom

Redefining healthcare infrastructure: Integrating services and the built environment

James Barlow, Professor of Technology and Innovation Management, Imperial College London, UK

Measuring performance and value in manufactured housing

Pekka Huovila, Chief Research Scientist, VTT Technical Research Centre of Finland

The integrated building envelope – lessons learned from a development project

Mikkel Kragh, Associate, Arup, London, United Kingdom

Sustainability is increasingly on the global agenda. In the construction industry, standards are imposed by legislation such as the EU Energy Performance of Buildings Directive. The presentation introduces a commercial development project, which deals with prefabrication and industrialised architectural technology at a time where the construction industry needs to focus on the agenda of climate change and sustainability.

The project originated under the Building Lab DK programme, which aims to facilitate innovation in the construction sector. Within this context, the project explores ways of working across traditional boundaries between disciplines and commercial players. The brief is both ambitious and challenging:

- An integrated façade system, utilising ‘new’ materials.
- Marked performance advantages over conventional solutions.
- High degree of integration of standard and bespoke subsystems.
- Industrialised manufacture.
- Facilitation of mass customisation.
- A business model for commercialisation of systems and processes.

The project explores the use of fibre-reinforced polymer (FRP), which has already found application in bridges, off-shore structures and transportation. The first curtain walling concept is aimed at maximum utilisation of the intrinsic properties of the composite material:

- Low thermal conductivity (reduced cold bridging).
- Large pultruded FRP sections (fewer joints).
- Compact (slim) system (for maximum floor area).
- Structurally bonded connections (combined connection and weather seal).
- Lightweight (savings on structure).
- Limited number of parts (optimised manufacture).
- Appearance (potentially translucent).

An important aspect of the project is the collaboration between industry partners and non-manufacturing partners with specialised skills and global presence. The collaboration will only be successful as long as each of the partners benefit, albeit in very different ways. In addition to a return on investment, the collaboration allows each of the partners to develop solutions beyond their own core business. It is exactly this facilitation of holistic thinking that can bring about truly innovative products and solutions.

Less tangible benefits result from the access offered to technical expertise and networking. Architects within the consortium will demand aesthetic quality and functional flexibility. As they gain a deeper understanding of the system, it will inform their projects. Ultimately the architects will identify the projects which are best suited for this innovative technology. It is easily a win-win situation.

Redefining healthcare infrastructure: Integrating services and the built environment

James Barlow, Professor of Technology and Innovation Management, Imperial College London, United Kingdom

Healthcare services, and the built infrastructure and technologies that support them, are undergoing rapid change. Care is increasingly being decentralised from hospital to the home and new medical technologies are reducing the time spent in hospital. Demand for care services continues to rise as the population age and the incidence of long-term chronic health conditions grows.

The healthcare system is one of the most complex and rapidly changing organisational and technical environments in any sector of the economy. Many stakeholders are involved; funding mechanisms are complicated; patterns of demand and use are evolving; and government policies often change rapidly. These features are compounded by a further problem; the lifecycles of the various elements of the system – the built and technical environment, service delivery practices, and associated policies – are mismatched. For example, in the UK the current PFI programme for new hospitals involves multiple stakeholders, and supply contracts extending for thirty years or more, but incorporates diagnostics technologies which have five year life cycles and therapies which are undergoing even more rapid evolutionary change.

In combination, these mismatches in life cycles make planning and delivering a built infrastructure to meet future healthcare needs a challenge both for government and industry. The presentation will discuss the dynamics underlying future demand for healthcare infrastructure and the implications for the built environment industries, using examples from the UK.

Measuring performance and value in manufactured housing

Pekka Huovila, Chief Research Scientist, VTT Technical Research Centre of Finland, Finland

Manubuild (2005-09) is an Integrated Project on Open Building Manufacturing within the EU Sixth Framework Programme. It is developing sustainable value-driven business processes for implementing open manufactured building systems, with organisational concepts and models. It supports and reflects the new processes, and new services covering the whole life cycle of buildings from initiation to demolition, recycling and waste disposal.

One ManuBuild task is creating a performance metrics system. This consists of core indicators related to building processes, housing products and organisational performance that add value to end users. Those indicators are being validated and demonstrated by construction firms to help them deliver new value-adding housing services in Europe.

The performance metrics system is being developed in three phases. In the first phase, 53 potential performance and value indicators for manufactured housing were compiled. They were collected from different building performance classifications, national or sectoral key performance indicators, environmental rating systems, corporate reporting initiatives, company specific measures, and other known metrics frameworks and systems. In the second phase, these indicators were weighted by the ManuBuild project partners (Dragados, NCC, Taylor Woodrow, YIT) and by architects with practical experience in housing. In this way, core performance metrics were identified relevant to adding value to building owners and users. A system of twelve core value indicators is currently available for further testing by companies. The aim is to use these value indicators together with the traditional production-oriented indicators in real applications. In the third phase, the ManuBuild performance system will be revisited and validated in conjunction with the new ManuBuild business model when that is available.

Since the metrics framework focuses on performance in use, it provides good opportunities for market differentiation and branding. New technical solutions and new services can be developed and customised to meet the different needs of different customer segments, to add value specifically to them. The ManuBuild performance metrics system also makes a contribution to the strategic objectives of the European Construction Technology Platform, namely: how to meet client requirements, how to become sustainable and how to transform the construction sector.

15.00 – 15.45

Keynote presentation: Construction: An industry in transition

Chair

Henrik L Bang, Head of Secretariat, Danish Association of Construction Clients, Denmark

Speaker

Fred Moavenzadeh, James Mason Crafts Professor & Director, Massachusetts Institute of Technology, USA

Construction: An industry in transition

Fred Moavenzadeh, James Mason Crafts Professor & Director, Massachusetts Institute of Technology, USA

The construction industry plays a vital and highly visible role in the life of every nation and its people. The industry transforms resources of labour, capital, materials, equipment, and management into the facilities and infrastructure that meet a broad range of social and economic needs. It plays a significant role in promoting commerce and national identity, in improving health and quality of life, in providing for national defence, and in supplying the infrastructure needed for shelter, public health, transportation, water supply, irrigation, power, education, and other necessities of daily life. In this presentation I analyse the current evolution in the business of construction, especially as globalisation impacts the industry.

Today, the construction industry is in the midst of great change. Increased demand for construction is one factor precipitating this change. Construction markets in China and India are growing rapidly and placing a significant demand on supply side. This increased demand has strained supply of materials, equipment and skilled manpower. In addition, infrastructure upgrading has been neglected during the past two decades in developed economies such as the US, Japan, and Western Europe, resulting in substantial demand for increased investment. In the US alone, the estimates for upgrading the existing infrastructure are in trillions of dollars – for transport, water treatment, wastewater treatment, solid waste management, hazardous waste remediation, power generation and distribution, and telecommunications.

To meet these needs (particularly in the emerging markets of Asia, Latin America, and the former Soviet Union) the construction industry is undergoing major restructuring and reorganisation and redirecting itself globally. The current structure, know-how and technology cannot cope with the demand and has the potential of increased inflation and lowering the quality of service.

Functional Characteristics

Unlike other forms of industrial activity, each construction project is a discrete event, with the major participants coming together as an ad hoc team, usually for the first time and under temporary contracts. Most participants are from independent organisations, engage in the project only when their particular expertise is needed, and have few opportunities to establish working relationships which can be extended to other projects.

The structural features of the construction industry also help to explain its functional ability to handle the diversity in the size, complexity, and sophistication of the facilities it builds. At one extreme, the construction industry must handle technologically advanced facilities in very difficult environments such as hydroelectric dams, petrochemical plants and the like. At the other extreme, it constructs and repairs relatively simple structures (e.g. timber frame houses) or minor components of systems (e.g. utility pipes). Clearly, the levels of skill, management expertise, equipment specialisation and capitalisation, financial strength, time commitment, ability to absorb risk, and potential for technological improvement vary across this spectrum of projects, and help to rationalise the diverse nature of the construction industry.

The industry's diversity also acts to its detriment, however, in some significant ways. Characteristics such as specialisation, fragmentation, small firm size, local market orientation, and rapid turnover, coupled with intense competition among firms, retard industry-wide cooperation and unified action.

Changes in Market Demand

In addition to the international pressures described above, the construction industry also faces changes in the structure of its domestic market. For example, resource recovery systems are large and complex, and require innovative technological and management approaches. Projects involving off-shore construction or polar construction entail harsh environments, which challenge the performance of materials and equipment. However, perhaps the best developed example of a future change in market demand is that of the renewal of infrastructure, with reliance on privatisation as a major source of financing, the increasing importance of information technology and globalisation pressures in general. The construction industry response has been rather *ad hoc* and somewhat reactive. Although the pace of merger and acquisition has accelerated over the past few years, no systematic analysis of alternative management and organisational change has been offered. It is, however, clear that fragmentation, small volume, one person operation is not economically viable.

Technological Innovation

The role of technology has barely been recognised in the current debate on infrastructure renewal or environmental remediation. As a result of this oversight, substantial opportunities to change the ways in which maintenance and rehabilitation are performed, to increase productivity, and to reduce costs are being overlooked. By implication, the cost and time projection to complete renewal programmes reflect maintenance and rehabilitation as it is accomplished today – not as it can or should be done 10-20 years from now.

Estimates of infrastructure needs are based upon current industry capabilities and costs; at present, total needs of \$1 to \$3 trillion exceed the ability in the US to pay for them, and therefore only a fraction of total infrastructure requirements can be realistically considered. However, if the industry could make even modest improvements in productivity and cost, such advances could be translated directly into an increase in the work that might be completed. Moreover, the magnitude of infrastructure needs is so large, that payoffs for even modest gains in productivity or cost would be substantial, far outweighing the cost of research and development. Spin-offs of such improvements could also improve the industry's technical edge over its competitors in other markets, helping it to re-establish leadership worldwide.

Four Dimensions of Change

The industry is changing in four distinct dimensions in an effort to enhance productivity and to improve the quality of its services and products. These areas, although somewhat interlocked, are very distinct and each offers exciting and new challenges to construction industry business leaders. Researchers at MIT are currently leading research in the following areas:

1. Consolidation, restructuring, integrated service delivery.
2. Innovative financing, procurement, public-private partnerships.
3. Technological innovation in process and products.
4. Information Technology.

This presentation focuses on the response of industry along those four broad dimensions.

15.45 – 16.30

Panel discussion: Redefining the boundaries – are we seeing the "death of construction" as we know it?

Chair

Peter Scuderi, Chief Operating Officer, Research and Commercialisation,
Cooperative Research Centre for Construction Innovation, Australia

Panelists

Sven Landelius, Chairman, Swedish Construction Clients Forum, Sweden
Frits Scheublin, Director, BAM Engineering, The Netherlands
Wang Wei

16.30 – 17.00

Closing observations and thanks

Chair

Henrik L Bang, Head of Secretariat, Danish Association of Construction Clients, Denmark

Speakers

Closing observations and thanks

Lone Møller Sørensen, Director, Danish Building Research Institute, Denmark

Closing remarks

Wim Bakens, Secretary General, International Council for Research and Innovation in Building and Construction, The Netherlands

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The Danish National Agency for Enterprise and Construction

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FORMAS

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BoligfondenKuben is a foundation that sponsors development initiatives in Danish construction. The basis for these non-profit activities is the foundation's income from co-ownership of the Kuben concern which carries out residential construction, building consultancy and property management. The primary focus of the foundation is dissemination of new knowledge, implementation of new methods and development of new products and processes within the construction sector. For further information, please visit www.boligfonden.dk.

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Realdania

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