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**CIB-W096**

**ARCHITECTURAL MANAGEMENT**

Vienna University of Technology

Austria, 13 - 14 October 2011



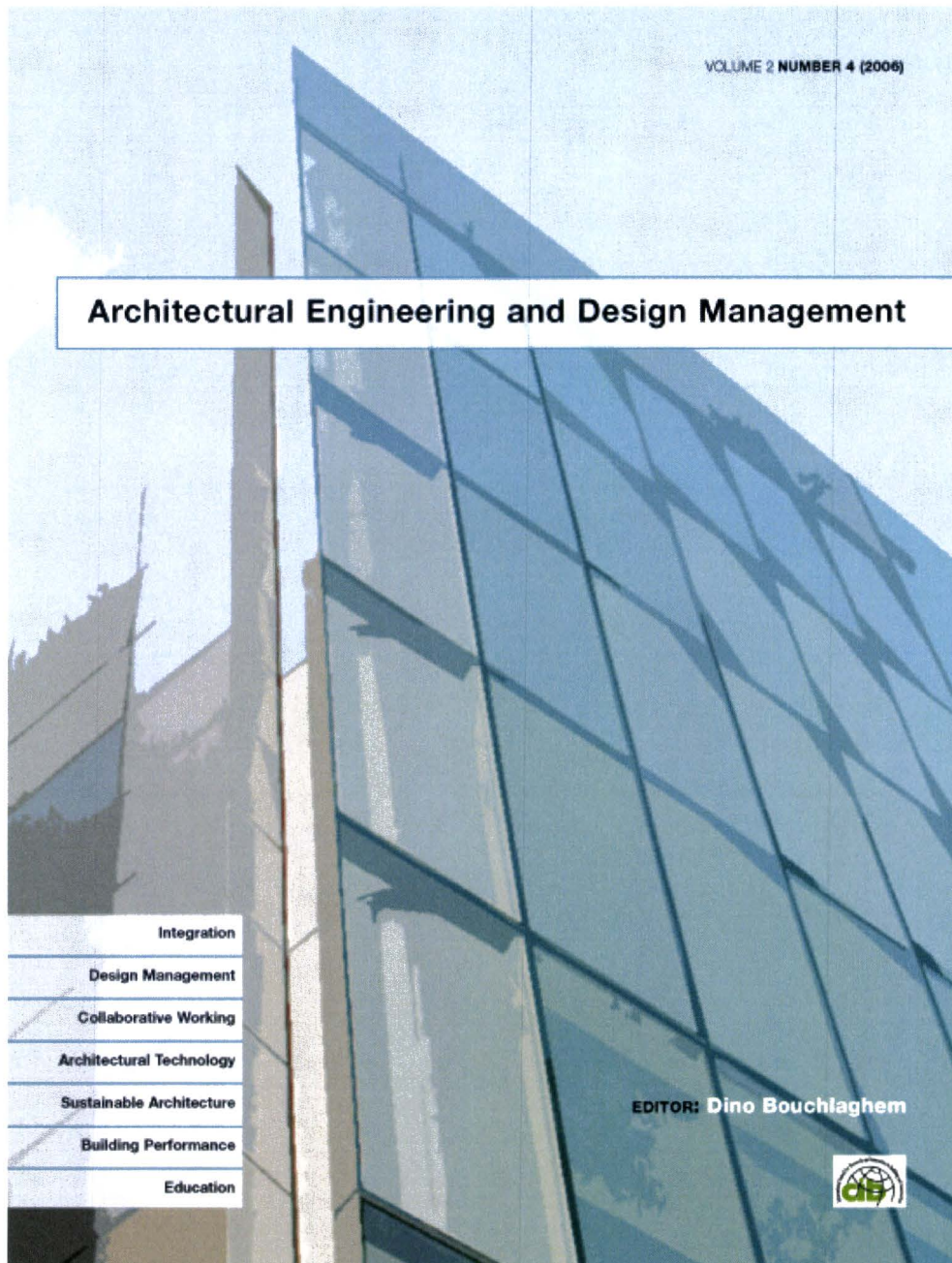
# Architectural Management in the Digital Arena



*Editors: Ad den Otter, Stephen Emmitt & Christoph Achammer*

## Book of abstracts





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# Architectural Management In the Digital Arena

Architectural management distinguishes itself from project management mainly by its pro active attitude towards people and the process of design to deliver the highest product quality within the constraints of time and budget. Leading research into architectural design management is the CIB's working committee W096 Architectural Management. CIB W096 was officially established in 1993, following a conference on 'Architectural Management' at the University of Nottingham in the UK. Since this time the commission has been active in the area, with regular international conferences, meetings, published conference proceedings and other publications. CIBW096 brings together researchers and practitioners concerned with the whole life cycle of building and construction projects. Recently the members of the working group have concentrated on achieving value for stakeholders and this work led to a focus on integrated design teams and improved communications. Active working areas are; revaluing design, communicating design, inclusive design, design management, design integration, design management education and revaluing architectural practice - all with an underlying sustainable agenda. In addition to the publication of peer reviewed conference proceedings the commission has produced the book *Architectural Management: international research & practice* (Eds. Emmitt, Prins, Otter, 2009, Wiley-Blackwell, Oxford), which provides a state of the art report into the rapidly evolving field of architectural management. One of the most topical issues to be dealt with by CIBW096 concerns information technologies and building information modeling, the theme of this, the commission's 24<sup>th</sup>, conference.

Architectural design processes are iterative processes in which designing and decision making are interwoven. Demands, wishes and concerns of clients and stakeholders for a beautiful, well functioning and sustainable building need to be fully understood and effectively communicated within the temporary project team. The focus of architects, managers, advisors and engineers has evolved from the project to responsibilities for the entire life cycle of the building. This is set in an age of rapid advances in digital technologies and changing responsibilities. This conference explores applications of architectural management using all types of electronic media for creating, communicating and realizing design in a variety of different contexts; as well as addressing long running themes within the architectural management knowledge domain. The proceedings contain 28 peer reviewed papers which cover a variety of topics that fall within the scope of Architectural Management. Abstracts of each paper are included in this book of abstracts, together with the conference programme.

For further information about CIB W096 visit: <http://qa.cib-w096.nl/index.html>

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## List of Titles and paper id.

Paper ID	Title
P1101	Coordinating design: an interactional accomplishment
P1102	Sustainability and Resource Efficiency through Robot Oriented Management
P1104	An innovative signage design software to assist way-finding in complex environments
P1105	Lean Design Management: Exploring Perception and Practice
P1107	Organizational Requirements for Integrated Planning Processes
P1108	A study of decision-making factors on the project profit of residential construction
P1109	The Study of Bim Performance of AEC Firms at Design Stage in Taiwan
P1110	A Design Control Structure for Architectural Firms
P1112	The study of decision-making Public building investment
P1113	Implementing a Lean Design Management Culture in SMEs
P1114	Architectural Management: Exploring Definitions and Impact
P1115	Tertiary Architectural Technology Education and Construction Health and Safety (H&S)
P1116	Properitisation of Building Information Modelling
P1117	Virtual Quality in BIM, Checks on Total Quality and Failure
P1118	A Task management System Development for collaborative performance
P1120	Governmentality and client decision-making on mega projects
P1121	Integral design: the next step after Integrative design
P1122	Decision support tools for the early collaboration within sustainable building design
P1125	Managing Teams for Integrated Design Solutions and Working Practices
P1128	A review of current approaches to access and people circulation within health-care facilities
P1131	Collaborative Communication in the Building Process
P1134	The Building Design Process in the Context of Different Countries
P1135	Challenges for Implementation of a New Model of Collaborative Design Management
P1137	The <i>as built monitoring plan</i> , a supporting tool for life cycle management
P1138	Implementation of Quality Management System on architecture offices as a requirement for sustainable design
P1139	Conceptualizing Design Management for Construction Projects
P1140	Modelling network of practice
P1141	Assessment of Buildability Information for Designers and Site Managers by a Bayesian-based Evaluation Model





**P1101**

**An ecology for design coordination:  
multidisciplinary as a way of working**

*An ecology for multidisciplinary design coordination*

R. Luck and I. Ewart  
*University of Reading, UK*

**Abstract:** At a point in time when technologies for remote and asynchronous forms of collaboration are pervasive, being able to justify the time, space and places for collocated working becomes increasingly important. This article provides an account of a way of working in a multidisciplinary design practice where the setting, the routine yet ordered practices and a series of design meeting events were seen to feature in the organisation of the design work. In this account, the notion of the design meeting as an event category is questioned, as different forms of design meeting staged for different purposes were observed. In various ways the inter-disciplinary inputs to the design of a project were coordinated and this was seen to happen in a series of workplace interactions and practices that were part of the ecology of a multidisciplinary design organisation. Collectively, these situated observations support *multidisciplinary* as a location-based way of working in a real-time synchronous manner.

**Keywords:** Design, Multidisciplinary, Meetings, Coordination, Interaction, Synchronous communication

**P1102**

**Integration along the Value Chain in Construction  
through Robot Oriented Management**

T. Bock and T. Linner  
*University of Tokio, Technische Universität München*

**Abstract:** Construction industry has a low productivity rate concerning the raw material input and about 40% - 50% of global raw materials are used for the construction of our environment. Construction waste states the largest waste fraction even in highly industrialized countries and buildings are among the most expensive goods that we produce. Although we have achieved that complex high-tech products as cars and computers are produced with high efficiency, we have not brought the production of simple low-tech products as buildings to a comparable level. An alternative method to conventional construction is the large scale deployment of industrialization, enabled by applying automation and robotics based processes and technologies throughout all phases of the life cycle of built environments. Therefore, complementary robot oriented management has to address all value-added steps from off-site fabrication, ERP Logistics, on/off-site combined management, automated on-site assembly, construction robotics to service robotics, automated deconstruction and remanufacturing. The present paper first analyzes best-practice industrialization/automation and Mass Customization projects, which have been tested or applied successfully in larger scales during the last decades. The projects are organized and presented in accordance with the value-added steps in order to show that all projects, processes and technologies in combination would represent the whole value chain or value system. Through industrialization and complementary Robot Oriented Management, construction industry would be able to simultaneously address multiple parameters relevant for sustainable economic, environmental and social development. The paper shows, that integrating and managing the advantages of the analyzed best practice examples allows for closed and controlled chains concerning technology, processes, resources and information flow and value creation. Further, Robot Oriented Management would not only be limited to building fabrication but also link systems of controlled deconstruction, component reuse and re-customization to a network for continuous and industrially organized resource circulation.

**Key words:** Robotics, Value Chain, Construction Management, Closed Loop





## P1104

### An innovative signage design software to assist wayfinding in complex environments

A.Finneran, P.D. Bust, A.G. Gibb, J.Buckingham,  
C.Garcia-Hernández<sup>1</sup>, P.Ubieto-Artur<sup>1</sup>  
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**Abstract:** Wayfinding is a critical process for navigating through an environment. The process has three stages; “Plan, Orientate, and Proceed”. Signs and other visual aids play a key part in the wayfinding process, affecting the efficiency of the wayfinding operations. This makes both the architectural and the signage design very important. Signage design involves a variety of practitioners who collaborate to provide a signage layout which is safe and efficient, and assists in the provision of a good wayfinding environment. This paper highlights the advantages of using an innovative software-tool that can assist and speed up the signage design process. The software plugs into AutoCAD, and can significantly reduce the time taken to create signage layout for a building, and its subsequent assessment of suitability and efficiency. Loughborough University, in collaboration with the University of Zaragoza, Spain, are developing the software so that it may be used on major construction projects. The group are currently in the process of applying and verifying the benefits of the software tool on an existing large UK construction project. The client has a particular interest in wayfinding issues, not only because of the type of building, but also due to the large, phased nature of the regeneration works proposed. Using the widely used AutoCAD architectural design software package as a platform, the signage design software can be easily incorporated into existing drafting procedures, and make the signage design of buildings more collaborative overall.

**Keywords:** Usability, CAD drawing, Wayfinding

## P1105

### Lean design management: exploring perception and practice

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**Abstract:** Many construction projects suffer from delays and cost uncertainty with the result that, in many cases, the customer or client is not satisfied with the final product. The importance of managing the early design phases effectively and efficiently is well-established, although how best to do this is not so clear. The successful use of lean management in the construction stage (using the principles largely developed by Toyota) has opened up the possibility of using lean management in the early design stage, thus helping to establish a systematic approach to managing construction projects and the organisations that participate in them. This study, explores the interpretation and application of lean design management in architecture, engineering and construction (AEC). A survey questionnaire was used to obtain a deep understanding of the issues connected with the current processes and practices in design management. The findings from 125 survey responses provide evidence that inefficiencies in design management practices in the UK construction industry are related to ineffective design management processes (e.g. briefing, design planning, etc.) as well as problems with procurement. The main conclusion drawn is that lean design management appears valid for implementation in the construction industry but needs to be customised according to the project context to achieve the desired value.

**Keywords:** lean design management; client briefing; design process waste; design process value stream; architecture, engineering and construction (AEC).



## P1107

### Planning Practice in Transition from Fragmentation to Integration

I. Kovacic, S. Faatz, M. Filzmoser

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Interdisciplinary Planning and Industrial Building*

**Abstract:** Design processes for sustainable buildings are characterised through high number of integrated planning aims linking the economical, ecological and socio-cultural aspects, beyond the classical planning goals for achievement of architectural, on Vitruvian philosophy based qualities of unity of functional, constructive and aesthetical values.  
With increasing demands on building performance, the number of tools for evaluation, prediction and simulation of the energy-, cost- and emissions- efficiency is rising together with the number of experts and the relevant professional languages involved in such a planning process. Therefore we argue that the planning processes for sustainable buildings are characterised through high level of complexity, and represent complex dynamic social systems. Special attention needs to be drawn to communication and decision making mechanisms within such processes as well as to organisational structures that would enable the optimal achievement of the aims set for desired building performance. This paper presents the first results of the interdisciplinary research project Co\_Be: Cost benefits of Integrated Planning, where experiment was conducted in order to compare the integrated with the traditional, sequential planning practice. The experiment was organised as a student-competition based, role-playing simulation of design for a temporary smoothie-bar. The results were qualitatively and quantitatively evaluated – this paper will present the first results of qualitative evaluation of student feedback.

**Keywords:** Integrated Planning, Sustainable Building, Whole Building Approach, Planning Process Analyses



## P1108

### A Study of Decision-making Factors on the Project Profit of Residential Construction

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<sup>2</sup> Associate Professor, Department of Architecture, National Cheng-Kung University, Taiwan

**Abstract:** The majority of investors in Taiwan engaging in residential construction come in the form of construction companies. When these construction investors estimate the profit of a residential construction project, they often follow their past accumulated experiences and personal subjective judgments which may fail to understand the important decision-making factors, and may often cause the companies to face with financial crisis due to misjudgement. To compensate the aforesaid subjective misjudgements during the decision-making process, this study has summed up 26 important decision-making factors that would affect the profit earnings in residential construction project after conducting a questionnaire survey on construction investors, and analyzing the assessment process statistically. The SPSS software was adopted by this study to perform a factor analysis on the questionnaire scales using the Common Factor Analysis, and good results were obtained after reducing part of factors, and checking on the validity and reliability of the scales. The decision-making factors proposed by this study were divided into 6 aspects, namely construction, economy, site, company, policy and project aspects according to the attributes of each factor. The results are expected to provide a reference for the real estate industry and academic research units.

**Keywords:** Residence, Decision-making Factors, Common Factor Analysis, Likert Scale



## P1109

### A Study of BIM Performance at the Design Stage by Architecture Consulting Firms in Taiwan

Y.H. Pan, C.T. Tzeng and S. Emmitt<sup>1</sup>

National Cheng Kung University, Taiwan <sup>1</sup>Loughborough University, UK

**Abstract:**

BIM has been accepted as a new paradigm that improves productivity of the building industry through facilitating process change in the way projects are delivered. It is widely implemented in countries like Finland, Norway, Denmark, Singapore and the USA. In Taiwan, a number of leading architecture consulting firms have adopted BIM for design. In countries where BIM policies, technologies and processes are relatively developed, BIM is used throughout the full building lifecycle. In Taiwan, however, BIM is just emerging, and there is currently no record of projects completed with full adoption of BIM from design to construction. Taiwanese architecture consulting firms primarily utilise BIM to improve performance at the design stage. The study sets out to explore the overall BIM performance level of Taiwanese architecture consulting firms at the project design stage through a case-study approach, where four of the country's leading firms were selected to determine their BIM capability and maturity levels. Data was collected through direct observation, interviews and study of relevant documents and archival records. A BIM performance assessment framework was developed through a study of literature and used to analyse the empirical data. Discussions of the findings are organised around two research questions developed at the beginning of the study. Findings reveal BIM to be adopted primarily to improve visualisation and design coordination. Collaboration at the project design stage remains largely intra-organisational. The utilisation of BIM for design analysis and supply chain integration to achieve transformational effects for the building industry is challenged by problems that are legal, technological and organisational. The study concludes with suggestions of ways to help facilitate a top-down approach to BIM implementation to reap true productivity benefits from BIM use.

**Key words:**

BIM Capability and Maturity, BIM Performance, Design stage, Process standardisation, Taiwan



## P1110

### A Design Control Structure for Architectural Firms in a highly Complex and Uncertain Situation

J.T.H.A.M. Schijlen, A.F.H.J. Den Otter, H.J. Pels

Architectural Design Management Systems (ADMS), Eindhoven University of Technology (TU/e)

**Abstract:**

A large architectural firm in a highly complex and uncertain production situation asked to improve its existing "production control" system for design projects. To that account a research and design project of nine months at the spot was defined. The production control in the organisation was based on a mix of project management tools, resource allocation to whole projects, and regular updating of the project portfolio. The results of the research analyses showed that the situation of the firm's design projects (the design situation) cannot be controlled with only such tools, due to lack of coherence between the "production control" and the design situation. To improve the coherence, a basic "production control" structure with is designed. The design of this structure is based on the match between the research findings and theoretical principles of how decisions should be made in multi-project situations that are highly complex and uncertain. The design consists of four hierarchical planning functions (strategic resource planning, rough cut capacity planning, resource constraint project scheduling and detailed planning). After finalizing and presenting the design, the design led to new insights into resource allocation for the client and has been approved by the client and office management. The implementation of the design is however still in design proposition due to other priorities.

**Key words:**

Production Control, Resource allocation, Multi-Project Scheduling, Matrix structure, Engineer to Order, Design situation.



## P1112

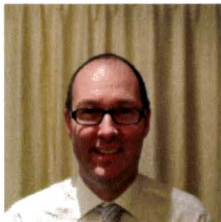
# The study of decision-making Public building investment

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**Abstract:** After twice alternations of Taiwan's ruling party, public buildings were used by politicians as a campaign tool rather than the demands for Taiwanese people. Over the last decade, about 100 billion NEW Taiwan dollars was spent on a large number of idle, deserted, or low-beneficial public buildings. Although public construction has its value, it can't be out of the laws of economics. There are many kinds of public buildings such as self-liquidating with no external beneficial effect or non-self-liquidating with a large external beneficial effect. How to use the concept of portfolio theory on public buildings to make a most reasonable plan, to further expand the marginal benefit of construction to bind irrational politicians, becomes an important lesson. It also can provide a chance to decide whether Taiwan will be one of the advanced countries. This study first reviews and compares from the past buildings the effectiveness of Taiwan's public buildings investment and then illustrates the importance of public asset allocation decision by using Markowitz portfolio theory. Finally, it appears that using the portfolio theory can help reduce or eliminate the demands of politicians in terms of improper construction and will be helpful to decision-making in public investment.

**Keywords:** Collaboration, BIM risks, risk distribution, communication, transparency.



## P1113

# Addressing the Architect/Contractor Interface: *A Lean Design Management Perspective*

S. Emmitt, C. Pasquire, and B. Mertia

*Loughborough University, Nottingham Trent University, Loughborough University UK*

**Abstract:** One of the challenges in design and construction projects is the interface between the designers and the contractors. It is here that difficulties can be resolved, or conversely manifest, as a result of the effectiveness of interface management. The work reported in this paper is associated with a knowledge transfer project (KTP) that sought to embed a lean culture within a small design and build organisation. One of the issues arising from the KTP related to the effectiveness of design management and communication between the design and build organisation and its consultants. This resulted in additional research to better understand the contractor/consultant interface and hence devise an effective lean design management protocol. The research reported here is from the pre-construction phase, supplemented with data from the early construction phase of projects. Analysis of data from interviews, collaborative planning workshops and monitoring of processes informs the work presented in this paper. Tentative results indicate that attention to the social aspects of projects, the people factors, are fundamental to successful communication and collaboration within projects.

**Keywords:** Impact, Integration, Interface management, Knowledge transfer partnership (KTP), Lean design management.



## P1114

### Architectural Management: Exploring Definitions and Impacts

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*Department of Civil and Building Engineering-Loughborough University, UK*

**Abstract:**

Since the emergence of the term ‘architectural management’ nearly 50 years ago in the UK there have been very few attempts to define the term, or indeed, the field of knowledge. Most of the work in architecture, engineering and construction (AEC) has been associated with the CIB commission W096 Architectural Management. Parallel to this has been the use of the term architectural management in the field of information technology (IT). With architectural management increasingly conducted in a digital arena the definitions from the field of IT appear to be increasingly pertinent to those working in AEC. By bringing together definitions from both fields a number of questions arose about the term architectural management, the role of the architectural manager and the impact of CIB-W096 on architectural practice. A questionnaire survey was designed and issued to individuals associated with CIB-W096 in an attempt to gather some informed views on these issues. Also, the websites of three well-known recruiting agencies were consulted regarding the architectural manager’s job description and qualifications. The results were combined with the findings of the literature review to propose a definition of architectural management that is relevant to our current, digital, era.

**Keywords:**

Architectural Management, Definitions, Impact, Information Technologies, CIB-W096.



## P1115

### Tertiary Architectural Technology Education and Construction Health and Safety (H&S)

J. Smallwood

*Nelson Mandela Metropolitan University*

**Abstract:**

Designers influence construction ergonomics directly and indirectly. The direct influence is as a result of design, details, specification, and method of fixing, and depending upon the type of procurement system, supervisory and administrative interventions. The indirect influence is as a result of the type of procurement system used, pre-qualification, project time, partnering and the facilitating of pre-planning. The purpose of the paper is to determine architectural technologists’ perceptions relative to addressing of construction H&S in architectural technology programs. A survey of the related literature was undertaken and an empirical study was conducted among members of the South African Institute of Architectural Technologists (SAIAT) using a self-administered questionnaire.

The following constitute the salient findings. There is universal support for the addressing of construction H&S in architectural technology programs. Respondents mostly support the addressing of construction H&S as a separate subject, followed by a component of a subject in terms of the form in which construction H&S should be included in an architectural technology program. The following predominate in terms of the importance of the inclusion of nineteen subject areas relative to construction H&S in an architectural technology program: hazard identification and risk assessment (HIRA); the need for construction H&S; the role of project managers in H&S; the economics of construction H&S; the environment and construction H&S; the OH&S Act & Regulations, and H&S specifications. The study realised a low response rate. However, the respondents are likely to constitute the more committed in terms of construction H&S, which enhances the credibility of the findings. The study identifies shortcomings in tertiary architectural technologist education. Recommendations include the comprehensive addressing of construction H&S in tertiary architectural technologist education, and continuing professional development (CPD). The study constitutes the first of its kind, and provides insight relative to architectural technologists’ perceptions relative to tertiary architectural technology construction H&S education, and construction H&S in general.

**Keywords:**

Architectural technologists, Construction, H&S, Tertiary education



**P1116**  
**Propertisation of Building Information Modeling Mapped  
Against Firm Intellectual Capital**

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**Abstract:** Building Information Modelling is an innovation which is in the process of diffusion across the construction industry and it is expected to be more prevalent in the future. Literature suggests that certain benefits of BIM are being delayed and overshadowed by legal and regulatory uncertainties related to technology adoption, business processes and integrated delivery. Although no significant law-suit has been filed based upon the use of BIM, litigation may occur in the future relative to risks, rights and responsibilities of the parties. At the same time, some authors indicate that BIM can also be seen as a platform for reducing disputes, claims and legal complexities. Hence, the legal and regulatory issues in relation to BIM need a comprehensive discussion. This paper begins this discussion by exploring the collective authorship and individual ownership of Building Information Models in the digital environment. In particular as we explore BIM ownership a theoretical model shall be developed synthesising a legal and economic value concept of BIM Propertisation. There are various legal frameworks and concepts that we can draw upon from intellectual property law, law of contracts and law of property to develop theory for BIM ownership. This work is positioned within the theory of virtual property and investigates the following constructs; rivalrous, persistence, interconnectivity, private vs public domain and integration within the framework of a firm's intellectual capital and inter-firm collaboration in the construction projects. The paper presents some pilot study empirical work aimed at exploring the validity of the Propertisation conceptualisation.

**Keywords:** Building Information Modeling, virtual property, propertisation, valuation



**P1117**  
**Virtual Quality in BIM**  
*Checks on Total Quality and Failures*

H.H. van Zeeland

*Van Zeeland Architecture & Advice Soest NL*

**Abstract:** Quality can be expressed by regularity's related to several type fields of laws. Author has find out that the technical quality in the build reality from the view of building information can have relations on 11 levels or groups of regularity's. The virtual reality in Building Information Models is from the view of architectural management only useful if the presented reality can be checked on technical quality and be controlled on failures. As Arch Man Tools the virtual prototype of a building is trustworthy if there are so called Quality Checkers. The total technical observation of an existing building can be expressed in a coherent set of 1 till 5 different interpretations based on and combined with an aware perception by using one or more human senses. A fundamental research project pointed out that it is possible to express all kind of aware technical observations on an exact mathematical way. Research results on this problem of virtual total quality checking of a prototype in a BIM proved out to be complex in case the total quality is related too many aspects, many elements, and many different situations in the same project. If one of the main goals of Arch. Man is reducing failure costs Quality Checkers are necessary. Based on the research results author statement is that it is proved that it is theoretical possible to create IT tools on a modular way that guarantee total virtual quality.

**Key words:** Virtual reality, Quality Checkers



**P1118**  
**Task Management System Development for  
Collaborative Performance of Building-yard Workflows**

A. Folino, E. Oliveri, M. Padula, R. Scaioli, P.L. Scala  
*Institute for Construction Technologies Milan, Italy.*

**Abstract:** Research about building information modeling (BIM) supports the complexity of building life cycle. This paper focuses the activities carried in and around a building-yard (building-yard workflow) to manage a design from its starting version to the delivery of the building to the customer. Many actors with different experiences and roles produce and exchange information often inconsistently, causing knowledge misalignment and lacking of relevant information. The evolution of CantiereOnLine vers. 1 is discussed, a BIM system focused to design management in building-yard. Adoption of end user development approach for designing workflows, workbench offered to users for semantic search from remote repositories, customization and integration of autonomous software components, and their storing; reinterpretation of the idea of Task Management System as a platform expandable with additional components realizing specific tasks; these main features led to COL vers. 2 as a TMS Editor. The workflow includes activities from the head office of a building enterprise to the building-yard: in the technical office, annotated and modified technical drawings and documents are validated and circulated in an accepted release, uploaded on mobile devices used in building-yards, where are annotated to indicate building variations and other additional information; the annotated drawings are sent back to the technical office. The workflow designer operates in COL workbench by means of visual commands and widgets representing task components, relations among them and operations which can be performed. Each component consists of its active part, based on Web Services technologies, and its semantic description expressed in Web Ontology Language standard, allowing organization of repositories based on a shared ontology.

**Key words:** Building technologies, building yard, design management, workflow, task management, Web Services, visual user interaction



**P1120**

**The cultural political economy of megaprojects**  
*Governmentality and the social realm  
of client decision-making*

P. S. Siva and K. London  
*RMIT University Australia*

**Abstract:** In recent years the landscape for international design management has been fast changing and a key development, which has led to this, has been the unprecedented advances in digital technologies. Firms in the architectural, engineering and construction (AEC) sector are no longer constrained to working on domestic projects but now operate on a global scale. The rise of globalisation has not been without problems and in particular project challenges related to technological and social complexity, strategic behaviour, contested information and cost overruns are prominent. Effective design management and project success is significantly impacted by the internal workings of clients and its relationship with project decision-making which is often beyond the control of project teams. Yet the focus of past megaproject and design management research has tended to be on the industry's role instead of the client's. In their role as project initiators and financiers, clients are the driving political force on projects, occupying a central position within the power structure embedded on megaprojects. This paper is positioned within a PhD study which seeks to offer a theoretical contribution to the design management field by examining the governance context of megaprojects with a focus on the critical role of the client. There has been little research investigating the sophistication of the international client and their capacity to contribute to project success in relation to sound decision making regardless of the political environment. This research is concerned with two key gaps; firstly a lack of empirical research to explain the nature and structure of the power relations underpinning the client's complex decision-making environment on mega projects and secondly, a lack of theory and methodological framework to achieve this. A theoretical model is proposed based upon the concept of governmentality to explore the power relations underpinning megaproject decision-making. The outcomes of this research have serious implications for design managers in the AEC sector who are increasingly faced with project challenges in the international megaproject environment. Deeper understanding of how various forms of power come to be created, distributed and exercised on megaprojects may enable design managers to better shape and influence project outcomes at various stages of project decision-making.

**Keywords:** Governmentality, megaprojects, clients, power, cultural political economy



**P1121**

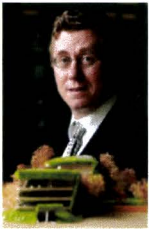
**Integral design: the next step after Integrated design  
between engineering and architecture**

W. Zeiler  
*Eindhoven University of Technology (TU/e), department of the Built Environment*

**Abstract:** In the present day design is understood as a highly complex process that requires the support of multi-disciplinary design teams. Therefore a supportive design approach has been developed: Integral Design. Integral Design combines an engineering design method with an innovation strategy, to support innovative integrated design between engineering and architecture. The innovative Concept-Knowledge theory by Hatchuel and Weil is used in combination with the Integral Design method. Morphological Overviews, which are produced by combining mono disciplinary Morphological Charts, provide a tool to structure and to give an overview of the communication and information exchange between design team members, while C-K theory supplies the theoretical framework for the reflection on the Integral Design. The resulting synthesis between architectural concept and engineering functionality is as such a good example of a next step after integrated design.

**Key words:** creative architectural management, integral design, C-K theory





## P1122

### Decision Support Tools for the Early Collaboration within Sustainable Building Design

W. Zeiler, R. Maaijen , W. Maassen

*Eindhoven University of Technology (TU/e), Royal Haskoning Nijmegen NL*

**Abstract:**

More effective and early collaboration is needed during the design process to make decisions so that the building meets the required sustainability goals. Often the specialist are included too late to influence the outcome of the design without major changes and resulting costs. Integrated sustainable design solutions are necessary, which will mean to make the step from sequential working practices to integrated design. Currently the building industry uses different sustainability assessment tools which are difficult to compare. These tools are designed for assessing different types of buildings and emphasize different phases of the life cycle. The paper discusses some examples of these sustainability assessment tools: BREEAM, LEED, Ecological Footprint and Greencalc+. Especially the focus will be on the role of sustainable assessment tools as decision support tools in the integrated building design process. As financial viability is considered to be the most important deciding factor in the selection of sustainability options our research is aimed on the development of a design decision support tool primarily focussing on that aspect. The first results are presented of such a new decision support tool. This development was done in cooperation with one of the largest Dutch consulting companies Royal Haskoning.

**Keywords:**

Sustainable assessment, Green building design, collaboration, architects & engineers

## P1125

### Managing Teams for Integrated Design Solutions

V. Singh, K. von Treuer and K. London<sup>1</sup>

*Deakin University, Australia <sup>1</sup>RMIT University, Australia*

**Abstract:**

Design integration in the architecture, engineering and construction sector requires a multiplicity of skills, knowledge and experience. Design practice requires management tools and skills besides the design skills and the domain knowledge. Teams and design teams have been extensively studied, and it is widely accepted that the team management practices are contingent on the nature of collaboration. This research specifically investigates the critical success factors for managing teams for integrated design and delivery solutions (IDDS), which aims to involve virtual collaborative environments and various stakeholders and supply chain players such as architects, consultants, contractors, and suppliers across the project lifecycle. Since IDDS is a recent development, the associated teamwork factors and challenges are not currently well understood, especially for the design development phases. Therefore, there is an immediate need to investigate the teamwork requirements and challenges for successfully meeting the IDDS objectives. This paper reports the preliminary findings from an ongoing research that investigates this gap. This investigation builds on the rich literature on teamwork and organizational studies, design management and construction supply chain integration to identify the critical success factors necessary for an IDDS team. For teams to be efficient, team members need to have well developed mental models of each other, as well as the mental models for the task, process, context, and competence of the team. In particular, our question is what are the critical task, process, context and competence factors specific to the IDDS teams that involve multiple players representing the construction supply chain? How can the early identification of these factors help better team management and enhance team efficiency? This research adopts an interdisciplinary approach to investigate these questions. The findings reported in this paper are part of an ongoing research that aims to develop a framework for teamwork in IDDS teams, based on the constructs of mental models. The framework is intended to form the basis for a computer simulation tool, which can support team management decisions and formation of IDDS teams in large construction projects. The research plans and objectives are presented in the paper.

**Keywords:**

Teamwork, mental models, construction supply chain, integrated design and delivery solutions





**P1128**

## **A Review of Different Approaches to Access and People Circulation within Health-care Facilities and the Application of Modelling, Simulation and Visualisation**

M. Nazarian, A.D.F. Price and P. Demian

*Loughborough University, department of Civil Engineering, UK*

**Abstract:**

Evidence suggests that improving access and people circulation in hospitals can: improve staff performance and productivity; enhance patients' safety, privacy and rate of recovery; minimise the risk of cross-infection; reduce the delay time of external service delivery; create a more welcoming environment for visitors; and reduce the evacuation time in emergency situations. Consequently the need to design hospital layouts that benefit from the most effective system cannot be over-emphasised. This paper focuses on identifying different systems of access and people circulation in health-care facilities in general and hospitals in particular. The research on access and people circulation reported in this paper comprises three main phases. The first phase involves a literature review of existing health-care environments to identify different types of access and people circulation requirements. The second phase focuses on categorising the adopted approaches and systems in order to compare and contrast the advantages and disadvantages of each. The final phase provides a critique of current modelling and simulation tools being applied during the planning and design phases to improve access and people circulation. The paper concludes with recommendations, which will be used to shape future research in the area.

**Keywords:**

Accessibility, Circulation, Layout Design, Hospital, Healthcare, Simulation, Modelling



**P1131**

## **Communication vs Information in the Building Process**

I. Svetoft

*Halmstad University, Sweden*

**Abstract:**

There are severe problems in the Swedish construction sector due to a communication gap between the actors involved. A report from Svensk Byggtjänst in 2007 declares that this gap costs 2,3 billion Euros a year. Can the digital arena replace the meetings between the actors involved or is it even more necessary to work with communication skills and human relations? All tools available that can be of importance for the process and the product must be used. Is it possible to combine low-tech and high-tech methods for communication?

With an end-user perspective, in order to keep focus on how to get the best quality of the product, this paper will discuss the risk to rely on the digital techniques to solve the problems with the communication gap. The discussion in this paper will use the report made by Svensk Byggtjänst (2007) as a reference where 240 interviews were done with different actors about how the investments were used in the construction industry.

The objective of this paper is the question of how digital techniques can support the communication between the actors involved, especially when involving the end-users into the building process. The method of performance of this research contains literature reviews and experiences from case studies. The result is an overview of how different communication tools can support the collaboration between the actors involved. The contribution of this research is a discussion of different kind of communication and a reminder of the dialogue as a basic tool for communication.

**Keywords:**

Communication, information, collaboration, dialogue, digital tools, arena for communication



## P1134

### The Building Design Process in the Context of Different Countries

#### *Similarities and differences of professional practices*

S.B. Melhado, M. Fabricio, S. Emmitt<sup>1</sup> and D. Bouchlaghem<sup>1</sup>

*University of Sao Paulo – Brazil <sup>1</sup>Loughborough University*

**Abstract:**

Despite the historical, economical and socio-cultural disparities between the realities of different countries, it is also possible to see several similarities all over their design processes and practices. Building design is a unique process that has the same remarkable basic characteristics in any Western Nation, such as the need for design to be split up into stages, the multidisciplinary character of the design decisions despite the low collaboration level between design specialties and the inherent conflict between the viewpoint from market-based inception and further construction-driven requirements. These common points taken into consideration, each particular national context can lead to a singular environment in which the building design practices are embedded. Some of the most relevant context issues involve the construction regulatory and standardisation systems, availability of handbooks and guides, corporative patterns of professional activities, costs of manpower and education concerns. The aim of this paper is to present a contribution to the analysis of the building design process that emphasises the similarities and differences of the main practices actually conducted in Europe and Brazil. Research methods included a comprehensive literature review, records from case studies and interviews carried out by the authors. As a result, a set of influencing factors is presented in the final section of the text.

**Key words:**

Architectural management, design process, Brazil, Europe



## P1135

### Challenges for Implementation of a New Model of Collaborative Design Management: Analyzing the Impact of Human Factor

L. Manzione<sup>1</sup>, M. Wyse<sup>1</sup>, R.L. Owen<sup>2</sup>, S.B. Melhado<sup>1</sup>,

*<sup>1</sup>University of São Paulo <sup>2</sup>University of Salford*

**Abstract:**

The ineffectiveness of current design processes has been well studied and has resulted in widespread calls for the evolution and development of new management processes. Even following the advent of BIM, we continue to move from one stage to another without necessarily having resolved all the issues. CAD design technology, if well handled, could have significantly raised the level of quality and efficiency of current processes, but in practice this was not fully realized. Therefore, technology alone can't solve all the problems and the advent of BIM could result in a similar bottleneck. For a precise definition of the problem to be solved we should start by understanding what are the main current bottlenecks that have yet to be overcome by either new technologies or management processes, and the impact of human behaviour-related issues which impact the adoption and utilization of new technologies. The fragmented and dispersed nature of the AEC sector, and the huge number of small organizations that comprise it, are a major limiting factor. Several authors have addressed this issue and more recently IDDS has been defined as the highest level of achievement. However, what is written on IDDS shows an extremely ideal situation on a state to be achieved; it shows a holistic utopian proposition with the intent to create the research agenda to move towards that state.

Key to IDDS is the framing of a new management model which should address the problems associated with key aspects: technology, processes, policies and people. One of the primary areas to be further studied is the process of collaborative work and understanding, together with the development of proposals to overcome the many cultural barriers that currently exist and impede the advance of new management methods. The purpose of this paper is to define and delimit problems to be solved so that it is possible to implement a new management model for a collaborative design process.

**Keywords:**

BIM, Collaborative Design, IDDS, Design Management.



**P1137**

**The as built monitoring plan, a supporting tool for building management, *Dwellings in Cava dei Tirreni (SA, Italy)***

S. Viola

*Università degli Studi di Napoli, Federico II*

**Abstract:**

The paper introduces the first results of a research in progress at the Dipartimento di Configurazione e Attuazione dell'Architettura, dealing with procedures and tools for managing buildings' life cycle, fulfilling the contemporary challenges posed by the processes of degradation in the environment. The proposal is aimed at new buildings, providing a management response to issues of degradation, focusing on anticipating failures, organizing works. The emergences posed by climate changes and the new awareness of energy efficiency, are the scientific starting point of an investigation on procedures and supporting tools to prevent and control the occurrence of unknown dynamics of aging, degradation, failure. The research introduces the as built monitoring plan, a multi-scalar control register for new buildings, structured on the basis of a critical de-composition of the building system in environmental units and constructive analysis of the technical elements. The plan reports the as built information, systematizes knowledge in a relational grid, links performances data to spaces. The research is scientifically founded on a vision of building as a yard, a set of interconnected nodes of monitoring - located inside and outside - dedicated to the systematic detection of changes in status indicators on the basis of an experimental integration among different procedures. The principles underlying the drafting of the plan are: integrity of the object observed, fast relief, ability to provide quantitative and qualitative data, ease of return. The plan realized for new dwellings realized in Cava dei Tirreni (Sa) provides an opportunity to reflect on the completeness and incisiveness of the approach, relating it to: sources of knowledge, sensitive indicators and frequency of data acquisition and analysis.

**Keywords:**

Dwellings, management, preventing, aging



**Nr: P1138**

**Implementation of Quality Management System on architecture offices as a requirement for sustainable design, *Case Studies***

M. Santos Salgado

*Universidade Federal do Rio de Janeiro (Federal University of Rio de Janeiro – Brazil)*

**Abstract:**

The concern with quality management systems initiated on 1990 through ISO 9001 regulation. In Brazil, the improve of quality on civil construction industry have been stimulated after 1998 through the Federal Government PBQPh – Brazilian Program for Quality and Productivity in the habitat – which proposes the quality improvement of construction enterprises through the progressively compliance with the requirements of ISO 9001. The architecture offices were the last to join this initiative with the establishment, ten years later (on 2008), of a program created specifically for them. At the same time, during the last part of 20th century, design methods for sustainable buildings have emerged all over the world. Europeans have taken the sustainable construction as an important goal to be achieved, particularly considering the necessity of reducing energy consumption. Among the methodologies for sustainable design that have made their way to Brazil, the French one (HQE®) has been adapted, resulting in the AQUA Brazilian certification. The main contribution of this paper is to analyze the relation between the existence of an implemented quality management system on design offices and its influence on the design management process for sustainable buildings. Constructors and architects have been interviewed in order to get their opinion about this subject. Results obtained testify the relation between an organized quality management system as a requirement to produce sustainable buildings through the integrated design..

**Keywords:**

Sustainable Design, Design Management, Architecture management.



**P1139**

## **Conceptualizing Design Management for Construction Projects**

*Bridging the Gaps between Urban Planning, Architectural, and Engineering Design*

V. Zerjav<sup>1</sup>, T. Hartmann<sup>2</sup>, Ch. Achammer<sup>1</sup>

<sup>1</sup>Vienna University of Technology, Vienna, Austria. <sup>2</sup>University Twente, AE Enschede, The Netherlands.

**Abstract:**

The aim of this discussion paper is to propose an inclusive definition of design management for the construction industry. This definition is based on reducing the separation between several fields of activity that have, to date, mostly been elaborated independently. These fields of activity can be broadly grouped into the phase-based and disciplinary design conceptualizations. The differences between the conceptualizations are mainly a result of domain-dependent approaches to the design problem in construction. Based on these differences, construction projects form their design supply chains and delivery methods. Urban planning and architectural design, for example, strongly implement criteria of aesthetic and social value into their processes, whilst focusing less on technical aspects of the project. In such a constellation engineering design can be considered as a commodity in the process. In this traditional representation, engineering is embedded into the architecture of the facility and, respectively, architecture is embedded into the urban planning of the area. Instead of traditionally emphasizing the differences between different planning tasks, this discussion argues for a common representation of design operations in the construction sector. This representation defines design as a group of tasks that share characteristics of the planning problem. Preliminary conclusions of this theoretical discussion suggest that the design process can be grouped into its conceptual and detailing components. In this vein, each discipline reaches the concept solution in a different time-frame and subsequently elaborates the concept solution. In conclusion, this discussion proposes that the flow of design should not be divided in terms of disciplinary and phase-based boundaries, but in terms of conceptual solutions and detailing of each of its constituent parts. The implications of this discussion can be generalized at the level of both construction project management, as well as public policy development.

**Keywords:**

Design management, Planning problem, Construction project management, Interdisciplinary processes



**P1140**

## **Main Aspects for Modelling Networks of Practice**

*Profiling network organizations  
for small- and sole- architectural practices*

I.A. Iliescu, A.G.L. Romme, T.J.P. Goossens  
*Eindhoven University of Technology, the Netherlands*

**Abstract:**

Networks of practice are increasingly important as resources to organizations. They are means to satisfying an objective or need, such as sharing knowledge or bringing products and services to the market. Practitioners and members of networks of practice have indicated the need for theory-grounded network models that respond to the members' needs and ambitions. This paper presents a theoretical approach to the design of network models for sole and small architectural practices, with a specific focus on three main attributes: the production-oriented, the knowledge-sharing and the innovation oriented network. Using axiomatic design theory as a framework, we propose three design network models, each dealing with six main aspects of network activity coordination. The prescribed models give practitioners in emerging design networks the means to better understand, define and manage their organizations.

**Keywords:**

architectural design; design theory; network models; network design; axiomatic design;





**P1141**

## **Assessment of Buildability Information for Designers**

Kumar, L.C.M. Tang, R. R. Zou  
*University of Reading U.K.*

**Abstract:** Construction is a process through which architects render design (client's idea) into practicality. The processes during the construction are mainly due to the availability of information based on present situation to be ready to be transferred for future use. The construction process is known as a fusion of several disciplines and this feature leads to multidisciplinary information flow. In the digital information age there is an urgent concern that the right information needs to be transferred in a right format and quantity at a right time to a right person with a reasonable cost over a multi-principles information platform. This paper aims to exam the optimum level of information (quality and value) to be provided on construction site in a way of minimising errors (e.g. human error, drawing error, and information interpretation error). A questionnaire survey was conducted among site managers in the UK to collect their perspectives on the utilisation of high value and quality information being produced by designers. An information evaluation model was developed on the basis of Bayesian network theory for data that are stemmed from the questionnaire. The result of the research indicated that information must be integrated to enable collaborative production in construction; high value information needs to be generated although it has diverse interpretations among different stakeholders. The significances of various information attributes playing in relation to the increase of information value were exposed in this paper for site managers. A future research concern was flagged up by the respondents that the generation of high value information must be balanced between its costs and benefits directly and economically.

**Keywords:** value, quality, information maturity, evaluation model, collaborative production

## Detailed Conference program

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<b>1st day Thursday October 13th</b>	location: TU Wien, Karlsplatz 13, Vienna
8.00 - 8.40	Registration , meeting and greeting
8.50 -9.00	Opening of the Conference by Ad den Otter and Stephen Emmitt, joint organizers
9.00 - 09.45 Key note speaker	Prof. Christoph Achammer, University of Vienna, conference host
09.45 - 10.00	Tea - coffee break

Time period	Paper ID	Authors
<b>10.00 - 11.20 Paper Session 1</b>		
Session chair: W. Zeiler	1 P1125	V. Singh, K. vonTreuer and K. London
	2 P1109	C.T. Tzeng, Y.H. Pan and S. Emmitt
	3 P1116	K. London and V. Singh
	4 P1101	R. Luck
11.20 - 11.35 Tea- coffee break		
<b>11.35 - 12.35 Paper Session 2</b>		
Session chair: K. London	5 P1107	I. Kovacic and St. Faatz
	6 P1121	W. Zeiler
	7 P1140	I.A. Iliescu, A.G.L. Romme, T.J.P. Goossens
12.35 - 14.00 Lunch		
<b>14.00 - 15.00 Paper Session 3</b>		
Session chair: R. Luck	8 P1139	V. Zerjav, T. Hartmann, Ch. Achammer
	9 P1102	T. Bock and T. Linner
	10 P1108	K.M. Huang and C.T. Tzeng
15.00 - 15.15 Tea-coffee break		
<b>15.15 - 16.15 Paper Session 4</b>		
Session chair: C.T. Tzeng	11 P1117	H. van Zeeland
	12 P1135	L. Manzione, M. Wyse, R.L. Owen and S.B. Melhado
	13 P1114	M. Alharbi and S. Emmitt
<b>16.15 - 17.15 Workshop</b>		
Chair: S. Emmitt		Presenter: M. Alarbi

19.00 - 21.25 Conference dinner



**2nd day, Friday October 14th** location: TU Wien, Karlsplatz 13, Vienna

8.30 -9.00 Registration

9.00 - 09.45 Key note speaker Prof. Bauke de Vries, University of Technology Eindhoven (TU/e)

09.45 - 10.00 Tea - coffee break

Time period	Paper ID	Authors
10.00 - 11.20 Paper Session 5		
	15 P1141	A.Kumar, L.C.M. Tang, R.R. Zou
Session chair:	16 P1137	S. Viola
S. Melhado	17 P1122	W. Zeiler
	18 P1131	I. Svetoft

11.20 - 11.35 Tea- coffee break

11.35 - 12.55 Paper Session 6		
	19 P1113	S. Emmitt, B. Mertia, R.Garland, G. Lennon and C. Pasquire
Session chair:	20 P1105	M. H. El.Reifi and S. Emmitt
J. Smallwood	21 P1110	J. Schijlen, A.F. den Otter, Hj. Pels and W. Bertrand
	22 P1138	M. S. Salgado

12.55 - 14.00 Lunch

14.00 - 15.00 Paper Session 7		
	23 P1134	S. Melhado, M. Fabricio, S. Emmitt and D. Bouchlaghem
Session chair:	24 P1115	J. Smallwood
I. Svetoft	25 P1118	M. Padula

15.00 - 15.15 Tea-coffee break

15.15 - 16.15 Paper Session 8		
	26 P1104	A.Finneran, A. Gibb, P. Bust, J. Buckingham, C.Garcia
Session chair:	27 P1120	J. P. Sun Siva and K. London
B. Giddings	28 P1128	M. Nazarian, A.D.F. Price and P. Demian

16.15 - 16.30 Closure of the conference by Stephen Emmitt and Ad den Otter

16.30 - 17.30 Business meeting CIB-W096 AM by Stephen Emmitt

**Saturday October 16th**

9.00 - 12.30 Excursion to the Central railway station

INTERNATIONAL CONFERENCE CIB-W096 2011 VIENNA  
**ARCHITECTURAL MANAGEMENT IN THE DIGITAL ARENA**

**13 – 14 October 2011**

**Venue: TU-Wien Kupelsaal, karlsplatz 13, Vienna**