As established at IDS Workshop I at the meeting of the CIB Board in March 2006 at the Middle East Technical University (METU) in Ankara, Turkey, the IDS purposes were explored within the context of establishing a new theme of the three CIB proactive themes (sustainable construction, performance-based building, revaluing construction) and concentrating on the following: a coherent integration of these three themes within IDS; be strongly linked to the Working Commissions (WCs) and Task Groups (TGs) of the CIB and be oriented to the major stakeholders in building and construction.
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INTRODUCTION

This report is a summary of the proceedings from the Integrated Design Solutions (IDS) Workshop II held in Atlanta, Georgia, on September 27 and 28, 2006 (See Appendix A for the workshop program). The second IDS workshop began on Wednesday afternoon and continued the next morning with the goal of further defining how IDS could function as a priority theme within the framework of the International Council for Research and Innovation in Building Construction (CIB). Thirty-seven people attended the workshop, representing 18 countries and 5 continents (See Appendix B).

Dr. Thomas Galloway, Dean of the College of Architecture at the Georgia Institute of Technology, organized and hosted this second IDS Workshop, which followed the semi-annual board and committee meetings of the CIB. Founded in 1953, CIB is a worldwide network of building and construction experts who improve their day-to-day performance through international cooperation and information exchange with their peers. CIB is the acronym of the abbreviated French (former) name: “Conseil International du Bâtiment.” The English translation is the “International Council for Building.” In 1998, the full name was changed to the International Council for Research and Innovation in Building and Construction but the abbreviation CIB was kept.

In addition to the voluntary international cooperation projects in its Task Groups and Working Commissions, CIB operates through the so-called pro-active approach: the CIB Board, in consultation with the Membership, chooses priority themes, defines the envisaged deliverables for each theme and sets up a three or six year program. Components of such a program for each theme in this approach can be:

- committed projects to be carried out by the CIB Commissions
- collaborative Member projects
- targeted partnerships with other organizations
- if possible: funded programs

The established CIB Priority Themes, for which such programs have been developed, are:

- SC - Sustainable Construction
- PBB - Performance Based Building
- RC - Revaluing Construction

The CIB is currently exploring Integrated Design Solutions (IDS) as a fourth priority theme to complement and unite the three existing themes—Sustainable Construction, Performance Based Building, and Revaluing Construction—and to strengthen the other themes’ link to the working commissions and task groups.

The Program Committee of the CIB began discussions at their 2004 Brussels meeting for the development of IDS as a new priority theme. At the 2005 Madrid meeting, Peter Barrett, representing the University of Salford Research Centre for the Built and Human Environment and chair of the CIB Program Committee, argued for IDS as necessary to synthesize the themes for a coherent set of initiatives by the CIB and its Program Committee. Barrett proposed IDS as “the activity of bringing together the ideas, technologies, and people necessary to elegantly solve the challenges of particular projects” within building and construction. Further
discussions regarding IDS as a potential theme occurred in Tokyo, where plans were made to host a series of workshops on IDS.

Middle East Technical University (METU) hosted the first workshop in March of 2006 in Ankara, Turkey in conjunction with CIB’s spring board meeting. The purpose of this workshop, Towards A New Proactive Theme: Integrated Design Solutions (IDS), was to further conceptualize what IDS would mean within the context of CIB. The workshop presenters demonstrated how IDS could complement the existing themes by helping link them to form a unified set of themes, by strengthening their connections to the working commissions (WC) and task groups (TG) of CIB, and by having broad appeal to major stakeholders in building and construction. Organized and moderated by board member Professor Selahattin Önür from the Middle East Technical University, the participants in the workshop program included:

Peter Barrett, University of Salford, Board Member & Program Committee Chair
Thomas D. Galloway, Dean, Georgia Tech College of Architecture, Board Member
Arzu Gönenç Sorguç, Middle East Technical University
Mine Özkar, Middle East Technical University
Marcus Ormerod, University of Salford
Sezgin Kaya, University of Salford
Ghassan Aouad, University of Salford
Yiu Lam, University of Salford

The purpose of the second workshop in Atlanta was to further define the possibilities of IDS within the context of CIB. Board members, deans and directors of design schools from around the country, and experts in the design and construction industries from around the world participated in the Atlanta workshop.

Georgia Tech’s recently appointed Provost Dr. Gary B. Schuster gave the welcome and discussed how Georgia Tech’s College of Architecture interprets IDS through its integration of architecture, engineering, and construction in undergraduate and graduate curricula, specifically through its Common First Year program; the College of Architecture’s research in building information modeling (BIM) and interoperability; and its research and application of digital manufacturing and fabrication through computer-numeric-control (CNC) machines and parametric modeling.

There also were presentations on IDS and the Hong Kong Polytechnic University from board member Dr. Andrew Baldwin, the role of technologies in design and construction, and sustainability in construction. Georgia Tech College of Architecture Professors Fried Augenbroe and Chuck Eastman made presentations on their work related to AEC Integration. Dr. Soofia Tahira Elias-Ozkan from Middle East Technical University presented her ideas on the importance using a common language between built environment professionals.

The workshop ended with a panel discussion featuring the invited architecture deans and directors. Moderated by Dean Galloway, this discussion focused on design education, IDS, and globalization. Auburn University, New Jersey Institute of Technology, Texas A&M, University of Maryland, University of Minnesota, University of Pennsylvania, University of Nevada-Las Vegas, and the University of Utah were represented at the workshop.

Throughout the workshop, the audience raised a number of questions and made comments on their vision of IDS. Although there were many interpretations of Integrated Design Solutions and how they functioned within each person’s organization or agency, there was a consensus
that IDS could be utilized to benefit the design, engineering, and construction industry as well as related disciplines and professions in general and CIB in particular. Further exploration of IDS will continue through the Cape Town, South Africa CIB World Congress, May 2007.
SUMMARY OF PRESENTATIONS

This summary of presentations is designed to provide an overview of the Atlanta IDS Workshop II. In addition to the summaries, the workshop agenda, biographical information about the speakers and panelists, and the five major power point presentations given at the workshop can be found in the appendices following the summaries. After the formal presentations by Peter Barrett, Selahattin Önür, Andrew Baldwin, Charles Eastman, Soofia Tahira Elias-Ozkan, and Godfried Augenbroe, there was an opportunity for questions and discussion. The audience gave their reactions to the ideas presented and their personal interpretations of IDS. This discourse was lively and revealed the necessity of adopting IDS as a fourth pro-active theme of CIB.

Welcome
Dr. Thomas D. Galloway, Dean, College of Architecture, Georgia Institute of Technology

As host and moderator for the workshop, Dr. Galloway opened the workshop and welcomed the attendees to Atlanta, Georgia Tech, and the workshop. He also introduced Dr. Gary B. Schuster, Provost of Georgia Tech, who gave the official Georgia Tech welcome. Please see Appendix B for the biographical information on the speakers.

Provost Gary B. Schuster, Georgia Institute of Technology

Dr. Gary B. Schuster welcomed the participants to Georgia Tech and discussed how Georgia Tech interpreted the theme of Integrated Design Solutions (IDS). He explained that Georgia Tech interprets Integrated Design Solutions (IDS) as a counterpart to Architecture/Engineering/Construction Integration (AEC Integration), in which the Institute is actively involved in both its pedagogy and research.

Dr. Schuster pointed out that as a leader in engineering, design, and construction education in the United States, Georgia Tech provides an interdisciplinary curriculum for both the graduate and undergraduate students who are entering the built-environment professions. For example, all undergraduate students entering the College of Architecture—whether they are studying architecture, building construction, or industrial design—are required to participate in the Common First Year curriculum where they are exposed to the planning, design, engineering, and construction fields.

In terms of research, the College of Architecture has started an AEC Integration Lab to expand its research in building information modeling and interoperability. Led by Professor Chuck Eastman, who holds a joint appointment in the College of Computing, this initiative involves national architecture and construction firms, as well as students and faculty, who are experimenting with and developing new technological solutions to improving the way buildings are planned, designed, built, and operated.

The Advanced Wood Products Laboratory (AWPL) within the College of Architecture at Georgia Tech provides faculty, students, and members of the construction industry opportunities for research and application of digital manufacturing and fabrication
through computer-numeric-control (CNC) machines and parametric modeling, all of
which are integral to the full AEC integration within the industry.

Dr. Schuster ended his talk by stating that IDS fits in with Georgia Tech’s emphasis on
innovation, interdisciplinary education, and globalization. Thus, Georgia Tech supports
IDS as a proactive theme of CIB.

**Workshop Opening Remarks**

**Professor Peter Barrett, Chair, CIB Program Committee,**
**Research Centre for the Built and Human Environment and Pro-Vice Chancellor**
**Research and Graduate College, University of Salford, United Kingdom**

As chair of the CIB Program Committee, Professor Peter Barrett first introduced the idea of
adopting a fourth priority theme that he labeled Integrated Design Solutions or IDS in 2004. He
then crafted an argument for its necessity in the discussion paper “CIB Strategy
Implementation” (April 2005) that has served as the basis for CIB’s understanding and adoption
of IDS. In Atlanta, his presentation was entitled, “CIB Programme Committee Vision for
Transformational Change in Construction.” Professor Barrett explained that adopting IDS as a
pro-active theme would be closest to the beginnings of “Revaluing Construction” as a theme.
Both began without financial support. He suggested forming a commission to investigate IDS
and name two people to lead the efforts of the commission.

Professor Barrett purported that the basis of the CIB’s success can only be the vibrant, focused
activities of the Working Commissions and Task Groups. These are often curiosity-driven, but
even when they are solution-orientated they may not satisfy the complex needs of major
international stakeholders. Thus, there is tremendous latent value to be had from bringing
together these focused activities via carefully chosen proactive themes that link complementary
work around the concerns and interests of major international stakeholders to whom the CIB
has access and with whom it can develop strong relationships. Over time this scheme of
operating will be two-way, with greater impact for the work of individual members and enhanced
opportunities to understand these stakeholders’ requirements and so earn support for future
work.

Using a four-quadrant diagram, Barrett illustrated that a distinction exists between macro and
micro issues. His diagram purposefully showed these as extremes, thus representing
tendencies rather than absolute “types”. He further assumed that the balance of influence was
from macro to micro issues. Similarly a demand – supply continuum is suggested on the other
axis and here the arrows within the diagram suggested that on balance demand drives supply.

Barrett demonstrated an obvious link to the current and proposed CIB proactive themes and
suggested a feedback loop where the goal would be to provide practical working solutions in
creating sustainable built environments. IDS would encourage construction and facilities
industries that are organised in ways that ensure maximum value is created and equitably
shared by all stakeholders and that appropriate knowledge, frameworks, and norms support the
capacity to clearly express performance requirements and elegantly resolve multiple demands.
Wim Bakens, CIB General Secretary

The General Secretary of CIB Wim Bakens gave an introduction to CIB and its organization, focusing on the Pro-Active approach of CIB and the interdependent nature of the priority themes. He explained that the Program Committee of CIB is responsible for the CIB research- and innovation-related activities. It establishes the various 60 or so CIB Commissions (see Appendix B) that are central to the CIB organization. These may take the form of either a Task Group where there is a limited program that can be accomplished within a defined period, or a Working Commission. Each Commission has a defined scope, objectives, and a work program. The Commissions are chaired by a Coordinator or Joint Coordinators who facilitate the Commission's activities with the CIB Program Committee, the General Secretariat, and in some cases with outside organizations. The scope, objectives, and work program of each Commission are defined by its members and officially approved by the CIB Program Committee.

CIB has recently adopted the so-called pro-active approach in which the CIB Board, in consultation with the Membership, chooses two or three themes, defines the desired deliverables for each theme and sets up a three or six year program for their productions. At this time, the established CIB Priority Themes, for which such programs have been developed are: Sustainable Construction, Performance Based Building, and Revaluing Construction. The adoption of IDS as a Priority Theme would be the fourth. Components of such a program for each theme in this approach include, but are not limited to committed projects to be carried out by the CIB Commissions, collaborative Member projects, targeted partnerships with other organizations, and if possible: funded programs.

Secretary General Bakens sees great potential in adopting the IDS as a fourth theme. While the industry is further along in integration than the university, there is still work to be done with which CIB can facilitate through its programmatic agenda based on international cooperation and information exchange.

Recapitulation of IDS’s Development

“Summary of the IDS Workshop I”
Professor Selahattin Önür
Department of Architecture, Middle East Technical University (METU)

HIGHLIGHTS FROM THE IDS WORKSHOP I

Professor Selahattin Önür summarized the first IDS Workshop held in Ankara, Turkey, in March 2006. He began with a short background of IDS. The idea of IDS as a new priority or proactive theme was introduced in the CIB PC Meeting of September 2004 in Brussels. As a new proactive theme, IDS would be a strategic tool for the objective of creating a common focus for the disparate areas of research by the CIB Working Commissions and Task Groups, which were around 60 in number. The idea was elaborated in a paper presented in the CIB PC Meeting of April 2005 in Madrid. In this paper, IDS was considered as complementing the existing themes of Sustainable Construction, Revaluing Construction, and Performance Based Building. Interested Parties or “shareholders” involved and relevant research groups that were strongly related with IDS were identified and charted.

In the CIB PC Meeting of September 2005 in Tokyo, the Program Committee decided to continue the development of the idea of IDS as a new CIB priority theme in consecutive
workshops, with the initial ones to be during the CIB Meetings of March 2006 in Ankara, and again here in Atlanta.

The Workshop in Ankara aimed to bring together the variety of stakeholders to participate in working sessions. Out of the 60 invited 43 attended; 14 from research institutions; 12 from construction industry and building services; and 19 from universities. The aim to have the coordinators of WC’s and TG’s most related with IDS was not realized.

The first group of the presentations in Ankara addressed 3-D and nD modeling and explained how the multiplicity of the tools, disciplines, and increasing complexity of requirements in the multidisciplinary process of design was the basis of some definitive proposals. Among them was the employment of mathematics and algorithmic thinking for controlled and optimized solutions. It led to the idea of developing “software architecture” defined as an interface to moderate requirements of different users and customers. This would enable collaboration of different disciplines over a 3-D model, combining different knowledge domains. The ideas and practices related with building information modeling (BIMS) and interoperability were recapitulated. The future of IDS was seen in “nD Modeling” or parametric modeling which would allow for and address increasingly complex designs issues.

Proposal of algorithmic thinking was considered problematic and even restrictive, since collaborators over a 3-D model could have different ways of approach. Also, narrowing down to computing could leave larger social and economic issues unattended or unsolved; new design issues emerge that compel us to rethink design. New knowledge emerging with new technology and production methods has an impact that creates shift in design concepts, as well as in the relations between stakeholders. One consequence of “nD Modeling” with different collaborators is the issue of intellectual property rights.

Another major point made during the presentations was related to the impact of information and computational technologies (ICT) on education. It required a change of mind and changes in education. Also addressed was the need for a cultural, social, and process related education, and the need to eliminate “stove-piping” of disciplines in undergraduate education particularly, but in graduate education, as well.. There was a suggestion for CIB inventory of good practices in universities of the exposure of different disciplines to one another.

In the presentations made of practices in schools, it was shown how architectural schools were incorporating design computing with a sense for digital manufacturing and fabrication in their educational programs. There was the emphasis on iterative process from design to fabrication with illustrations from practices in these programs.

Professor Önür ended his overview of the Ankara IDS Workshop I by summarizing some of the questions and comments made during the discussion periods.

Who are the stakeholders of IDS and who would most likely be served by its promotion? An answer was members of the CIB, building owners, designers, constructors, and planners.

Ownership of the process model was yet another question. Why should the industry or business own it? Avoidance of expense of remedial work that would accrue afterwards and the penalties of building acts (i.e. discrimination acts) are seen to have become drivers for the business.
A point was raised that IDS, instead of being a priority theme, could be a Task Group composed of those working on multi-dimensional concepts with nD Modeling, which is at the moment the most actual subject. A related question and a given answer was:

*What is the difference between a priority theme and a working commission?*
IDS differ from a commission, since it is much more generic and theoretically has greater potential to connect to many CIB Commissions and Task Groups.

*What is IDS?*
It is a very general idea intended not to exclude, but to engage people in the discussion to appropriate it and turn it into something that would make sense for them, the AEC industry and the built environment professions.

*Who IDS is for? Who would be interacted with and what would be achieved?*
It is for leadership in setting the agenda and involving the stakeholders to create a change in the industry and the built environment.

*Is IDS for the owners or occupants at the time it is built, or for the life of the building?*
There is a need to look at it in a multi-faceted way in the long run.

*Isn’t there a need for building up a common language since there are a variety of stakeholders and domain knowledges involved?*
People are to come together and develop a capacity to communicate. So the need is rather to provide for people to come together.

“**Format for IDS Workshop II**”
**Dr. Thomas D. Galloway, Dean**
**College of Architecture, Georgia Institute of Technology**

Dean Thomas Galloway outlined the format for the IDS workshop, explaining that the first workshop in Turkey uncovered the need to hear more about IDS in practice and to understand better the existing IDS-related research initiatives of the design schools. Thus, the rest of Wednesday will focus on the intersection of practice and training with examples from Asia and the United States. The next day’s first session used sustainability as a lens through which architect Soofia Tahira Elias-Ozkan will outline her theory on the necessity of IDS as a communication tool, followed by Fried Augenbroe who will present case studies on how his students use integrated design solutions to meet design challenges. The workshop will end with Deans and Directors from United States design schools discussing how their schools address globalization, disciplinary integration, and international engagement as a contribution of further defining and refining the IDS theme.

“**IDS as Seen by Hong Kong Polytechnic University**”
**Dr. Andrew Baldwin, Dean**
**Faculty of Construction and Land Use, Hong Kong Polytechnic University**

**Title of PowerPoint:** “Integrated Design Solutions – A perspective from Hong Kong”

Dean Baldwin began by providing a background on the Hong Kong Polytechnic University’s Faculty of Construction and Land Use which includes the departments of Civil and Structural
Engineering, Building Services Engineering, Land Surveying and Geo-Informatics, and Building and Real Estate. He reflected on the Ankara workshop, highlighting some statements that he felt were critical to understanding how Hong Kong interprets IDS. These were:

- “architectural design is multi-dimensional”
- “the impact of information and computational technologies, (ICT), is strong”
- “with mathematics we represent, we do not think”
- A new way of thinking
- “the sufficiency of the designer to develop this type of thinking”
- “education has to change to lead students to cope with changes in design and design process”

Dean Baldwin then began his presentation in earnest, dividing it up into three sections: 1) Current IDS initiatives in Hong Kong; 2) Issues related to IDS; and 3) the Way forward with IDS.

In addressing Integrated Design Solutions through BIM, Dean Baldwin used Frank Gehry's work and the construction of Swire Headquarters in Hong Kong as case studies. He also pointed to Digital Product for CATIA, which contains a full range of building industry solutions that Gehry Technologies provides to its customers. Dean Baldwin foresees a complete shift in the process of designing, building, and managing projects. The design, fabrication, estimating, scheduling, etc. will all be integrated into one process or system that is computer based. The owners will own the model.

In introducing the issues involved with the full integration of the building industry, Dean Baldwin quoted one of the participants in the Ankara IDS workshop Tuba Kocaturk, “New knowledge emerging from new forms of technology and means of production create a shift not only in design concepts but also in relations between the stakeholders.” Baldwin listed the issues as,

- New types of systems
- Who has control?
- Who owns the model?
- Who decides on the knowledge included in the model?
- The importance of new procurement methods
- ‘The gorilla’ v ‘the guerilla’
- The changing role of the designer
- Long term educational issues

Dean Baldwin briefly discussed the “way forward” with IDS. Within Hong Kong, he argued for the path to be from educational institutions to the industry.
“An Assessment of the Role of Technologies in Design and Construction within the IDS Theme”
Professor Chuck Eastman, Director
Ph.D. Program, College of Architecture at Georgia Tech

Title of PowerPoint: “An Assessment of Technologies in Design and Construction and University Research Opportunities”

Professor Chuck Eastman began his presentation with a short summary of the current situation of integrating the architecture, engineering, and construction industry in the United States. He provided an overview of the types software products available to firms and argued for integrated or all-in-one firms to utilize these Building Information Modeling (BIM) packages. Following his introduction, Professor Eastman discussed BIM in more detail, explaining what it is, its driving forces, benefits, and likely impacts. He sees the shift from manual craftsmanship to machine and engineering craftsmanship as the emerging paradigm in the building industry. This necessitates the move to 3D parametric design and Building Information Modeling (BIM) for construction-level design. He used the steel industry as an example of computer integrated manufacturing and demonstrated how his work with precast concrete building industry provides one example of fulfilling the many possibilities of BIM through a university-industry partnership. He ended his presentation using Daniel Liebskind’s Denver Art Museum as a model case study of the benefits of BIM.

Under the leadership of Professor Eastman, the Georgia Tech College of Architecture served as technical advisors to the Precast Concrete Software Consortium (PCSC), a limited liability corporation (LLC) of major precast concrete producers from Canada and the USA. The PCSC formed with the goal of fully integrating the engineering, production and construction operations of its members through adoption of advanced information technologies (IT). Through a year-and-a-half review process, twelve proposals were evaluated and benchmarked, and Tekla, a Finland-based CAD company, was selected as the main developer of a new precast concrete 3D parametric modeling system. Prior to this development, the industry used a wide variety of “off-the-shelf” software, combined with varying degrees of customization, for all aspects of its business. These included software for estimating, design, drafting, manufacturing, inventory control, shipping, accounting functions, etc. The result was there was little or no interoperability between the applications and no coherence. A strong 3D parametric precast building modeling platform and a data model for precast concrete were lacking.

Professor Eastman contends that the basis for an effective 3D parametric modeling requires effective methods to articulate and embed expert knowledge into these systems, an objective of which Professor Eastman and his Georgia Tech team sought in their work with the PCSC. The purpose was to specify functionality of a strong 3D parametric modeling platform to replace computer-aided drafting for the precast concrete building industry. The platform allowed for efficient design and detailing of whole buildings and building assemblies and pieces, in a top-down manner.

The final product serves as a platform for automated structural design and more automated fabrication. Some of its major functions include:

- Support for the top-down modeling and automation of piece, connection, joint, and rebar generation
- Libraries for Parametric Piece, Connection, Joint and Others
- Integrated structural analysis, with automatic reinforcing and prestressing detailing
• Efficient, mostly automated, drawing and report generation
• Automated piece-mark and embedded numbering tools
• Dual representation of warping, cambering, and elastic shortening of pieces

In October 2005, Tekla released version 1.0 after four projects with 3 beta releases. Today, there are 40 companies using the Tekla platform. Professor Eastman listed its contributions and benefits to the precast concrete industry as the development of: process modeling that allowed automatic capture of domain information flows and derivation of supporting product model; diagramming methods enabled domain experts to depict parametric model design behavior; processes to coordinate the development of industry-wide parametric modeling specifications; and mechanisms to define multi-function parametric models in a way as to allow mixed means to resolve a function. It is with greater ease, less time, and lower costs that the industry can now design, engineer, and fabricate to order individual pieces. Professor Eastman and his team from Georgia Tech are currently involved in the Reinforced Concrete BIM Consortium, which aims for similar results as achieved with the PCSC.

Standard construction practices, as historically found in Ramsey and Sleeper’s Architectural Graphic Standards, are the shared cultural knowledge of the construction industry, which today are moving toward computer implementation. The National BIM Standard Project aims to put into practice a standard and integrated information model for the AEC industry. The National Institute of Science and Technology 2004 report, Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry, estimates that 15.8 billion dollars are wasted annually on interoperability in construction. As architecture is becoming an information-based and information-driven field, Professor Eastman maintains that no one design tool is adequate and essential to success in integration is the development of effective interfaces.

Professor Eastman further stated that while engineering forged relations with universities years ago, the same cannot be said for architecture. He sees that now is the time for such a relationship to be developed. There are new and changing technologies and tools, challenges of workflows, and more demanding systems. How to take advantage of these transitions is a question that Georgia Tech’s College of Architecture is investigating with their new initiative AEC Integration Laboratory. Professor Eastman is spearheading this partnership project between Georgia Tech and its leading AEC industry partners: Cooper Carry; Facility Group; Perkins + Will (Chicago); SOM (New York); Tectonic Network; Thompson, Ventulett, Stainbeck & Associates (TVS); and CUH2A.

The Lab was created to address issues of interoperability in the AEC industry and involves the Architecture, Ph.D., Building Construction and various other MS programs of the College of Architecture at Georgia Tech. It was initiated through a grant from Tectonic Network Inc. and supported with the financial help of Mr. Arol Wolford and Dr. Jane Wolford. The partners held their first meeting in August 2006 where they reviewed the new initiatives in the IT industry and the status of Building Information Modeling with the College of Architecture AEC Integration Lab faculty and students. The partners discussed strategic issues especially for architectural firms and their IT directors within the overall structure of the AEC industry and identified several initiatives that will be developed over the next year. These include the development of tutorials for companies (and the Georgia Tech students), to investigate creating a common object structure for parametric modeling, and demonstrate how construction time can be reduced by moving fabrication layout into design and developing a translator into a fabrication model.

As a real-life example of the potential of AEC Integration, Professor Eastman described how Daniel Liebskind’s Denver Art Museum was completed three months early with all contingency
fees returned and no Requests for Information (RFIs). Professor Eastman ended with the quote:

When revolutions occur, traditional means of operation are no longer effective. Traditional culture becomes unstable and new practices are explored to address the instability. Some social units will succeed and become successful, while others will not adapt and fade away. Revolutions are times of creation.

*Sustainability and IDS*

“IDS: Defining Its Possible Scope within CIB”
Dr. Soofia Tahira Elias-Ozkan
Department of Architecture, Middle East Technical University

Dr. Soofia Tahira Elias-Ozkan began her presentation by situating her experiences as an architect and an academic. Using sustainable designs as her case studies, Dr. Elias-Ozkan explored the theme of IDS for the built environment by looking into the areas of crucial collaboration from the point of view of formulating, communicating, exchanging, finalizing, and then implementing design solutions. She sees buildings as composed of many systems, each of which is designed by a different group of professionals; and each of these professions has their own criteria, systems and technical jargon. In order for these systems to operate in harmony, they have to be integrated into the design of the building. Integration itself requires coordination, cooperation, interaction, communication, understanding and, thus, a unified language.

Dr. Elias-Ozkan argued that the adoption of a common language is crucial to such collaboration amongst built-environment professionals. She noted that barriers to communication can be broken down if and only if a common language is adopted – be it verbal, visual or written. This in turn can be achieved if future professionals are trained to ‘speak’ a common language, which can be learned at the earliest stages of their training, i.e. during their formal education. Thus, curricula for teaching building construction professionals need redesigning.

Dr. Elias-Ozkan made a case for not allowing students to use CAD in their first years of design education, as it limits their creativity. Based on her years of experience as an instructor and user of CAD software (AutoCAD, ArchiCAD and 3D Max), Dr. Elias-Ozkan perceives the software as sophisticated drafting and presentation tools, which can also be a reliable platform for integrating the various A&E production drawings. However, she does not see software applications as the key to design integration, as championed by Professor Eastman the previous day.

In conclusion, Dr. Elias-Ozkan sees integration as one arena where CIB can play an important role, as within its folds leading research and educational institutions are already interacting and sharing ideas. Hence, they can be instrumental in promoting IDS through their curricula in such a way that it does not limit design and fosters interdisciplinary collaboration.
Professor Godfried Augenbroe began with an overview of the building technology area within the College of Architecture. Its faculty consists of Fried Augenbroe, who specializes in building simulation, performance assessment, A/E interface, building diagnostics, energy, acoustics and sustainability, and Ruchi Choudhary, who specializes in design analysis, computational fluid dynamics, and optimization studies. They have ten Ph.D. students and six Master of Science students with whom they are working. They collaborate with Chuck Eastman and Craig Zimring, who are also on the architecture faculty, and with the Tennenbaum Institute, the Woodruff School of Mechanical Engineering, Industrial Systems Engineering, and the College of Management at Georgia Tech. Their major projects include: advanced simulation model for decathlon solar house competition, building performance toolkit for the General Services Administration, Design Analysis Integration (managed interoperability), post-Katrina healthcare guide, knowledge management in communities of practice (CoP), and collaborative engineering: e-HUBs (European Union project). He also gave some example of Ph.D. theses of recent years that includes a range of topics from concert hall acoustics to a theoretical exploration on whether building construction itself is becoming unsustainable.

Introducing himself as a hard-core simulator, Professor Augenbroe provided an outline of his presentation that addressed performance and design rationality, a systems view, research into design analysis integration (DAI), and integrating rational design studies into pedagogy. He ended by posing questions on the use of performance-based design of technical building systems. He views the importance of his AEC Integration work not as the interoperability between software but as maximizing and supporting the dialogue between human beings.

Professor Augenbroe presented his ideas on introducing the concepts of performance and design rationality into building. He questioned if design performance could be made an objective statement? And if so, can it yield satisfactory results? He further questioned whether design performance can be subjected to rational decision making. He suggested that absolute and relative performance and decision making based on differential performance (used in comparison of discrete design options) were possible. He sees the advantages of such quantification as better control of the process and product, transparent decision making, a more linear process, and an enabler of co-engineering. He ended this portion of his presentation with a discussion on performance versus quality, where performance is specific, never general, neutral, objective, and aggregates into utility. He defined quality as “a set of characteristics that are perceived to contribute to value” and as subjective, general, not quantified, and does not aggregate.

The next part of Professor Augenbroe’s discussion focused on a systems approach, as defined by Herb Simon’s design theory, and based on a performance-based framework (Herbert A. Simon, The Sciences of the Artificial, 1969). This framework introduces functionality, quantification, and tools for measuring performance to the system. He did this by using a systems view and a Generic Architecture Reference Model (GARM) to illustrate how technical solutions and performance indicators interact within the building process. The challenges as Augenbroe sees them are can we identify the relationships between the most relevant functions and the technical systems that perform them and can we quantify the performance levels in
objective Performance Indicators. Within his own work, Augenbroe asks, can we make platforms that support rational design dialogues and can we teach students to work with them?

Such a platform for design analysis integration would include the following:

- Manages the BIM (or many BIM parts)
- Embeds modularized set of analysis functions (automatic delegation to software)
- Computes each analysis function exactly one performance measure
- Manages design dialogue based on discrete set of performance measures
- Establishes process management as a prerequisite for integrated design analysis

As an exploration in the validity of applying rational performance methods to design decisions and in integrating these methods into the architectural curriculum, Professor Augenbroe had his students revisit previous design projects from their portfolios. He presented three case studies from his students’ work where they examined a discrete design decision from one of their earlier projects now using quantifiable performance indicators (PI). The first student looked at the question of an atrium versus a courtyard in a healthcare facility. The next student investigated the choice between a steel or concrete roof structures in a dance studio. The last student questioned his choice of a suspended or not suspended ceiling in the design of a lighting system. While the students’ responses to the validity of the project varied, for the most part the students came to the same design conclusions using a rational approach.

Throughout his presentation, Professor Augenbroe posed questions regarding the use of applying rational performance. Rather than making any concrete conclusions, he ended his presentation with more research questions to consider regarding using a rational performance-based approach to design. His final questions were:

- How are we going to define necessary/sufficient Performance Indicators?
  - To be cover a significant percentage of recurring dialogues?
- Can we control the number of Performance Indicators (granularity, system diversity…)?
  - Can we come up with a classification?
- Will rationalization lead to the capture of best practices?
  - How should dialogues be conducted in integrated delivery processes?
- Framework or heuristics and expertise?
  - What is there to gain?

Professor Augenbroe left the audience with the thought “many questions…not enough answers.”
SUMMARY OF ACTIVITY IN US DESIGN SCHOOLS

Each panelist was asked to discuss how their home institution addresses globalization, disciplinary integration, and international engagement. Dean Thomas D. Galloway introduced the panel and moderated the session.

Professor J. Thomas Regan, Dean
College of Architecture, Texas A & M University

Dean J. Thomas Regan began his presentation by describing the different programs of the College of Architecture at Texas A & M University. There are 2,000 students and faculty in the College. Within their College of Architecture, there are three departments: the Department of Construction Science, the Department of Architecture, and the Department of Landscape Architecture. The College offers twelve degree programs from bachelors to Ph.D. Dean Regan said that the College research focus is interdisciplinary through five research centers: Center for Health Systems and Design; Hazards Research and Recovery Center; Center for Leadership and Management in the Design and Construction Industry (CRS Center); Center for Heritage Conservation; and Center for Housing and Urban Development. These centers, composed of faculty members from all three departments of the College, are one component of the College’s “strategy of disciplinary integration” for faculty members…and for students. Each research center offers a certificate program for graduate students in all masters and PhD programs throughout the College. Certificates in Healthcare Architecture, Hazard Reduction, and Facility Management are the most popular.

Another way the College practices professional integration is through the design studios, which by their nature integrate the professions, although situated in separate departmental disciplines. Special cross-disciplinary undergraduate and graduate studios combine students and faculty from architecture, construction, landscape architecture, and planning who work in teams on a real-world project, often in conjunction with a professional firm. Cross-disciplinary studios are excellent integration experiences, but they are difficult because it forces people and disciplines that do not usually work together to do so and there is real incentive for the faculty members to participate. All studios have new leverage since the College has recently completed an “architectural ranch” which allows students to build full-scale prototypes and to test full-scale building components.

Professional integration for students is also accomplished through the College’s requirement that each student spend a long semester away from campus. A student may study abroad in one of the College’s programs in Germany, Italy, or Spain, studying with students from other disciplines, other universities, and other countries. Instead of study abroad, a student may select an internship with an architect or contractor, either in the U.S. or abroad. Dean Regan stated that as he spoke there were about 45 construction science students currently working on the United States Embassy in Beijing. For students, a master’s theses and a doctoral dissertation also serve as an integrator because of the requirement that faculty members from different departments participate on each student’s committee.

An individual faculty member established a unique international integration vehicle at the College. Dr. Guillermo Vasquez started the Las Americas Network, composed of 32 schools of architecture from Texas to Chile, connected through the Internet. Each fall semester a different twelve of the 32 schools conduct a joint studio working on the same project. The faculty members for all twelve schools are involved, and they review all of the students’ projects. The
Network operates through an interactive video system that allows the students and faculty from all of the schools to see and talk to each other about the project.

Dean Regan cited digital technology as another key integrator for both student and faculty. Each student is required to have a laptop, and extensive wireless land networks allow flexibility throughout the Colleges four buildings. Rapid prototyping machines, computer driven shop equipment, and laser cutters facilitate three-dimension models quickly. Special projects that require considerable teamwork in complex design and construction efforts, such as the Solar Decathlon, also instill a spirit of integration through collaborative work.

In closing, Dean Regan remarked that traditional curricula and departmental turfs are “structured to isolate people;” there is considerable inertia to overcome as we work toward integration of the disciplines and professions. The College of Architecture Professional Advisory Board of the College, which involves leaders in the built environment professions and industries, are a real asset in the continual effort to integrate teaching, research and service. They all tell us that the world of work is not subdivided; everyone works together for the good of the project.

Dr. Gary Hack, Dean and Paley Professor
School of Design, University of Pennsylvania

Dean Gary Hack began by thanking Dean Thomas Galloway of the Georgia Tech College of Architecture for bringing the group together. Dean Hack sees one of the real agendas of this meeting is “to get deans out of their schools and make them think about what they are doing. Tom is very good. Tom is the educator of the educators.” Dean Hack stated that he did not have a sharp message on integration because he sees it as a “wooly topic.” He views globalization, integrated design, and architectural education as a set of topics with each being “moving parts in their own right.”

Dean Hack sees there are to two stages that a digitally driven revolution goes through. The first one is that the new tools and techniques are “grafted onto the existing processes,” but you do not radically change what you are actually doing. The second phase is that you “reinvent what you are doing to take advantage of the new tools.” Dean Hack sees that Penn is on the cusp of these two stages and that they have made a lot of changes as a result of the new tools and techniques. Penn went digital in all of their teaching about eight years ago and it has taken all of this time to make the transformation. Currently, there are only 2 or 3 out of 30 or 40 people teaching design that were teaching eight years ago. Penn had to reinvent all of their introductory classes and think up new protocols for teaching digitally.

Penn has done a number of experiments in teaching cross-cultural design studios with Taiwan, China, Japan, and some with Europe. There are cultural differences in the ways in which one thinks about design in practice and building. It is important to expose students to these different ways of thinking in order to train students to have effective collaborations with all different types of people. Dean Hack found that it is easier to collaborate with schools in Asia than in Europe because Asian universities are much more similar to the United States. Penn has created a number of joint programs. One of which is a joint center for building simulation and energy modeling with Tsinghua University in Beijing (Penn-Tsinghua T C Chan Center for Building Simulation and Energy Studies), where there are research groups at both Penn and Tsinghua working on the same problem. They come together once a year to share results and construct a common agenda. In the meantime they communicate electronically. Although in its initial stages, Dean Hack sees this partnership as an important experience.
This year for the first time Penn School of Design had a real integrated design studio using BIM technology. Dean Hack observed that he thought it was interesting that the advance in particular fields, such as energy or structural analysis, have created distance from the design aspect; thus, the integrated design studio is Penn’s attempt to pull all this knowledge together and bridge the divide. Penn also uses technologies to integrate faculty who are abroad. In between the faculty visits to campus every 2-3 weeks, the faculty use web-based video and direct feedback to communicate with students.

Penn has a program called Penn Praxis, which gives students an opportunity to have practical experience with outside clients. They currently have about 70 projects and have recently completed their first architectural projects. They are currently building houses. These projects are designed to get faculty engaged with students on real projects. One of the upcoming large projects is the re-planning of Delaware River Waterfront in Philadelphia using faculty and others.

Dean Hack states that in envisioning what the future will look like in ten to fifteen years in practicing or building, you set your sets on developing your capabilities and then you move there. Dean Hack sees several ways for Penn and other design schools to move toward. The first is already becoming prevalent and that is the linking production with the design of buildings; and the concurrent design, engineering, and construction of buildings. He sees that Japanese firms have done a better job at integrating than the United States and have developed protocols for doing this type of work.

Secondly, because there is more collaboration among firms in different places, design schools could for example put a greater value on teaching people how to work in teams and teaching leadership skills to their students.

The third trend that Dean Hack sees is the branding of architecture; not in the sense of Frank Gehry’s designs that are instantly recognizable, but in the specialization of firms in a building type that reflects accumulated expertise based on research and experimentation. For example, firms that specialize in the medical area and know what systems work and do not work. Dean Hack sees a weakness in the traditional way of designing one-of-a-kind buildings without a prototype and having systems that do not work. He foresees it becoming a necessity and a reality that firms must repeatedly using techniques and technologies in multiple buildings. Penn has several examples, including the work of faculty members Karen and Jim Timberlake, who have done several off-site fabricated buildings. Each building has been an advance on the technology used before in which the knowledge is carried forward and marketed as a solution, not to all buildings, but to a certain class of buildings. He sees the future in organizations that are fueled by research and experimentation and cites Arup as a success story. He thinks that there must be alliances between schools and research-based organizations where research-based practices will become increasingly important. For schools, this means that they must become portals to educational and work opportunities rather than discrete educational systems that start in the first year and end when the students graduate.

Dean Hack’s last point is that if the field truly begins to think of integrated building, repeat building, and experimentation then schools must rethink the processes of teaching, especially design. Instead of starting from the abstract and moving to the concrete, he can envision a process that may begin with an existing structure or building and the form is modified to create a better building as the project moves forward. He concludes that taking on such a change would require a “genuine rethinking of architectural education.”
Dr. Michael Kroelinger, Director  
School of Architecture, University of Nevada, Las Vegas  
Member of the Board of the Architectural Research Centers Consortium (ARCC)

Dr. Michael Kroelinger began his comments by providing some background on the University of Nevada, Las Vegas (UNLV). The school is only about 50 years old and the School of Architecture, which grew out of the engineering school, is only 22 years old. Its first class graduated less than ten years ago. Dr. Kroelinger came from Arizona State University with over 100 faculty members to UNLV with only sixteen full-time faculty members, 60 students, and no history of research. UNLV is very entrepreneurial and is growing rapidly. Given these details, Dr. Kroelinger, as director of the School of Architecture, is determining how best to lead the school to the next level.

The uniqueness of Las Vegas is critical to the path his school takes. Its focus is gaming and hospitality and the rapidness of their growth. This is central to what goes on at UNLV. The community is tearing down buildings (Stardust and Tropicana are next) quickly and building them even faster. For example, the resort Mandalay Bay was built in less than a year. Dr. Kroelinger has not ever experienced such rapid development, “its mind boggling.” The university is also growing quickly. It now has 29,000 students on a 335-acre campus that will hold a maximum of 35,000 students. UNLV has just signed a purchase agreement with the Bureau of Land Management for 640 acres north of Las Vegas and will be buying more land at the same location.

Dr. Kroelinger has great flexibility in his School of Architecture. The School has three academic programs. The graduate programs emphasize sustainability, urban design, and hospitality and gaming architecture. Their interior architecture program has been heavily involved in hospitality and “is quite mature in that area for a four-year program.” They also have “a small but engaged landscape architecture program,” which does a lot of work with the State Department of Transportation. There are about 60 students in the five-year LAR program. One of the reasons that Dr. Kroelinger came to UNLV was that there are “no departmental barriers” because of the smallness of the programs and size of faculty. David Ashley is the new president of UNLV. He has an engineering background. Dr. Kroelinger is hoping that this is a positive move for the School since he sees leadership at the top of the university is critical to disciplinary integration.

The School of Architecture has a close working relationship with the professional community from which they draw their up to 40 part-time faculty members. Within the school and the university, the students are 70-80% part time. The school’s students work, often within the professional firms in the community. These statistics pose a real challenge for academic delivery; however, they also provide unique opportunities.

In the curriculum, the School started to make the transition from autoCad, architectural desktop, 3D max, and formZ to BIM about a year ago. The change seems to be working. The professional community is looking to the University for guidance with the new architectural technologies.

Dr. Kroelinger switched gears to talk about research projects. The first was a three-year funded project to develop a renewable energy laboratory as a joint project with mechanical engineering. This project is funded by National Renewable Energy Laboratory (NREL), which has funded three renewable energy centers in Nevada. UNLV is responsible for solar in buildings, which provides a great opportunity to link architecture and engineering. NREL is providing a little over two million dollars spread over three years. The first year is spent doing strategic planning with
focus groups. The center will focus on research, education, training, and outreach. The center also will provide some seed money for projects. There are some space issues about where to house the center, but hopefully those will be resolved so as to bring the participating faculty together at one location.

The second one is a joint project between engineering and fine arts to offer courses between the School of Architecture and Entertainment Engineering and to create a center. UNLV sees a shortage of people who understand both the creative side of gaming and entertainment and the engineering side of the industry.

The School of Architecture has launched an interdisciplinary Downtown Design Center in collaboration with the City of Las Vegas, with whom the School has a close relationship. This effort grew out of a downtown design studio that focused on urban design. Now the School has a ten-year, dollar-per-year lease in the 1950s Fifth Street School for use as a design center. The center will include faculty from fine arts, visual arts, and maybe from engineering and business. Dr. Kroelinger sees this as the umbrella for the School’s research activities. The center will work on projects directly with the City and the community. He sees the critical issue for the School is to build a community presence and to be engaged with the community.

The School of Architecture is also trying to build relationships with other schools around the world. So far they are working with Thailand and Bangkok and are looking at a school in South America and one in Mexico. Europe has been a little harder to crack. Dr. Kroelinger recognizes that they are behind other architectural schools in these globalization efforts. However, UNLV has a great international programs office and he hopes to have three to five significant international activities over the upcoming years.

Dr. Kroelinger ended by discussing the Architectural Research Centers Consortium (ARCC). He pointed out that it had been around for about 30 years and that Georgia Tech had a role in its creation. He sees a real opportunity for its members to promote a research culture, partnerships, knowledge transfer, and technology exchange. There are about 50 schools involved, mostly from the United States. Dr. Kroelinger hopes that it can really make a difference in promoting a research culture in architectural education. Currently, ARCC and CIB are exploring the possibility of a collaborative relationship.

Professor Garth Rockcastle, Dean
School of Architecture, Planning and Preservation, University of Maryland

Dean Garth Rockcastle began by introducing himself and his School of Architecture, Planning and Preservation at the University of Maryland. He continues to practice architecture while being in academia. Although it is getting more difficult to do both, for him it is extremely relevant to understand the current changes in practices and in academia and to think through the many choices that the discipline(s) are facing through a number of lenses. While the University of Maryland is quite old, the School of Architecture is only 35 years old. The architecture program was established first and then the others—urban planning, historic preservation, and real estate development—followed; the size of the architecture program has remained essentially the same for that time period. Most of the faculty date to the period of the program’s founding and are beginning to retire. Currently, Dean Rockcastle finds himself in a period of transition where there is a lot of anxiety for the future.
Dean Rockcastle pointed to the tradition at Maryland for the comprehensive studio, which the students take in either their seventh or eighth semester (third or fourth year). He described it as an “extraordinary studio that is kind of a boot camp” through which the students must pass through to get to the final two studios that are more elective and dynamic in their focus. This comprehensive studio has a fully integrated curriculum between studio instruction, buildings systems, and structures. Every year its curriculum gets scrutinized however it remains a great source of pride for the program. Prior to coming to Maryland, Dean Rockcastle taught for 25 years at Minnesota where he led the department through the 1990’s. The last few years at Minnesota, he stepped down as head to start a comprehensive studio based loosely on the Maryland model. He found it exceedingly difficult at Minnesota to do so because there wasn’t enough coordination in the curriculum or collective will to follow through with it.

This year at Maryland, the School has begun the transition to BIM with ArchiCADD as its choice of software—after much debate. REVIT is also on the table but there is much anxiety over the adoption of the fully integrated software because it would mean throwing out the one inch equals a foot models that have served as educational foundation. Dean Rockcastle points to the many extraordinary wood models that have been built over the past twenty years and how “these models continue to teach because they are so substantively and elegantly built.” To give this tradition up would be painful. However, Dean Rockcastle has hired two new faculty this year versed in ArchiCADD and REVIT. These new professors are being challenged by the existing faculty on whether BIM is a good idea or not. Rockcastle reasoned, “You are not going to teach the grey old dogs like myself these new tricks.”

Dean Rockcastle repeated a conversation that he had with some colleagues a few nights ago about the difference between software which is geared toward a delivery process—a set of utilities which help design and have its imbedded information in it—and the notion of teaching and learning intelligence about buildings. It was stated,

> If only the folks that had developed this software had really come to educators to help think through what it is we need to do to teach these skill sets, to teach these thinking process insights, we could have helped them develop better and quite different software.”

Dean Rockcastle thought it would be helpful to have editing tools that deny students’ access to the choice of products embed in the software, which are shortcuts; and instead force students to actually construct the performance criteria and the hypotheses of buildings systems. This would be better for educational purposes and lateral thinking. He sees the problem as the software makes it too easy to make design or specification decisions without thinking through the underlying principles. However, the software has advantages in speed and dynamism. He thinks that architectural schools need to continue focusing on the thought processes as foundations for what we hope education should be.

Dean Rockcastle pointed out that another challenge for the software is that it is not yet friendly for adaptive reuse or the remaking of buildings, which is the fastest growing design commission source in the country. The emphasis on sustainability makes adaptive reuse essential. The challenge is to find effective ways to remake and make higher performing existing buildings.

Dean Rockcastle referenced Maryland’s participation in the Solar Decathlon and how it was an effective competition to bring into focus adaptive reuse and sustainability. Maryland is not obsessing over the criteria but is looking deeply at adaptive reuse and at re-appropriating materials. The competition is costing $800,000 for an 800 square foot prototype house; however,
they are putting a large amount of the money in curriculum development. This focus has allowed for greater fundraising success because the audience is receptive to the idea of developing a curriculum that is interdisciplinary and design-build oriented. Thus, Maryland has used the Solar Decathlon as a platform to make a fundamental shift in curriculum that takes the comprehensive studio model and moves it toward design-build and integrated practice.

Dean Rockcastle ended by discussing his work on developing partnerships with two companies—CoStar and Optura—to create interdisciplinary and dynamic enterprise between Maryland’s Architecture, Planning, Preservation, and Real Estate Development Programs. CoStar is a fast-growing virtual information company that provides real estate research information. “It is a three-dimensional visual system that has a fourth-dimension component in time and space.” Based in Maryland, the company offers new tools and new ways to model and analyze land and buildings; and provides to subscribers such information as value, rent rates, energy performance, and capacity for market expansion.

The other company is Optura, which is based on software that first originated in the defense industry. “It [the company] uses infrared triangulated point monitoring to pick up exacting information about the built world. It basically takes multiple positions and does a scanning of an existing environment and allows it to be represented three dimensionally [and] precisely ...within a micron.” It takes the burden and unreliability out of manually recording existing environments. Dean Rockcastle mentioned these companies because he believes that building relationships with such innovative companies is key for academia to stay at the forefront of technological change and help shape the tools and the tool sets so that educational institutions are more deeply rooted in lateral thinking and interdisciplinary activities.

Professor Daniel Bennett, Dean
College of Architecture, Design and Construction, Auburn University

Dean Daniel Bennett started with a brief description of Auburn, Alabama, and Auburn University. He said, “Auburn is either a large town or small city” with 50,000 people. The University has 23,000 students and the College of Architecture, Design and Construction has 1,300 students. The College has programs in architecture, landscape architecture, interior architecture, planning, industrial design, and construction. Most of their programs are undergraduate professional programs. The College does not have a Ph.D. program so their level of research is different from the others discussed. When Dean Bennett came to Auburn there was only interaction between architecture and interior architecture. The other programs had no relationships with each other. Dean Bennett has tried to improve this situation.

Auburn is one of twelve schools in the country with architecture and construction programs under the same umbrella (so is Georgia Tech and Texas A&M). Deans Bennett, Regan, and Galloway worked on a survey to poll these twelve schools on attitudes between the disciplines. There was a 40% return rate on 600 surveys they distributed to architecture and construction students. Only 17% of the students had a positive view of the other; 87% had a negative view. When asked if there exists a disconnect between the two disciplines, 87% of the students responded “yes.” When asked “if there is a disconnect in industry, do you believe that the relationship can be improved by addressing it in academia,” 89% said “yes.” The results of the survey pointed to a problem in academia that is carried forward into the industry.

Auburn has tried to correct the problem through their Rural Studio program and requiring all architecture and construction students to take at least one collaborative studio together. The
Rural Studio program takes students from the College and other schools around the county and world to one of the poorest counties in the country in Southwest Alabama to build facilities for the rural poor. The students spend a year there. The program was started under Dean Tom Regan’s tenure at Auburn for architecture students. Dean Bennett has extended it to include construction students in an effort they call “leveling through labor.” At first these students do not like each other, but they soon begin to understand each other and appreciate what the other brings to the table.

Auburn also offers an urban studio in Birmingham, Alabama. This program offers our students an opportunity to work collaboratively with many of the state's architects and actually spend significant time in their offices while a resident in the program. We schedule the year long program such that each student is assigned to an office. The semester is structured (including summer) whereby the student participant actually spends a maximum of 5 months out of the twelve month year in an office.

On campus, Auburn offers a collaborative studio between the architecture and construction programs. The faculty was resistant to the collaborative studio initiative. Thus, Dean Bennett placed two of the younger faculty members in charge of the pilot program. The result was that students who participated in it were excited and those that did not were mad that they did not have that experience. In these collaborative studio settings, the architecture students do the programming and schematic design work while the construction students are looking at the parameters such as the site and its size, constraints, and how it relates to the type of building needed. The construction students also utilize their budget, property, and scheduling skills. The teams work collaboratively toward a common goal; and at the end of the semester they are together in front of the jury defending their work. The idea is that this working together in academia will be translated into industry. Both the architects and contractors on the College’s professional advisory board have been supported of these efforts.

Dean Bennett sees technology as the key. The College is spending over two million dollars a year on technology. Fifteen years ago they did not have to include technology in the budget. This has been a challenge for all schools.

In 2002, Auburn entered the Solar Decathlon competition and came in third. They chose not to enter it again because of the amount of money it required to be successful. Dean Bennett and his colleague in Engineering raised $400,000. Colorado won that year and they have an advantage because they have been working on solar issues for thirty years. Because of time constraints, Dean Bennett ended his presentation.

**Follow-up Discussion to the Dean’s Panel**

This discussion centered on the challenge for architecture programs to balance professional experience with research and scholarship. The deans recognized the need for both practitioners and research-oriented faculty to help bridge the gap between academia and industry. There is resistance among the organizational structure of universities to change. It may actually turn out that there is a two-tier educational system. Several people pointed out that it was important to bring the knowledge and experience from the research centers into the classroom. Dean Tom Regan expressed frustration that the architectural associations and accreditation boards are not behind the move toward integration or are not addressing issues related curriculum, research, and practice.
CONCLUSIONS AND NEXT STEPS

The wrap-up for the Atlanta IDS Workshop II consisted only of a brief discussion due to time constraints. However, the authors wish to offer the following concluding thoughts:

- The challenge of developing a specific and agreed upon theme for IDS is large and may require an extended process. However, we have found in our sessions thus far an important extension of the boundaries of the discussion and a broadening of the participants engaged. It is clear, however, that we are not there yet, even though each of these sessions has brought the discussion in clearer focus.

- As suggested by the presentations and the panel of deans at the Atlanta session, integration of the built-environment disciplines and professions continues to be an extraordinarily important concern of the built environment fields. At least for a significant, if yet small, set of stakeholders, integration and collaboration (particularly among faculty and administrators) is appearing to be strongly advocated and an increasing number design, construction, planning, and development schools are taking up the cause. At both the Ankara and Atlanta workshops, participants discussed making a concerted effort to poll different colleges and universities for their best practices regarding IDS.

- Relatedly, it is also clear from this workshop and the preceding one at METU that the two workshops have brought important insights and challenges from the perspectives of the AEC faculty, academic leaders, and research scientists. However, these views are not sufficient. Missing views are those from the practitioners themselves and other disciplines who need to be further engaged, as well from students and additional design and construction schools and building research centers, particularly those in global hot spots, as well as in other regions where sustainability and globalization are reshaping their worlds.

- In the upcoming May 2007 meeting of the CIB in Cape Town, South Africa, one of our goals should be to define the next steps that will be needed to secure the views and voices of this broader set of stakeholders, as well as those of the many leaders of CIB Working Commissions and Task Groups.
APPENDIX A
PROGRAM

Wednesday, September 27, 2006

1:30 – 5:00  Integrated Design Solutions (IDS) Workshop II (Session I)
Moderator: Dr. Thomas D. Galloway, Dean, College of Architecture, Georgia Tech

1:30  Welcome and Introduction of Provost of Georgia Tech, Dr. Gary B. Schuster
Dr. Thomas D. Galloway, Dean, College of Architecture, Georgia Institute of Technology

1:45  Welcome
Provost Gary B. Schuster, Georgia Institute of Technology

2:00  Workshop Opening Remarks

Professor Peter Barrett, Chair, CIB Program Committee,
Research Centre for the Built and Human Environment and Pro-Vice Chancellor
Research and Graduate College, University of Salford, United Kingdom

Wim Bakens, CIB General Secretary

2:15  Recapitulation of IDS’s Development

“Summary of the IDS Workshop I”
Professor Selahattin Önür
Department of Architecture, Middle East Technical University (METU)

“Format for IDS Workshop II”
Dr. Thomas D. Galloway, Dean
College of Architecture, Georgia Institute of Technology

2:30  “IDS as Seen by Hong Kong Polytechnic University”
Dr. Andrew Baldwin, Dean
Faculty of Construction and Land Use, Hong Kong Polytechnic University

3:15  Afternoon Break

3:30  “An Assessment of the Role of Technologies in Design and Construction within
the IDS Theme”
Professor Chuck Eastman, Director
Ph.D. Program, College of Architecture at Georgia Tech

5:00  Adjournment
Thursday, September 28, 2006

8:00 – 12:00 Integrated Design Solutions (IDS) Workshop II (Session II)
Moderator:  Dr. Thomas D. Galloway, Dean, College of Architecture, Georgia Tech

8:00 Sustainability and IDS

“IDS: Defining Its Possible Scope within CIB”
Dr. Soofia Tahira Elias-Ozkan
Department of Architecture, Middle East Technical University

“Integrated Design Methods to Meet Sustainability Challenges”
Professor Godfried Augenbroe
Ph.D. Program, College of Architecture, Georgia Institute of Technology

9:45 Morning Break

10:00 Deans and Directors Panel on IDS in United States Design Schools

Each panelist will discuss how United States design education addresses globalization, disciplinary integration, and international engagement from the perspective of their home institution.

Panelists:

Professor Daniel Bennett, Dean
College of Architecture, Design and Construction, Auburn University

Dr. Michael Kroelinger, Director
School of Architecture, University of Nevada, Las Vegas
Member of the Board of the Architectural Research Centers Consortium (ARCC)

Dr. Gary Hack, Dean and Paley Professor
School of Design, University of Pennsylvania

Professor J. Thomas Regan, Dean
College of Architecture, Texas A & M University

Professor Garth Rockcastle, Dean
School of Architecture, Planning and Preservation, University of Maryland

11:30 Wrap-up: Issues for CIB/IDS in South Africa
APPENDIX B
LIST OF ATTENDEES

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Dr. Thomas D. Galloway, Dean and Professor
College of Architecture
Georgia Institute of Technology

Dr. Thomas D. Galloway is Dean and Professor at the College of Architecture, Georgia Institute of Technology, located in Atlanta, Georgia. He came to Georgia Tech from the College of Design at Iowa State University where he served as Dean and Professor from 1985 to 1992. He has also held faculty and administrative appointments at the University of Rhode Island and the University of Kansas.

Gary B. Schuster
Provost and Vice President for Academic Affairs
Vassar Woolley Professor of Chemistry and Biochemistry
Georgia Institute of Technology

Dr. Gary B. Schuster is currently provost and vice president for academic affairs and the Vassar Woolley Professor of Chemistry and Biochemistry at the Georgia Institute of Technology. Previously, he served as dean of the College of Sciences. Before coming to Georgia Tech, he was in the Chemistry Department at the University of Illinois for twenty years.

Professor Peter Barrett
Pro-Vice Chancellor for Research and Graduate Studies
University of Salford

Professor Barrett is Pro-Vice Chancellor for Research and Graduate Studies at the University of Salford where he is also a long-time member and ex-director of Salford’s 6* (top) rated Research Institute for the Built and Human Environment. He is also Chairman of SCRI, a £3M programme of research funded by the UK research council. Barrett is the current Chair of the CIB Programme Committee and is a Board Member.

Dr. Wim Bakens
Secretary General
CIB

Dr. Wim Bakens has been the Secretary General for CIB since 1994. Previously, he was a partner in one of the biggest Dutch Management Consultancies that focused on research in the construction industry. Dr. Bakens also worked with the Dutch ministry for Housing, Construction, and Physical Planning.
Professor Selahattin Önür  
Department of Architecture  
Middle East Technical University (METU)

Professor Selahattin Önür has been a faculty staff member at METU Department of Architecture since 1972. Involved in running the first year design studio and lecture courses, he has chaired his department since 1998. He became CIB Board and Programs Committee member in 2004.

Dr. Andrew N. Baldwin, Professor and Dean  
Faculty of Construction and Land Use  
Hong Kong Polytechnic University

Professor Andrew N. Baldwin is Dean, Faculty of Construction and Land Use and Chair Professor of Building within the Department of Building and Real Estate, The Hong Kong Polytechnic University. A civil engineer by profession he has worked as a planning engineer on a number of major construction projects and has extensive construction management systems design experience.

Professor Charles M. Eastman  
Director, College of Architecture Ph.D. Program  
Professor, College of Computing and the College of Architecture (joint appointment)

Professor Chuck Eastman is an architect and one of the pioneers of AEC CAD, developing research 3D modeling and early parametric modeling systems in the middle 1970s. He has directed research labs in both computer science and architecture at Carnegie-Mellon University, UCLA, and now at Georgia Tech, where he currently is Director of the College of Architecture Ph.D. program and runs the AEC Integration Lab, focusing on BIM application issues.

Dr. Soofia Tahira Elias-Ozkan  
Department of Architecture  
Middle East Technical University

Dr. Soofia Tahira Elias-Ozkan has been teaching at METU Department of Architecture since 1997. She has worked as an architect in Pakistan and Turkey for 17 years and taught part-time at the Department of Landscape Architecture and Urban Design at the Bilkent University in Ankara.

Professor Godfried Augenbroe  
Associate Director, Ph.D. Program  
College of Architecture  
Georgia Institute of Technology

Professor Godfried Augenbroe has a 25 year track record of research into the modeling and simulation of technical building systems. After spending the first 20 years of his career at TU Delft in The Netherlands, he is since 1997 a Professor at the Georgia Institute of Technology in Atlanta. Augenbroe is associate editor of two scientific journals and on the scientific board of five other international journals.
Daniel Bennett, FAIA
Dean, College of Architecture, Design and Construction
Auburn University

Dean Daniel Bennett has been the Dean of the College of Architecture, Design, and Construction at Auburn University since 2000. Previously, he served as the Interim Provost and the Dean of the School of Architecture at the University of Arkansas. Dean Bennett has been a practicing and license architect since 1974.

Dr. Michael Kroelinger, Director
School of Architecture
University of Nevada, Las Vegas

Michael D. Kroelinger is currently a Professor and the Director of the School of Architecture at the University of Nevada Las Vegas. He joined UNLV in January 2003. Kroelinger became a professor emeritus in the College of Architecture and Environmental Design at Arizona State University in 2003 after twenty-two years on the faculty.

Dr. Gary Hack
Paley Professor of City & Regional Planning
Dean of the School of Design
University of Pennsylvania

Dr. Gary Hack is the Dean of the School of Design and the Paley Professor of City & Regional Planning at the University of Pennsylvania. He teaches, practices, and studies large-scale physical planning and urban design and has served on the executive committee of the Association of Collegiate Schools of Planning and the Planning Accreditation Board.

Professor J. Thomas Regan, Dean
College of Architecture
Texas A & M University

Dr. J. Thomas Regan is the Dean of the College of Architecture at Texas A&M University. His major areas of research are design education, visual languages and design methodology. Dean Regan has served as dean at four major universities, and as national president of the Association of Collegiate Schools of Architecture.

Professor Garth Rockcastle, Dean
School of Architecture, Planning and Preservation
University of Maryland

Starting in July 2004, as Dean of the School of Architecture, Planning and Preservation at Maryland, he has initiated efforts to expand the School while diversifying and deepening its faculty and digital resources. Previously, he was a professor at the University of Minnesota for over twenty-five years. He is also a practicing architect.
APPENDIX E
POWER POINT PRESENTATIONS

The Power Points can be viewed at:

Professor Peter Barrett, “Workshop Opening Remarks”
http://www.coa.gatech.edu/news/symposiaarchives/CIB06_Barrett.php

Professor Selahattin Önür, ‘Highlights from IDS Workshop”

Dr. Andrew N. Baldwin, “Integrated Design Solutions – A perspective from Hong Kong”
http://www.coa.gatech.edu/news/symposiaarchives/CIB06_Baldwin.php

Professor Chuck Eastman, “An Assessment of Technologies in Design and Construction and University Research”
http://www.coa.gatech.edu/news/symposiaarchives/CIB06_Eastman.php

Dr. Soofia Tahira Elias-Ozkan, “IDS: Defining Its Possible Scope within CIB”

Professor Godfried Augenbroe, “Performance based design of technical building systems: A rational approach”
http://www.coa.gatech.edu/news/symposiaarchives/CIB06_Augenbroe.php