



2015 Global Leadership Forum for Construction Engineering and Management Programs (GLF-CEM)



2015 GLF-CEM Report

June 4-8, 2015 | Weimar

hosted by

Institute of Construction Engineering and Management

Bauhaus-Universität Weimar

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1 Message of Organizing Chair

Greetings to all who are interested in receiving and reading this 5th Global Leadership Forum report on activities of the academic community in Construction Engineering and Management.

For this year's Forum the Executive Committee had chosen an attractive destination in the middle of Europe, in the middle of Germany, in the heart of Thuringia. Weimar has always been and still is a place where people come easily to get inspiration and hook up on new ideas. The participants of the GLF-CEM 2015 have done this by exchanging their thoughts, concepts and visions on the future of Construction Engineering and Management in different parts of the world.

As host of the GLF-CEM 2015 in Weimar I am proud, that this Forum and the integrated selected lectures attracted a number of new members and delegates especially from European countries. Among those were delegates from Poland, Spain, Austria/Greece, United Kingdom, The Netherlands and, of course, Germany, who participated for their first time in the Forum. But also the participation of other delegates, from America, Africa and Asia, as well as additional information shared by those members who could not participate personally this year was impressive.

Step by step the Global Leadership Forum has established itself within the past 4 years as representative body for Construction Engineering and Management activities, education and research excellence programs worldwide.

This year's plenary discussion has been focused on two special topics: 1st a broad debate about the global trends and its impact on Construction Engineering and Management tasks and developments and 2nd the discussion about pros and cons for standardization of education programs in academia.

I thank all the co-organizers and supporters of the conference in Weimar and Ettersburg for their dedication and help in the preparation and during these 5 sparkling days. I wish everybody fruitful reading in this year's report.

All fruitful discussions and results achieved this year are a promising basis for next year's follow-up Forum.

I'm looking forward to seeing everyone again in Beijing, China in 2016.

Sincerely,



Hans-Joachim Bargstädt
Organizing Chairman, GLF-CEM 2015
Professor and Chair, Institute of Construction Engineering and Management
Bauhaus-Universität Weimar

2 Acknowledgement

We would like to thank all participants for their fruitful contributions and discussions. In addition we would like to thank the professors Middleton, Kagioglou, Wium, Hastak, Shen, Bargstädt and Soibelman for giving exciting guest lectures to the students of Bauhaus-Universität Weimar. We would also like to thank the GLF-CEM chairman, Geoffrey Shen, for leading all participants through an interesting agenda and for bringing everyone to a consensus even when opinions seemed to be contradictory.

Finally we thank the host, Prof. Bargstädt and his team, who organized the conference in Weimar, and the sponsors German Research Foundation (DFG), Kaiser Baucontrol and EUROVIA. Special thanks go to Torsten Teichgräber from Strabag AG Jena for giving an inspiring and very practice oriented dinner speech.

3 List of delegates

Title	Family name	First name	Institution	Country
Prof.	Alfen	Hans Wilhelm	Bauhaus-Universität Weimar	Germany
M.Sc.	Asiedu	Richard	Bauhaus-Universität Weimar	Germany
M.Sc.	Badasyan	Norayr	Bauhaus-Universität Weimar	Germany
Prof.	Bargstädt	Hans-Joachim	Bauhaus-Universität Weimar	Germany
Prof.	Bauch	Ullrich	KAISER BAUCONTROL Ingenieurgesellschaft	Germany
Dipl.-Ing.	Bendl	Joachim	Bauhaus-Weiterbildungsakademie	Germany
Prof. Dr.	Beucke	Karl	Bauhaus-Universität Weimar	Germany
Dipl.-Ing.	Bode	Birgit	Bauhaus-Universität Weimar	Germany
Prof.	Chen	Po-Han	National Taiwan University	Taiwan
Dipl.-Ing.	Dahana	Mada	Bauhaus-Universität Weimar	Germany
M.A.	Deobald	Milena	Bauhaus-Weiterbildungsakademie	Germany
Prof. Dr.	Donath	Dirk	Bauhaus-Universität Weimar	Germany
Dipl.-Ing.	Feine	Immo	Bauhaus-Universität Weimar	Germany
Dr.	Grenzdörfer	Giselher	EUROVIA	Germany
Prof.	Gürlebeck	Klaus	Bauhaus-Universität Weimar	Germany
Dipl.-Ing.	Hallermann	Normen	Bauhaus-Universität Weimar	Germany
Prof.	Halpin	Daniel	Purdue University	USA
Dr.	Hartmann	Andreas	University of Twente	Netherlands
Prof.	Hastak	Makarand Mark	Purdue University	USA
Prof.	Havers	Martin	Kapellmann und Partner Rechtsanwälte mbB	Germany
Dipl.-Ing.	Hollermann	Sebastian	Sieveke GmbH	Germany
Dr.	Homann	Cornelius	Kapellmann und Partner Rechtsanwälte mbB	Germany
Ph.D.	Hsieh	Shang-Hsien (Patrick)	National Taiwan University	Taiwan
Dr.	Jahren	Charles T.	Iowa State University	USA
Prof.	Kagioglou	Mike	The University of Huddersfield	UK
Prof.	Kalidindi	Satyanarayana	Indian Institute of Technology Madras	India
Dipl.-Ing.	Kaufmann	Ralf	Bauhaus-Universität Weimar	Germany
Dr.	Kirschke	Heiko	Bauhaus-Universität Weimar	Germany
Prof.	Lahmer	Tom	Bauhaus-Universität Weimar	Germany
Dipl.-Ing.	Lück	Andreas	Bauhaus-Universität Weimar	Germany
Dipl.-Ing.	Melzner	Jürgen	MARKGRAF GmbH	Germany
Prof.	Metzner	Steffen	Bauhaus-Universität Weimar	Germany

Prof.	Middleton	Campbell	University of Cambridge	UK
Prof.	Molenaar	Keith	University of Colorado	USA
Prof.	Morgenthal	Guido	Bauhaus-Universität Weimar	Germany
M.Sc.	Nasir	Abdur Rehman	Bauhaus-Universität Weimar	Pakistan
Prof.	Nentwig	Bernd	Bauhaus-Universität Weimar	Germany
Prof.	Nical	Aleksander	Warsaw University of Technology	Poland
Dipl.-Ing.	Nyga	Ilka	Bauhaus-Universität Weimar	Germany
Prof.	O'Brien	William	University of Texas at Austin	USA
Prof.	Pellicer	Eugenio	Universidad Politécnica de Valencia	Spanien
Prof.	Plank- Wiedenbeck	Max Uwe	Bauhaus-Universität Weimar	Germany
Dipl.-Ing.	Ponnewitz	Judith	Bauhaus-Universität Weimar	Germany
Prof.	Rodehorst	Volker	Bauhaus-Universität Weimar	Germany
Prof.	Ruth	Jürgen	Bauhaus-Universität Weimar	Germany
Prof.	Sawhney	Anil	Amity University	India
Prof.	Shen	Geoffrey	Hong Kong Polytechnic University	Hong Kong
Prof.	Smarsly	Kay	Bauhaus-Universität Weimar	Germany
Prof.	Soibelman	Lucio	University of Southern California	USA
Prof.	Steinmetzger	Rolf	Bauhaus-Universität Weimar	Germany
M.Sc.	Tarigan	Rina		Germany
Dr.	Tauscher	Eike	Bauhaus-Universität Weimar	Germany
Dr.	Teichgräber	Torsten	Strabag AG Jena	Germany
Dr.	Timmler	Hans-Georg	Bauhaus-Universität Weimar	Germany
M.Sc.	Valavanoglou	Ageliki	TU Graz	Austria
Prof.	Varghese	Koshy	Indian Institute of Technology Madras	India
Dipl.-Ing.	von Gynz- Rekowski	Beatrice	Bauhaus-Weiterbildungsakademie	Germany
Dipl.-Ing.	Weber	Larissa	Bauhaus-Universität Weimar	Germany
Prof.	Wium	Jan	Stellenbosch University	South Africa
Dipl.-Ing.	Wüdsch	Björn	Bauhaus-Universität Weimar	Germany
Prof.	Wüthrich	Charles T.	Bauhaus-Universität Weimar	Germany
Dipl.-Ing.	Zhyzhyl	Anton	Bauhaus-Universität Weimar	Germany

4 Program

Thursday, June 4th 2015

1700

HS A, Marienstraße 13

Guest lecture - Professor Geoffrey Qiping Shen

Friday, June 5th 2015

0915 to 1015

HS B, Marienstraße 13

Guest lecture - Professor Campbell Middleton

1100 to 1200

HS B, Marienstraße 13

Guest lecture - Professor Makarand Hastak

1200 to 1230

Mensa, Marienstraße 15

lunch break

1230 to 1330

HS B, Marienstraße 13

Guest lecture - Professor Jan Wium

1330 to 1430

HS B, Marienstraße 13

Guest lecture - Professor Mike Kagioglou

1500 to 1700

R210, Marienstraße 7a

GLF-CEM Executive committee meeting

1700 to 1730 pm

Bauhaus Atelier

Registration of members

1730 to 1600 pm

Bauhaus Atelier

Welcome reception and introduction to new members

Saturday, June 6th 2015

0915

Meeting room, Ettersburg Castle

Introduction of host and venue

0920

Meeting room, Ettersburg Castle

Speech by Chair

0935

Meeting room, Ettersburg Castle

Short presentation of new members and guests

1000

Meeting room, Ettersburg Castle

Introduction to Standing Committees

1030

Meeting room, Ettersburg Castle

Coffee Break

1100

Meeting room, Ettersburg Castle e

Presentation of Trends Committee – two parallel discussion

1200

Meeting room, Ettersburg Castle

Discussion of Tends

1245 <i>Restaurant, Ettersburg Castle</i>	Lunch Break
1330 <i>Meeting room, Ettersburg Castle</i>	Networking Presentation to General Assembly
1430 <i>Meeting rooms, Ettersburg Castle</i>	Two parallel sessions by two Standing Committees
1530 <i>Coffee area, Ettersburg Castle</i>	Coffee Break
1630 <i>Meeting room, Ettersburg Castle</i>	Final assembly with group presentations
1700 <i>Meeting room, Ettersburg Castle</i>	Closing Remarks
1830 <i>Resturant, Ettersburg Castle</i>	Dinner and Speech

Sunday, June 7th 2015

0900 to 1000 <i>Platz der Demokratie 1</i>	Visit to Anna Amalia library
1000 to 1230 <i>Markplatz</i>	Guided city tour
1230 to 1445 <i>Köstritzer Schwarzbierhaus</i>	Lunch break
1445 to 1830 <i>Goetheplatz</i>	Visit to “Buchenwald” memorial

Monday, June 8th 2015

0730 to 0900 <i>HS D, Marienstraße 13</i>	Guest lecture - Professor Hans-Joachim Bargstädt
1000 to 1230 <i>HS D, Marienstraße 13</i>	Guest lecture - Professor Lucio Soibelman

5 Guest Lectures

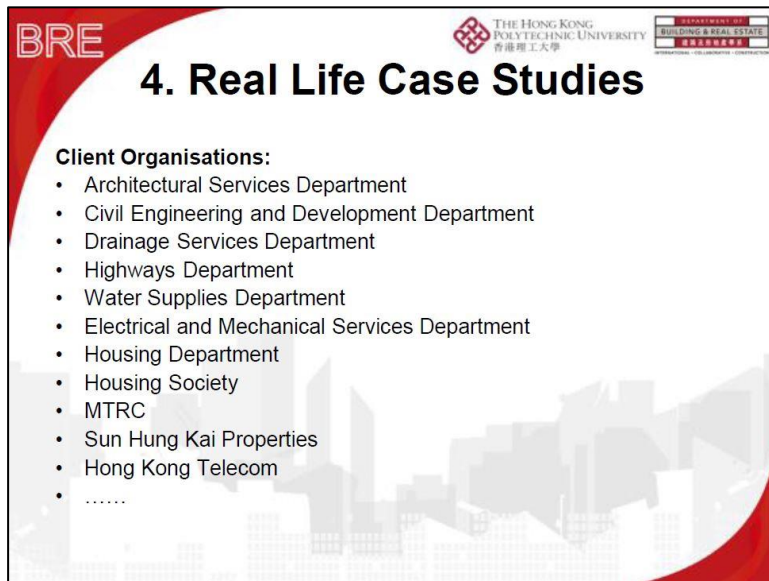
Guest lectures from GLF-CEM members, as part of this year's global leadership forum.

Bauhaus-Universität Weimar Fakultät Bauingenieurwesen  Professur Baubetrieb und Bauverfahren Prof. Dr.-Ing. H.-J. Bargstädt		INTERNATIONAL GUEST LECTURES Global Leadership Forum for Construction Engineering and Management Programs 	
Time/Place	Guest Lecture		
Thursday 4th of June, 5 pm in hall A, Marienstr. 13	Professor Geoffrey Qiping Shen Hongkong Polytechnic University Ensuring value for money in large, complex construction projects		
Friday 5th of June, 9.15 am in lecture hall B, Marienstr. 13	Professor Campbell R. Middleton University of Cambridge The Future of Construction		
Friday 5th of June, 11 am in lecture hall B, Marienstr. 13	Professor Makarand Hastak Purdue University A model for profitability analysis of a construction company		
Friday 5th of June, 12.30 pm in lecture hall B, Marienstr. 13	Professor Jan Wium Stellenbosch University Factors to be considered when choosing between pre-cast and in-situ concrete construction: A South African Perspective		
Friday 5th of June, 1.30 pm in lecture hall B, Marienstr. 13	Professor Mike Kagioglou University of Huddersfield Benefits realization: The essence of Lean Thinking		
Monday 8th of June, 7.30 am in lecture hall D, Marienstr. 13	Professor Hans-Joachim Bargstädt Bauhaus-Universität Weimar Special tasks in work planning for construction sites		
Monday 8th of June, 9.00 am in lecture hall D, Marienstr. 13	Professor Lucio Soibelman University of Southern California BIM and IT in Construction – The research to practice gap		

5.1 Ensuring value for money in large, complex construction projects

Presented by Prof. Geoffrey Quiping Shen, Chair Professor of Construction Management, Department of Building and Real Estate, The Hong Kong Polytechnic University.

The construction industry in Hong Kong is challenged by a large demand for housing. This is accompanied by various initiatives to ensure value for money in large and complex construction projects. Prof. Shen then shared results from research and development that have been conducted over the last 20 years, supplemented with real life case studies of infrastructure and building projects.

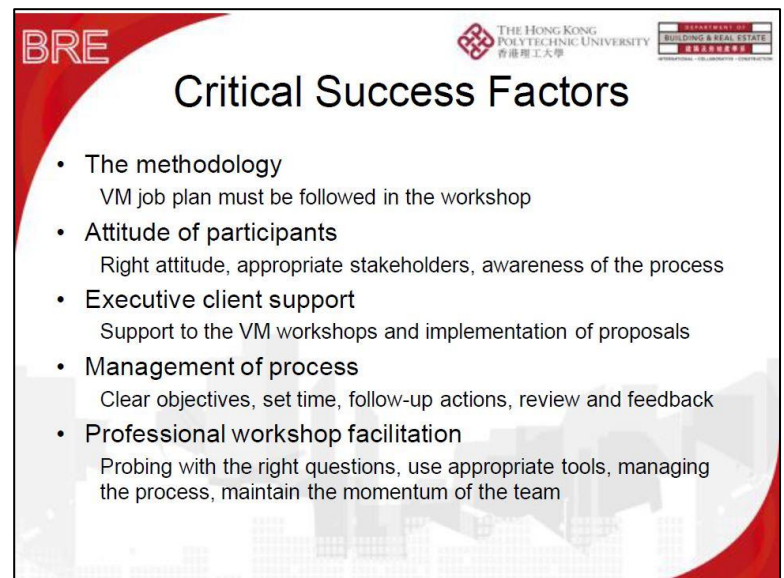


BRE THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學 DEPARTMENT OF BUILDING & REAL ESTATE

4. Real Life Case Studies

Client Organisations:

- Architectural Services Department
- Civil Engineering and Development Department
- Drainage Services Department
- Highways Department
- Water Supplies Department
- Electrical and Mechanical Services Department
- Housing Department
- Housing Society
- MTRC
- Sun Hung Kai Properties
- Hong Kong Telecom
-



BRE THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學 DEPARTMENT OF BUILDING & REAL ESTATE

Critical Success Factors

- **The methodology**
VM job plan must be followed in the workshop
- **Attitude of participants**
Right attitude, appropriate stakeholders, awareness of the process
- **Executive client support**
Support to the VM workshops and implementation of proposals
- **Management of process**
Clear objectives, set time, follow-up actions, review and feedback
- **Professional workshop facilitation**
Probing with the right questions, use appropriate tools, managing the process, maintain the momentum of the team

Full presentation: <http://rebar.ecn.purdue.edu/glf/2015/shen-presentation>

5.2 The future of construction

Presented by Prof. Campbell Middleton, Director of the Laing O'Rourke Centre for Construction Engineering and Technology, University of Cambridge.

The construction industry is at a crossroads. Faced with the prospect of scarcer resources and the need to dramatically decrease carbon emissions, it must adapt to operate more efficiently and sustainably. At the same time, the global population is rapidly growing and urbanizing, demanding both increased construction activity and infrastructure that can provide housing, transport, water, energy and digital communications networks for the cities of the 21st century.

Already the digital engineering revolution is transforming the way information is used by the supply chain at all stages of the construction process. New materials will transform the fabric of our structures and smart sensors will provide real time information on operation and performance.

To deliver such transformation, there will be need to fundamental changes to procurement practices as these underpin and drive all subsequent outcomes. Key ideas to facilitate this transformation of the industry are discussed in relation to various stages of the construction process, specifically planning and procurement, design and analysis, construction, operation and maintenance and end-of-life configurations. For each phase, current practices are challenged and alternative concepts must be evaluated.



Challenging the status quo

1. Procurement – outcomes & whole-life performance
2. Design – flexibility for changing demands
3. Construction – standardisation & offsite manufacture
4. Operation & management – “smart” structures
5. End-of-life – reuse, reduce, extend
6. The future – embrace new technologies

“The industry is looking for leadership, vision & ambition”

UNIVERSITY OF CAMBRIDGE 81

Full presentation: <http://rebar.ecn.purdue.edu/glf/2015/middleton-presentation>

5.3 A model for profitability analysis of a construction company

Presented by Prof. Makarand “Mark” Hastak, Head of Construction Engineering and Management and Professor Of Civil Engineering at Purdue University.

Presented was a model for profitability analysis of a construction company. The effective forecasting of the financial outcome of proposed, planned, and uncompleted projects is the key to a contractor’s financial decisions. Current methods do not consider the effect of internal and external entities although they obviously have high influence on the process of profit realization.

Five steps as part of the protocol are to be taken for applying the presented model:

1. Identification of cost and profit centers;
2. Investigation of all relationships between the entities;
3. Assessment of the performance of all relationships;
4. Location of the change in profit on the WBS of a profit center;
5. Finding solutions and calculation of the overall profitability of the construction company

The protocol can be utilized by construction companies for recognizing the changes in profit margins of projects, improving their overall profitability by identifying the root cause of the problems, improving their future cost estimations based on the analysis results of the protocol and for being more selective of profitable projects in future jobs.

The slide is titled "Need" and is part of a presentation from the Division of Construction Engineering and Management at Purdue University, featuring the \$parc logo. It contains three bullet points:

- Cash overdraft of each project and the overall cash overdraft of the project portfolio are also highly dependent on the cost schedule of each project.
- Therefore, **effectively forecasting the financial outcome of proposed, planned, and uncompleted projects is the key to a contractor’s financial decisions.**
- Current methods do not **consider the effect of internal entities** (organizational units inside the general contractor) and **external entities** (owner and subcontractors) although they obviously have **high levels of influence on the profit realization process.**

The slide is titled "Benefits of this Protocol" and is part of a presentation from the Division of Construction Engineering and Management at Purdue University, featuring the \$parc logo. It contains one main bullet point with three sub-points:

- Construction companies can utilize this protocol to:
 - recognize the **changes in profit margins** of projects
 - **improve their overall profitability** by identifying the root cause of the problems
 - improve their future **cost estimations** based on the analysis results of the protocol
 - **be selective of more profitable projects** in future jobs

5.4 Factors to be considered when choosing between pre-cast and in-situ concrete construction - A South African Perspective


Presented by Prof. Jan Wium, Chair in Construction Engineering and Management, Department of Civil Engineering, University of Stellenbosch.

A South African perspective has been presented on the factors which have to be considered when choosing between pre-cast or in-situ concrete.

The choice of an appropriate construction concept for a project is determined by several different factors. Very often this choice is driven by experience and local customs. The use of pre-fabrication on projects has proven to provide certain benefits to the project, including faster erection and improved quality. In South Africa relatively little use is made of pre-fabrication, and project teams are not always aware of the benefits due to the traditional use of in-situ construction. This presentation explores the factors that play a role when a project team decides between pre-cast and in-situ concrete construction. The research aims to provide project teams with the necessary information to make informed choices between these construction methods.

**Cost, quality and time comparison
between in-situ and precast**

Consulting engineers		
	Precast	In-situ
Cost	33%	67%
Time-efficiency	100%	0%
Quality	92%	8%
Contractors		
	Precast	In-situ
Cost	10%	90%
Time-efficiency	80%	20%
Quality	90%	10%




Full presentation: <http://rebar.ecn.purdue.edu/glf/2015/wium-presentation>

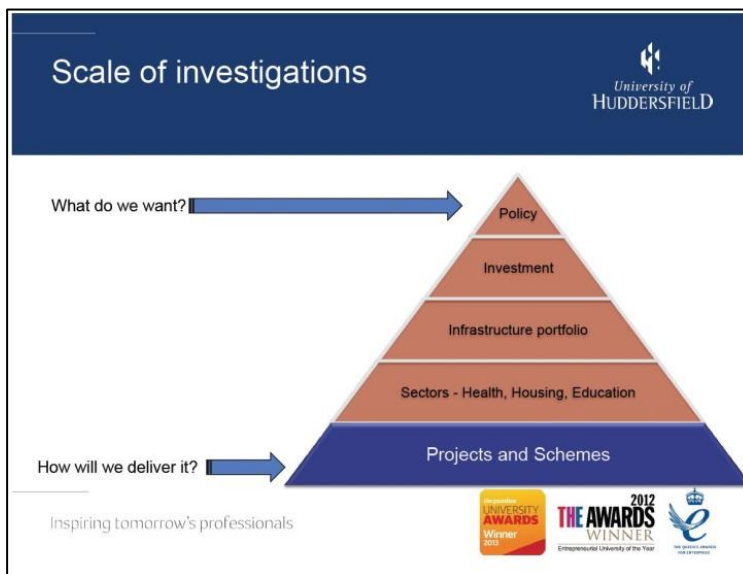
5.5 Benefits realization: The essence of Lean Thinking

Presented by Prof. Mike Kagioglou, Dean of Art, Design and Architecture at the University of Huddersfield.

The impact of lean thinking was presented in provision of a potential solution through benefits realization.

The current practices in construction lack to consider more soft issues, such as stakeholder management, communication and benefits. The presentation emphasizes on a more multi-disciplinary view, needed to overcome the challenge of developing projects and programs that deliver ultimate benefits at a larger scale.

For this, a BeReal and Lean knowledge management was considered as a means of turning fragmented data into useful information, as introduced when described the benefits segmentation and profiling techniques.



The slide, titled "BeReal and Lean knowledge mgt", contains a single bullet point: "The process offers a means of turning fragmented data into useful information, as introduced when described the benefits segmentation and profiling techniques. BeReal in project knowledge management terms is about getting the right information related to benefits, in the right form, to the right people at the right time". The University of Huddersfield logo is in the top right corner. At the bottom, there is the slogan "Inspiring tomorrow's professionals" and three award logos: "UNIVERSITY AWARDS Winner 2012", "THE AWARDS 2012 WINNER Entrepreneurial University of the Year", and "45th Anniversary".

Full presentation: <http://rebar.ecn.purdue.edu/glf/2015/kagioglou-presentation>

5.6 Special tasks in work planning for construction sites

Presented by Prof. Hans-Joachim Bargstädt, Institute for Construction Engineering and Management, Bauhaus-Universität Weimar.

Special tasks in work planning for construction sites have been presented. These covered the area site layout from an organizational and safety perspective as well as communicational aspects related to Building Information Modeling. The challenges have been illustrated by the use of different construction projects such as Lehrter Bahnhof in Berlin (main railway station), a highway bridge in Germany and many others. The presentation gave a broad overview about tasks in site planning and also about the wide range of knowledge which prospective site managers should acquire.

Special Tasks in Work Planning for Construction Sites

In virtual construction sites we can exercise, control and improve complex situations longtime before they become reality

See: www.conworld.biz



http://www.pm-akademie.de/pm_academy/ing/content/KS_M36-D-Baustelle-5-1-50x321.jpg

Professor Dr.-Ing. Hans-Joachim Bargstädt
Institute for Construction Engineering and Management,
Bauhaus-Universität Weimar

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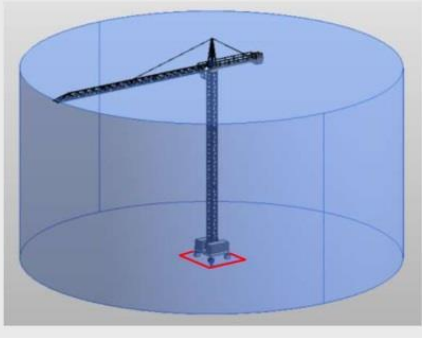
2015-06-10

Special Tasks in Work Planning for Construction Sites

Object oriented site installation planning

Visualization of site installation elements

- Dimension
- Geometry
- Mobility
- Working range
- Bearing load
- Safety areas
- Foundation
- Access



Professor Dr.-Ing. Hans-Joachim Bargstädt
Institute for Construction Engineering and Management,
Bauhaus-Universität Weimar

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2015-06-10

Full presentation: <http://rebar.ecn.purdue.edu/glf/2015/bargstaedt-presentation>

5.7 BIM and IT in Construction – The research to practice gap

Presented by Prof. Lucio Soibelman, Chair – Sonny Astani Department of Civil and Environmental Engineering at University of Southern California.

The environmental challenges require large research effort. Civil engineering researchers, especially in Construction Engineering and Management, have acquired very promising results in the past years in Building Information Modeling. Research prototyping shows the large potential of BIM in better planning, more accuracy, better quality and transparency. Virtual mock-ups yield a better understanding of complexity and of possible interference areas.

By implementation of an integrated building information model there are improvements in efficiency on several levels. One of these improvements is the timely identification of penetrations and embeds. However, there are many more if taking into account additional and adjacent innovations as laser scanning and imaging technologies, model creation from point clouds, project history visualization environments, virtual site logistics, immersive displays, augmented reality, construction robotics. Even if this potential is still not widely introduced in practice, there are even more powerful advances in the hindquarters, for example, energy-aware smart facilities collaboration and other technologies based on intelligent data mining.

Case Study – LF Driscoll Construction

- Hershey Medical Center



10 days per floor

1 day per floor
Elimination of errors

Bang-It Embed

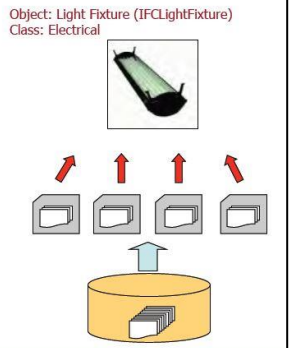
Duct-Hangers

Slab Penetrations

School of Engineering USC University of Southern California Astani Department of Civil & Environmental Engineering

Integration Model

- **Classification**
 - Classes are defined in the model.
 - Project documents are classified.
- **Retrieval and Ranking**
 - Object data are extracted from the project model and used as input.
 - Relevant documents are identified, ranked, and retrieved.
- **Association**
 - Selected documents are linked to project model objects.



Object: Light Fixture (IFLightFixture)
Class: Electrical

School of Engineering USC University of Southern California Astani Department of Civil & Environmental Engineering

Full presentation: <http://rebar.ecn.purdue.edu/glf/2015/soibelman-presentation>

6 Executive Committee meeting

An executive Committee meeting was held on 05. June 2015, prior to the Global Leadership Forum-CEM general assembly meeting. The attendees were as follows:

- Prof. Geoffrey Shen, Prof. Hans-Joachim Bargstädt, Prof. Jan Wium, Prof. Lucio Soibelman, Prof. Makarand Hastak, Prof. Mike Kagioglou (all in person),

and via video conference system:

- Prof. Irtishad Ahmad, Prof. Ed Jaselskis (via web conference system)

The protocol of the ExCom meeting is internal. It can be requested on demand by the chairman or the secretary of GLF-CEM.

7 Minutes of meetings from the general assembly and working committees (trends, outreach and membership, graduate program standards, upcoming GLF-CEM)

7.1 General

Saturday, 6th of June started with an introduction given by the host, Prof. Bargstädt. He welcomed all GLF-CEM participants at the castle Ettersburg in the near vicinity of Weimar. This castle was built in the period of 1706-1712 by the duke of Saxonia-Weimar-Eisenach, Wilhelm Ernst, as a small hunting residence. After the refurbishment in 2008 it is now used as exclusive conference center and for other festivities.

The chair Professor Shen opened the meeting by briefly presenting the vision of GLF-CEM and the results gained in the last 5 annual meetings. GLF-CEM started 5 years ago with lots of organizational activities before the focus could be shifted to different research activities. The task for now is to categorize what has been achieved in the last meetings and how it can be transformed into touchable results.

7.2 Discussion of Executive Committee Meeting

Prof. Shen informed all GLF-CEM members about the results of the Executive Committee meeting from the previous Friday afternoon.

Two candidates were proposed for Executive Committee members. The forum then decided to name Professor Koshy Varghese for secretary.

Thus from 2016 on the Executive Committee members are as follows:

- Chair: Prof. Simaan Abourizk,
- Vice-Chair: Prof. Hans-Joachim Bargstädt
- Treasurer: Prof. Ed Jaselskis
- Secretary: Koshy Varghese (new elected member from 2016 on)
- Prof. Geoffrey Shen
- Prof. Jan Wium (elected member since 2015)
- Prof. Lucio Soibelman
- Prof. Makarand Hastak
- Prof. Mike Kagioglou
- Prof. Irtishad Ahmad
- Prof. Dongping Fang
- Prof. Bud Griffis

Regarding the past and upcoming next venues for the GLF-CEM it was decided to make a longer forecast on future hosts. The following gives an overview about all past and planned hosts and venues until 2020.

Year	Host	Location
Past		
2011	Prof. Makarand Hastak	Purdue University, West Lafayette, USA
2012	Prof. Makarand Hastak	Purdue University, West Lafayette, USA
2013	Prof. Geoffrey Shen	Hong Kong Polytechnic University
2014	Prof. Simaan AbouRisk	University of Alberta, Banff, Canada
2015	Prof. Hans-Joachim Bargstädt	Bauhaus-Universität Weimar, Germany
Upcoming		
2016	Prof. Dongping Fang	Beijing, China
2017	Prof. Lucio Soibelman	Los Angeles, USA
2018	Prof. Jan Wium	Stellenbosch, South Africa
2019	Prof. Irtishad Ahmad	Miami, USA
2020	Prof. Mike Kagioglou	Huddersfield, England

The established GLF-CEM subcommittees and their chairs have been confirmed as follows:

- Trends Committee (Mike Kagioglou);
- Graduate Programs Standards/Guidelines Committee (Lucio Soibelman);
- Outreach and Membership Committee (Makarand Hastak).
- Upcoming GLF-CEM Committee (Hans-Joachim Bargstädt);

7.3 Introduction of new members

- Professor **Campbell Middleton**: Cambridge University, 10years bridge building experience, construction engineering and technology section, interested in: teaching issues; focus on infrastructure technologies at Cambridge, collaboration with other universities;
- Professor **Alexander Nical**: Technical University Warsaw, focus on precast production, institute focuses on various topics in collaboration with polish companies, mathematical methods for management of construction (fuzzy methods, ...), eLearning methods for construction management students;
- Professor **Andreas Hartmann**: University of Twente: Entrepreneur University (focus on innovations), personal focus: infrastructure management; project based bachelor programs;
- Professor **Eugenio Pellicier**: University of Valencia: focus on health and safety, technology management and others; Professor **Shang-Hsien Hsieh**: National Taiwan University: interest in R&D applications of IT-technology in construction and teaching issues, focus on BIM (BIM research center since 2009);
- Professor **Po-Han Chen**: National Taiwan University: head of construction management; different research and teaching interests;

- Professor **Keith Molenaar**: University of Colorado, interest in construction safety issues, organization and others as well as international exchange of students.

forum guests:

- **Ageliki Valvanoglou**: representing Professor Detlef Heck: Technical University Graz, institute of construction management; focus on contracts, procurement, and;
- Lawyer **Cornelius Homann**: representing Professor Martin Havers (Kapellmann and Partners lawyers) interest in legal aspects of construction for teaching on Bachelor and Master level;
- Professor **Hans-Wilhelm Alfen**: Bauhaus-Universität Weimar; dean of the faculty civil engineering and head of the chair construction economics;
Torsten Teichgräber head of technical division Züblin Thüringia (belonging to STRABAG SE); interest in practical and educational aspects of graduates.

7.4 GLF-CEM working groups

The GLF-CEM has established 4 working groups focusing on the following aspects:

- Outreach and Membership committee: convener Mark Hastak
- Upcoming GLF-CEM committee: convener Hans-Joachim Bargstädt
- Graduate Program Standards committee: convener Lucio Soibelman
- Trends committee: convener Mike Kagioglou

At this year’s meeting the focus has been put on “the graduate program standards” and the “Trends committee”.

7.4.1 Graduate Program Standards Committee

The objective of the Graduate Program Standards Committee meeting was to discuss two facets of Construction Engineering and Management graduate programs:

- What should we teach and how should we teach it?
 - Should we build/share a common body of knowledge?
- How can we assess our programs?
 - Assess success/need for improvement

What Do We Teach?

Defining the Scope	
Brainstorming session:	

What is our common knowledge?
Is a “standard approach” or “common core program” possible?
Must consider different specifics of each university:

- Location
- Faculty
- University requirements
- Students
- Clients
- Research
- Access to industry

How can we work together (two-way) with industry better?

- Can we vet model through industry to ensure we have the outcome they need?
- Not just research – real-world problems
- Technical knowledge AND personal skills are required
- Partnerships through continued education
- Knowledge transfer programs (fight brain drain)
- Programs should focus on being long-term (life-long learners) not short-term (industry)

- Engineering vs. management programs

will want short-term outcomes); e.g. teach change adaptation not training for specific technologies

- The means of delivering courses/teaching methods can develop skills like leadership without changing the curriculum (case studies, group work/discussion, industry input or guest lectures in courses)

Steps to define what we have in common:

- Get names and descriptions of courses
- Consider the needs of the “consumer” (employers) of the “product” (graduates)
- Define key attributes of graduates

Could build off of existing frameworks or tie in to them (CD10 framework (MIT), ASCE vision documents)

What is our goal/desired outcome? What level do we want to go to?

- Should we aim to create a steering or guidance document?
- Do we want to pursue a method for program accreditation?
- Document for benchmarking programs?
- Better define difference/outcomes of each university?
- Guide for self-assessment (define gaps/areas of strength/differentiation or niche)?
- Define the body of knowledge?

Decisions

After the brainstorming session outlined above, the following decisions were made

1. The programs should remain flexible/ have core requirements that allow uniqueness and competitiveness between universities
2. The group should produce a white paper that presents guidelines not standards
3. Industry involvement is desired (to promote lifelong learning)
4. It is not practical to require accreditation, but it is agreed that a core knowledge exists

The method of teaching is just as, if not more, important as the content

How do we assess?

Brainstorming session:

It may not be possible to give guidelines on teaching methods in the document; could we share experiences/examples of teaching specific content and the outcomes? Maybe it could be something similar to the Exceed Excellence in Engineering Education ASCE Program.

Is diversified knowledge a required attribute (courses outside of engineering)?

Should industry be involved in defining attributes?

CII Executive Leadership Program provides some attributes that could be considered.

What is the minimum core that everyone should teach? Outside of that, flexibility gives flavor to programs

The group brainstormed the following knowledge areas that should be acquired by students in CEM programs:

Guidelines for Grad CEM Education Lucio ①

Members: Lucio, Satya, Chuck, Hans, Mark

Eugenio ACTION: CONF CALL LUCIO
DOODLE POLL

- 1) Name: Guidelines for CEM Grad Edu
- 2) Cambridge Course Themes & Outcomes
 - Finance, planning & procurement
 - Design for value, functionality, operation and performance
 - Advanced Const mgmt & methods
 - Advanced Const Tech
 - Sector Specialization
 - Innovation, research & the future of const
 - Leadership
- 3) Identify other similar models at other Univs
- 4) Check report from GLF 2012
- 5) More flexible structure

Lucio ②

6) What base body of knowledge should a MScEM and MSEM should have.

7) ACTION: ALL
DUE: 8/30/15 ACTION: LUCIO + Geoffrey
Send 2011/2012 Template to all Members
Visit GLF-CEM Reports 2011/2012 to update the program into for their MS/PhD requirement/courses.

- 8) Publish a "Rosetta Stone" for CEM/MS program requirements
- 9) Define a Rubric for MS Graduates
- 10) Lessons from Bus Sch Models.
- 11) CEM → Engrg/Tech/Tools/Methods/Design/ Mgmt
CM → Mgmt/Tech/Tools/Methods

Knowledge Areas

- | | |
|-----------------------------|---|
| • Planning | • Productivity management |
| • Scheduling | • IT in construction |
| • Risk management | • BIM |
| • Managing people | • Front-end planning |
| • Cost management | • Construction methods |
| • Cost control | • Change management |
| • Safety management | • Equipment (or asset or facility) management |
| • Legal aspects (contracts) | • Plan reading |
| • Project delivery | • Codes and standards |
| • Quality management | • Dispute and conflict resolution |
| • Estimating | • Environmental sustainability issues |
| • Engineering economics | |

Benchmarking Metrics

- Student/faculty ratio
- Full-time/part-time ratio (faculty and student)
- Number of units to degree (minimum)
- Number of classes
- Frequency of classes
- Average class size (maximum number of students per class)
- Teaching methods
- Industry engagement
- Distance education
- Executive education
- Teaching load (grad/undergrad)
- Internal assessment (student employment, employer questionnaire, alumni)
- Advisory board

Program assessment

- What is done in different programs?
- Student feedback?
- Benchmarking?

"Soft Skill" Attributes

- Communication
- Critical thinking
- Ethics
- Negotiation skills
- Managing change
- Problem solving
- Team dynamics

Decisions

The group decided to conduct a survey of GLF-CEM members that will ask for:

- Name of graduate program
- List of classes with detailed description of courses
- Opinion on attributes that graduate students should possess
- Etc.


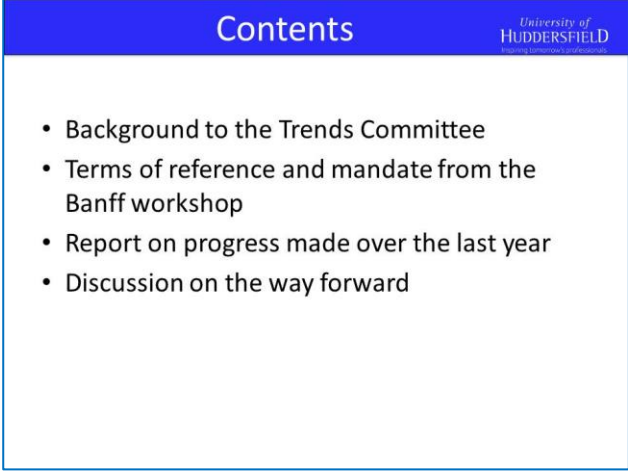


White Paper

After analyzing the survey results, the group will determine the bare minimum set of graduate attributes, and will then produce a white paper that provides guidelines for CEM programs.

7.4.2 Trends Committee

The report about the latest trends consists of 4 presentations and was given by Professor Kagioglou and Professor Wium. The following slides show the main input of the discussion:

General:

 <p>University of HUDDERSFIELD</p> <p>GLF – Trends Committee</p> <p>June 6th 2015 Weimar</p>	 <p>University of HUDDERSFIELD</p> <p>Contents</p> <ul style="list-style-type: none">• Background to the Trends Committee• Terms of reference and mandate from the Banff workshop• Report on progress made over the last year• Discussion on the way forward
 <p>University of HUDDERSFIELD</p> <p>The Genesis!</p> <ul style="list-style-type: none">• GLF purpose:<ul style="list-style-type: none">– <i>Be at the forefront of developments in CEM and – through its engagement with future leaders – ensure the global consideration of issues and how these can be applicable in CEM programmes, research and the collaboration with industry.</i>• Trends Committee purpose:<ul style="list-style-type: none">– <i>Report and articulate construction/Built Environment industry, educational, and research trends that have the potential or already impacting CEM and CM graduate programs</i>	 <p>University of HUDDERSFIELD</p> <p>Banff workshop members</p> <ul style="list-style-type: none">• Guiwen Liu - Chongqing University• Xiaolong Xue – Harbin Institute of Technology• Lug Chang – National Taiwan University• Rick Hermann – PCL Industrial Management Ltd.• Makarand Hastak – Purdue University• Rene Morkos – Stanford University• Leonhard Bernold – Universidad Tecnica Federico Santa Maria• Ming Lu – University of Alberta• Kasun Hewage – University of British Columbia• Janaka Ruwanpura – University of Calgary• Thomas Ng – University of Hong Kong• Mike Kagioglou – University of Huddersfield• Jan Wium – University of Stellenbosch• Jeff Russell – University of Wisconsin• University of Alberta Students

Definitions

- Trend (taken from Oxford and Free Dictionaries):
 - The general direction in which something tends to move.
 - A general tendency or inclination.
 - Current style; vogue: the latest trend in fashion.
 - *intr.v.* **trend-ed, trend-ing, trends**
 - To extend, incline, or veer in a specified direction: The prevailing wind trends east-northeast.
 - To show a general tendency; tend: "The gender gap was trending down" (James J. Kilpatrick).

Identified Themes

1. CE/CEM Programmes
2. Needs of the Industry (including industry and academic working together)
3. Funding trends in HE and Industry
4. Research

Initial list of areas identified

- Educational experience – Multidisciplinarity
- Understanding of fundamentals by students
- Student expectations and talents
- Educational outcomes
- Experiential learning
- Location of CEM programmes i.e. engineering, business, management, arts, etc.
- Education in data rich environments
- Online training / distance learning
- More PhDs going into industry
- Assessment of lecturers and professors and students
- UG internship, Grad Residency tied to w/thesis
- Teaching and Learning techniques (hi-tech / low-tech)
- Teaching tools
- Ethics in Curriculum
- CEM specific student competitions
- Changes in Curriculum
- Resident industry instruments

Initial list of areas identified

- Number of UG/G programmes in CEM
- Professional Registration
- Availability of funds from government, industry, others
- Types of funding i.e. horizon 2020, NSERC engage
- Global collaboration for research, education, study abroad, etc.
- Curriculum and community engagement
- Industry partnership in Capstone courses
- Entrepreneurship and Commercialisation
- Sustainable Design and Construction
- Technology based Research
- Multidisciplinary research
- System based research
- Longitudinal research
- Smart buildings
- Sensor / big data / VR
- Safety related topics
- Industry and Academic collaboration

Progress made throughout last year

- 6 weekly Skype meetings since July 2014
- Early realisations:
 - Had to be realistic around sample size and resource that can be utilised for the studies
 - GLF membership skewed towards particular continents/countries
 - Buy-in from membership
 - Establishing trends necessitates the establishment of a norm/baseline
 - Global survey vs individual theme-based ones

Themes and theme leaders

- CEM/CM programmes: Lead: Jeff Russell and Tom Foley
- Needs for Industry: Lead: Rick Hermann
- Funding Trends Higher Education and Industry: Lead: Kasun Hewage
- Research: Lead: Jan Wium

Structuring the work

- Determining desktop reviews and surveys
 - Envisioning the structure of the white paper
- Doing something is better than talking about everything!*
- We agreed on the design and dissemination of 3 surveys in research, programmes and industry and one desktop exercise

limitations

- Just about everything!
 - Sample size and representation
 - Validity
 - Breadth
 - Resource available
 - etc

However University of HUDDERSFIELD

- We do now have a starting point across all themes, in various degrees
- It is quite clear where gaps exist and how studies can be expanded
- It needs the active engagement of the whole GLF membership and beyond

Way forward University of HUDDERSFIELD

- Presentation of all outcomes before lunch time
- Workshops on every theme after lunch and defining the way forward

Well done to the whole team and on behalf of the team thank you to all of you that have contributed in one way or another

Industry needs:

PCL 1

Global Leadership Forum 2015

Trends Subcommittee Report on Industry Needs

Ulrich (Rick) Hermann P. Eng.
 Manager of Construction Engineering
 PCL Industrial Management Inc.
 Edmonton, Alberta, Canada

June 1, 2015

Outline 2

- Industry Needs Trend Scope
- Survey Preparation
- Survey Results / Analysis
- Conclusion

Industry Needs Trend Scope 3

- Identify broad spectrum of Industry needs as it relates to CEM Programs and Industry expectations of graduates
- Prepare a survey to obtain feedback from Industry and Academia
- Compare results to identify trends and differences between Industry needs and CEM programs

Survey Preparation 4

- Subcommittee developed initial list of desired outcomes and skill sets
- Obtained feedback from Industry and Academia before releasing survey
- On-line survey sent to Industry and Universities for input from Dec 2014 to Feb 2015

Survey Preparation

5

Major Categories:

- Management
- Behavioral
- Technical – disciplines
- Technical – Management process
- Other Practical Skills
- Course Category priorities

Survey Results

6

CEM Course Priorities / Trend

- Survey prepared to reflect previous results prepared by Arditi et al 2010
- Added Construction Engineering category
- Results tabulated to supplement previous results

Survey Results

7

Course Categories	1982	1996	2008	2015 % Training	2015 Priority
Project management	10	10	2	1	1
Scheduling and control	2	2	3	2	2
Contract administration/legal issues	1	1	1	4	3
Construction Engineering				3	4
Cost estimating/cost control	6	3	7	5	5
Construction technology	3	4	5	6	6
Systems optimization/ statistics	4	6	8	7	7
Equipment and methods	5	5	4	9	8
Economic decision analysis	8	7	10	10	9
CEM research	7	8	6	8	10
Computer applications	9	9	9	11	11
Real estate management	11	11	11	12	12
Other				13	13

Survey Results Analysis

8

CEM Course Priorities / Trends

- Project Management climbed considerably over time; Industry #1
- Construction Engineering is high on the list (#4 of 13)
 - increased complexity of construction projects
 - more technical savvy industry
 - Client push for engineering and safety verification

Survey Results Analysis

9

CEM Course Priorities / Trends (cont'd)

- Equipment and methods decreased in importance
- Research is lower on Industry needs, many unaware of excellent work Universities produce
- Balance of topics – minor fluctuation

Survey Results

10

Industry needs of student skill set

- Significant effort was performed to compile a list of Industry desired skill sets relating to management, behavior and technical
- Large wish list, but provides good input
- intend to assist training institutions by providing Industry expectations of employees

Survey Results - Management

11

Management	
Working in collaborative teams	1.75
Identify / resolve management issues	1.90
Customer relations and meeting their needs	1.90
Dealing with people, managing expectations, cultural awareness	1.95
Leadership	2.05
Supervisory Skills	2.15
Visionary, thinking outside the box	2.25
Understanding of organizational schemes, pros and cons	2.40
Public relations in urban centres	2.80
Comments:	
Most engineers move into some sort of management role within 5 years of graduation thus they need some exposure on how to lead and manage.	
Organizational Effectiveness / Labour Relationship.	
My comments reflect what I believe are important as a new grad. The skills I ranked as being less important are ones that I believe become more important later in their career.	

Survey Results - Management

12

Behavioural	
Conducts oneself in an ethical and professional manner	1.80
Good work ethic	1.80
People skills	2.05
Highly skilled learners, time mgmt, organized, reading, meta cognition	2.10
Self starter, takes initiative	2.15
Handle stress well	2.15
Presentation skill	2.15
Willing to get boots dirty	2.20
Comments	
Leading by example are good behavioral traits to have.	


Survey Results – Technical Disciplines	
Field inspections for progressing quality, deficiencies	2.00
Exposure to heavy industrial projects, commercial, residential and infrastructure	2.16
Exposure of eng and CEM students to multiple disciplines for purpose in managing and interacting with their work scopes	2.21
Material grades, specs, quality issues, bolt torquing, counterfeit ID, tolerances, surveying, welding	2.42
Exposure to P&ID's, systems, test pkgs line designation tables, cable schedules, instrument lists	2.53
Major eqpt brief description of purpose, exchanger, boiler, reformer, MCC, junction boxes, etc.	2.68
Comments:	
The answers really depend on the career track of the individual. All of these can be very important for a field engineer. PMs need to be aware but not necessarily the experts in these technical areas – they have others take care of that aspect for them.	
Risk assessment	

Survey Results – Technical - Management Process	
Quality management system exposure	1.63
Safety measures, methods, design considerations. Safety statistics, hazard analysis, pre-job task analysis, daily safety bulletins, stretching, drug testing	1.68
Knowledge of construction contracts and contract management	1.79
Dealing with large data and integration issues, understand estimate setup, transfer to progressing systems, productivity and progress analysis, links to cost codes and schedules, work pkg setup. Distinguish indirects from direct	1.95
Planning, feasibility studies, quantify cost savings, offsite logistics – camp, transportation – air/ground shift options advantages, impact on families, keeping people happy, dry camp	2.00
Subcontract management, control systems, integrated plan, coord. Mgt, quality audit, evaluation, high level knowledge of sub trade scope	2.11
Managing information on a fast-track project, progressively	2.11
Lean manufacturing / system optimization techniques	2.21
Information technologies and data visualization	2.32
Subcontract setup vs supplier purchase orders/service agreements	2.32
Temporary facility setup, trailers, power, washrooms, internet, phones, security, fences, toolcribs, first aid/nurse, laydown areas/warehouse	2.42
Worker disability, insurances, modified work	2.72
Comments:	
Project simulation / decision-making tools	
Again, depending on your career track, these items will carry different levels of importance	

Survey Results – Other Practical Skills	
Prepare students for roles in construction	2.05
Practical research	2.11
Post grad courses / phd counting for prof accreditation (P Eng); Willingness / encourage to work on project sites vs office environment	2.16
Practical industry experience during PhDs training	2.30
Good computer skills (MS Office, CAD, 3D models)	2.47
Comments:	
Leadership in construction organization (non-technical)	
Innovation and technology adoption processes, supply chain management,	
Ergonomics and health, performance measurement, temporary structures,	
International finance, entrepreneurship, history of construction,	
These items can be arranged differently depending on the career objectives of the individual.	
Health, Safety, Environmental and Quality Management and its link to Employee Competence	
Leadership in construction organization (non-technical)	
VE/LCC, Sustainability, Safety, Quality, etc.	


Conclusion	
<ul style="list-style-type: none"> • Industry needs were compiled through an outcomes list and corresponding priority and on-line survey held • provides a good spectrum of desired outcomes industry desires from graduating engineering students • Though sample size is small, some trends can be identified • Project Management and Construction Engineering has climbed the ladder of importance 	

Programs survey:



**Construction Engineering Management
Programmes survey results**

Thomas Foley and Jeffrey Russell



CEM Survey

- Purpose of survey:
 - Develop a better understanding of CEM programs
 - Determine which programs are most common and least common, as well as trends in terms of location and type of program
- Distribution
 - Survey sent to all members of the GLF committee
 - 26 returned responses

CEM Survey Results



Results:

- 46% (12 out of 26) of respondents were from the United States
- Because the response quantity was so low, we are unable to draw conclusions about countries other than the United States

Country	Number of responses
Australia	2
Canada	2
Chile	1
China	3
England	1
India	2
Singapore	1
South Africa	1
South Korea	1
USA	12

CEM Survey Results



Overall results:

- 13 out of 26 universities offer Civil Engineering as an Undergraduate degree option
- 12 out of 26 universities offer Construction Management as an Undergraduate degree option
- In the United States, the most prevalent degree option is construction engineering management (10 out of 12 U.S. universities have a program)

Undergraduate Degrees	# of Universities
Architectural Design (Engineering)	5
Atmosphere/Energy	1
Building Energy and Indoor Environments	1
Civil Engineering	13
Construction Engineering	7
Construction Management	12
Environmental Engineering	7
Geomatics Engineering	1
Geospatial Engineering	1
Geotechnical Engineering	3
Hydraulic Engineering	2
Hydrologic Engineering	1
Interior Design	1
Land Development Design	1
Landscape Architecture	1
Materials Engineering	3
Project and Facilities Management	1
Quantity Surveying and Cost Engineering	1
Real Estate Management	1
Structural Engineering	3
Transportation Engineering	4
Urban and Regional Planning	1

Programme focus



	# of Universities
Architecture/Design	1
Building Science	1
Construction Engineering	3
Construction Engineering and Management	9
Construction Management	10
Project Management	3
Quantity Surveying / Cost Engineering	2

Number of faculty per programme



	Average	Range	Median
CEM	10	3 to 48	6
CM	12	4 to 25	9
Civil Engr	36	1 to 58	50
ALL ENTRIES	13	1 to 58	8.5

Graduate provision



- 6 out of 26 universities offer an M.S in Construction Management
- 3 out of 26 universities offer an M.S in Construction Engineering Management

	# of Colleges	
	M.S	Ph.D
Architectural Engineering	3	1
Building Performance and Sustainability	1	N/A
Civil and Architectural Engineering	1	N/A
Civil and Environmental Engineering	2	4
Civil Engineering	7	7
Coastal Engineering	1	N/A
Construction Economics and Quantity Surveying	1 (MBA)	N/A
Construction Engineering Management	3	4
Construction Management	6	3
Environmental Engineering	4	2
Geotechnical Engineering	1	N/A
Infrastructure Project Management	1	N/A
Integrated Sustainable Design	1	N/A
Planning Design and Construction	N/A	1
Project Management	4	N/A
Real Estate and Urban Infrastructure	1 (MBA)	N/A
Structural Engineering	3	N/A
Transportation Engineering	3	1

Construction means and methods



	# of Universities
Construction Education	8
Construction Methods	12
Construction Planning, Control and Risk Management	17
Construction Simulation, Visualization, and Product Modeling	15
Contracting and Legal Issues	14
Data Sensing and Analysis	6
Disaster Management and Response	8
Environmentally Sustainable Design and Construction	15
Infrastructure Management	13
International Construction Issues	12
Knowledge Management and Information Technology	15
Organizational and Labor Issues	11
Quality Management	11
Safety and Reliability	13
Site Management	11

Student Research in sectors



	# of Universities
Civil Engineering	1
Communication	1
Construction	1
General Building	14
Highway/Bridges	2
Industrial	5
Infrastructure	4
Mining	1
Oil and Gas	3
Real estate	1
Sustainability	1
Underground Construction	1
Urban Design	2

CEM Survey



- Curtin University
- Dalian University of Technology
- Florida International University
- Indian Institute of Technology Madras
- Michigan State University
- National University of Singapore
- North Carolina State University
- North Dakota State University
- Purdue University
- Queensland University of Technology
- RICS School of Built Environment,
- Amity University
- Stanford University
- Tianjin University
- Universidad Tecnica Federico Santa Maria
- University of Alberta
- University of Colorado
- University of Hong Kong
- University of Huddersfield
- University of Michigan
- University of New Brunswick
- University of Seoul
- University of Stellenbosch
- University of Texas at Arlington
- University of Texas at Austin
- University of Wisconsin
- Virginia Tech

Don't see your university on the list? Contact Jeff Russell at russell@dcs.wisc.edu or (608) 890-2318 to take the survey.

Research and research funding:



GLF – Trends Committee
Research and research funding

June 6th 2015
Weimar



Stellenbosch University
South Africa

CONSTRUCTION ENGINEERING & MANAGEMENT CHAIR

Jan Wium

Contents

- Methodology used for the study
- Research :
 - Jan Wium
- Funding Trends for Research and Education
 - Kasun Hewage

Responses to survey 1

Country	Number of responses
Australia	2
Canada	2
Chile	1
China	3
England	1
India	2
Singapore	1
South Africa	1
South Korea	1
USA	12

Responses to survey 1

Country	Number of responses
Australia	2
Canada	2
Chile	1
China	3
England	1
India	2
Singapore	1
South Africa	1
South Korea	1
USA	12

Responses to survey 2

Country	Number of responses
Chile	1
China	1
Singapore	1
South Africa	1
USA	8

Research overview



- Research :
 - Disciplines of research
 - Areas of research
 - Research methodologies
 - Industry participation
 - Dissemination of research

Disciplines of research



(26 responses)	# of Universities
General Building	14
Industrial	5
Infrastructure	4
Oil and Gas	3
Highway/Bridges	2
Urban Design	2
Civil Engineering	1
Communication	1
Construction	1
Mining	1
Real estate	1
Sustainability	1
Underground Construction	1

Areas of research



Area	# of Universities
Construction : IT, Simulation, Automation	12
Green Building (energy efficiency, sustainability ...)	7
Building and Information Modeling	7
Infrastructure Management	6
Lean Construction	6
Risk Management	6
Housing	5
Project Management	5
Safety	5
Supply Chain Management	2
International Construction	2
	26 responses

Canada : Trending Research Areas

Research area	# Research projects*
IT in Construction Management	19
Green Construction/life cycle thinking/construction waste	15
Scheduling, planning, control and risk management	9
Labour productivity and human factors	6
Systems optimization/statistics	5
Construction safety	5
Knowledge management and quality management	5
Procurement, contract administration/legal issues	4
Infrastructure management /construction in facilities	4
Others (innovation, project management, value analysis, construction technology, multi-stakeholders aspects)	9

* By CEM researchers of Canada & research funded by construction research organizations

Research methodologies



(26 responses)	# of Universities
Case studies	12
Industry surveys	10
Laboratory simulations	10
Field testing/studies	4
Computer simulations and modeling	3
Interviews	1

Industry participation



Participation in research	Results
Number of responses	8
Minimum %	20
Maximum %	60
Average %	53

Dissemination of research



Pier reviewed journals	12
Industry seminars	12
Masters and PhD dissertations	12
Industry reports	9
Others methodologies reported:	Conference proceedings; workshops; books; Youtube; TV; magazines; newspapers; web portals; sponsor reports; industry task force/committees

UBC

Construction Engineering and Management: Funding Trends for Research and Education



Kasun Hewage, PhD, PEng

School of Engineering
The University of British Columbia Okanagan

June 1, 2015 **Research Study**



Presentation Outline

1. Introduction
2. Objectives
3. Methodology
4. Funds for CEM Education & Research
5. Trending Research Areas
6. Conclusions

1. Introduction

Construction Engineering and Management (CEM):

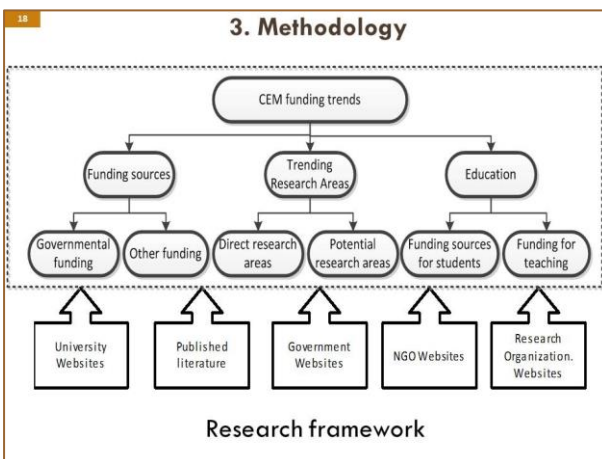
- Construction engineering emerged in early 19th century
- CEM rapidly increased between mid-1970s and mid-1990s
- CEM is a complex discipline in the recent past
- Trends provide valuable insights to formulate future strategies

2. Objectives


- Identify funding trends in CEM education
- Identify funding trends in CEM research
- Identify potential funding sources for CEM research



4. Funds for CEM Education

Student funding



Funding source	Range (%)	Mean \pm SD (%)
TA	0 – 40	13.3 \pm 11.7
RA	0 – 80	25.9 \pm 23.7
Scholarship from school	0 – 25	4.1 \pm 8
Scholarship from outside	0 – 40	5.9 \pm 11.3
Self-support	5 – 100	41 \pm 27
Others	5 – 50	3.7 \pm 12.6

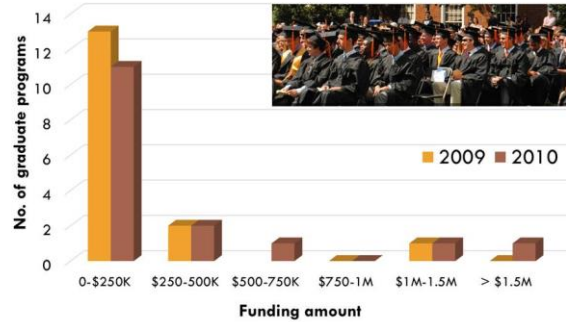
Source: (Lee et al., 2013)

Student funding ...



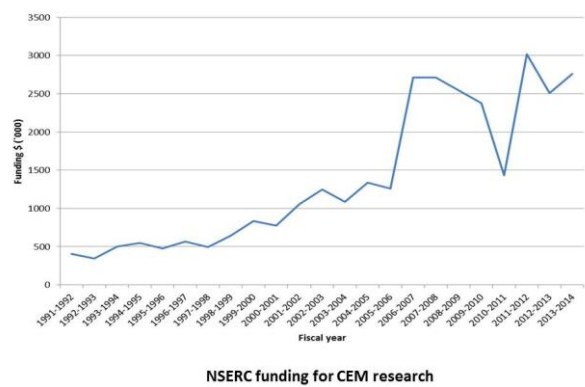
Grant/ Scholarship Type	Amount
NSERC IPS (Industrial Postgrad Scholarships)	\$21,000/yr
Canada Graduate Scholarships-Master	\$17,500/year
NSERC CGS-Doctoral (CGS D) & NSERC Postgrad Scholarships-Doctoral	CGS D: \$35,000/yr PGS D: \$21,000/yr
MITACS Accelerate	\$15,000

External funding for CEM graduate program



5. Funds for CEM Research

Engineering and Physical Sciences Research Council, UK (£ 26.8 million)	National Science Foundation, USA (>\$7 billion in 10 yrs)	NSERC, Canada (> CAD 7 billion, 0.2% for CEM)
Project Management Institute (\$ 50,000)	MITACS	Construction Industry Institute
Australian Research Council (ARC) (AUD 368 million, 0.2% CEM)	Horizon 2020s: European Union (€80 billion in 7 yrs)	



6. Trending Research Areas

Research area	# Research projects*
IT in Construction Management	19
Green Construction/life cycle thinking/construction waste	15
Scheduling, planning, control and risk management	9
Labour productivity and human factors	6
Systems optimization/statistics	5
Construction safety	5
Knowledge management and quality management	5
Procurement, contract administration/legal issues	4
Infrastructure management/construction in facilities	4
Others (innovation, project management, value analysis, construction technology, multi-stakeholders aspects)	9

* By CEM researchers of Canada & research funded by construction research organizations

7. Conclusions

- CEM receives ~ 0.2% - 0.5% of research funding in a country
- Extending from traditional CEM research areas to life cycle thinking, green construction, IT etc.
- Upcoming CEM research aims to integrate modern concepts with traditional CEM subject areas



<http://www.dccgroup.com/boconews>



<http://www.1stsource.ca/aga>

8 Event Photos

Guest Lectures



Presenter Mark Hastak and host Hans-Joachim Bargstädt fighting an argument in front of the audience

Interested audience following one of the guest lectures in the lecture hall of Bauhaus-Universität Weimar



Jan Wium in discussion with participants after his guest lecture at Bauhaus-Universität Weimar

Executive Committee Meeting



Members of the Executive Committee holding their meeting prior to the general assembly together with absent members who participated via video conference system agenda

Welcome reception to the 2015 GLF-CEM annual forum

Immo Feine and Mark Hastak discussing organizational matters during the welcome reception



Welcome reception at the „Bauhaus-Atelier on Bauhaus Universität Weimar campus. Welcome speech by the university rector Karl Beucke

Some group photos



Group photo of participants in front of the venue, the impressive castle Ettersburg near Weimar



Participants having a close-up photo at the Ettersburg Castle

Some photos from GLF-CEM annual assembly meeting



Welcome speech by the host Hans-Joachim Bargstädt on Saturday morning at the castle Ettersburg

Networking of guests and new members Aleksander Nical, Cornelius Homann and Po-Han Chen during the break of the general



Lucio Soibelman presenting the outcome of the work of the graduate program standards committee

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GLF-CEM 2015 Dinner photos



Daniel Halpin presiding dinner table together with colleagues and listening to dinner speech

Mark Hastak and Chuck Jahren in enlightened mood during the dinner



Weimar city excursion



Group photo of GLF-CEM participants in front of city hall and historic “Trabbi” cars



Guide sharing the history of the city on market place in

Participants enjoying the old “Trabbi” cars’ parade



Group photo and Mark Hastak and his son Ajay on the sculpture “West-East Divan” in Weimar’s historical Goethe-park