2016 GLOBAL LEADERSHIP FORUM FOR CONSTRUCTION ENGINEERING AND MANAGEMENT PROGRAMS

Hosted by Department of Construction Management
Tsinghua University
July 3-5, 2016 | Beijing, China
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1. Message of Organizing Chair

The 2016 GLF-CEM was organized by Department of Construction Management at the Tsinghua University. I’d like to thank the delegates that were able to attend and contribute to the success of this year’s forum. Additionally, I want to thank the Executive Committee members for their support of this event. This year’s plenary discussion has been focused on two special topics: 1st Trends and KPI in CEM and 2nd Student Education and Young Researcher Cultivation.

I thank all the co-organizers and supporters of the conference in Beijing for their dedication and help in the preparation and during these 3 sparkling days. I wish everybody fruitful reading in this year’s report.

All successful 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 Los Angeles, USA in 2017

Sincerely,

Dongping Fang, PhD, Prof
Organizing Chairman, GLF-CEM 2016
Head, Dept. of Construction Management, Tsinghua University
Executive Director, Institute of International Engineering Project Management
Director, (Tsinghua – Gammon) Construction Safety Research Center

2. Acknowledgements

We would like to thank all participants for their contributions and discussions. In addition we would like to thank Prof. Roger Flanagan and Dr. Jianzhong Lu for giving exciting invited speeches to the forum audience. 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. Dongping Fang and his team,
who organized the conference in Beijing.

3. List of delegates

<table>
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<tr>
<th>No</th>
<th>Name</th>
<th>Organization</th>
<th>Email</th>
<th>Country</th>
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4. Program

<table>
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<tr>
<th>July 3 (Sunday)</th>
<th>Registration: 14:30-15:00, Room 201, Dept. Civil Engineering</th>
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<tbody>
<tr>
<td>12:00 – 14:30</td>
<td>Lunch Meeting for ExCom Members</td>
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<tr>
<td>Jiasuo Restaurant</td>
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<tr>
<td>15:00 – 18:00</td>
<td>Welcome and Presentation by New Members</td>
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<tr>
<td>Room 201,</td>
<td>- Introduction of new members</td>
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<tr>
<td>Dept. Civil Engineering</td>
<td>- Program presentations by new members (10min each)</td>
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<tr>
<td>18:30 – 20:30</td>
<td>Reception for All Delegates</td>
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<td>Jin Chun Yuan</td>
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<tr>
<th>July 4 (Monday)</th>
<th>Registration: 8:00-12:00, Room 407, Dept. Hydraulic Engineering</th>
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<tr>
<td>8:30 – 8:45</td>
<td>General Assembly</td>
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<tr>
<td>Room 407,</td>
<td>- Welcome by Organizing Chair (Prof. Dongping Fang)</td>
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<tr>
<td>Dept. Hydraulic Engineering</td>
<td>- Opening Remarks by GLF Chair (Prof. Geoffrey Shen)</td>
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<tr>
<td>8:45 – 10:15</td>
<td>Keynote1: The Race to the Future</td>
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<tr>
<td>Room 407,</td>
<td>By Prof. Roger Flanagan, University of Reading</td>
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<tr>
<td>Dept. Hydraulic Engineering</td>
<td>Keynote2: Challenges Faced by Chinese Construction Contractors</td>
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<tr>
<td></td>
<td>By Dr. Jianzhong Lu, President of CCCC International Holding Limited</td>
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</tbody>
</table>
10:15 – 10:45
Foyer
Refreshment Break

10:45 – 12:00
Room 407, Dept. Hydraulic Engineering
Plenary Session on Future Leadership
Panelists: All ExCom Members
Moderator: Michail Kagioglou

12:00 – 13:30
Jiasuo Restaurant
Lunch for All Delegates

13:30 – 15:30
Room 403, Dept. Construct Management
Parallel Session I: Trends and KPI in CEM
Chair: Michail Kagioglou

13:30 – 15:30
Room 404, Dept. Construct Management
Parallel Session II: Student Education and Young Researcher Cultivation
Chair: Jan Wium

15:30 – 16:00
Foyer
Refreshment Break

16:00 – 17:00
Room 403, Dept. Construct Management
General Assembly
Share conclusions from the Parallel Sessions
Closing Remarks

17:30 – 21:00
Quanjude Beijing Roast Duck
Dinner for All Delegates

July 5 (Tuesday)

8:00 – 12:30
Technical Visit to National Housing Industrialization Base, Operated by Beijing UN-Construction Group
Shuttle leaves at 8:00 from Wenjin hotel
Lunch and airport drop-off provided
5. Welcome & Opening Remarks

Welcome by Organizing Chair Prof. Dongping Fang

Opening Remarks by GLF Chair Prof. Geoffrey Shen
6. Invited Speakers

<table>
<thead>
<tr>
<th>Time/Place</th>
<th>Guest Lecture</th>
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<tr>
<td>8:45 ~ 10:15</td>
<td><strong>Prof. Roger Flanagan</strong>&lt;br&gt;University of Reading&lt;br&gt;The Race to the Future</td>
</tr>
<tr>
<td>Room 407, Dept. Hydraulic Engineering</td>
<td><strong>Dr. Jianzhong Lu</strong>&lt;br&gt;President of CCCC International Holding Limited, Executive General Manager of CCCC Overseas Department&lt;br&gt;Challenges Faced by Chinese Construction Contractors</td>
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</table>
6.1 The Race to the Future

Presented by Prof. Roger Flanagan, Professor of Construction Management, School of Construction Management and Engineering, Engineering, University of Reading

The construction industry in the world 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. Roger Flanagan showed a number of pictures and charts showing the changes in the world, and clearly pointed out the opportunities and challenges we will face in the future.

6.2 Challenges Faced by Chinese Construction Contractors

Presented by Dr. Jianzhong Lu, President of CCCC International Holding Limited, Executive General Manager of CCCC Overseas Department.

Slides of the presentation
7. Plenary Session

**Topic : Future Leadership**

Panelists: All ExCom Members  
Moderator: Michail Kagioglou

**Plan**  
1. Questions on keynotes.  
2. Exec Comm views.  
3. Q/A  
4. Conclusions

**Minutes of the Meeting:**
Dr. Wium, South Africa, Stellenbosch University.

Leadership being about making yourself available. Volunteering.
Role of the forum: look at academic standards, revise and envision future research and teaching.

Dr. Soibelman, USC CEE Chairman

Introductory information on USC CEE. Within construction 4 full-time and 19 part-time faculties.
MS and PhD and undergraduate concentration.
What is not leadership? Experience in industry and academia, mistake is with promotion of good engineers to administration positions. Lacking of human management skills. Outstanding professors being promoted to leadership assuming good research capabilities bring good leadership skills. Lack of leadership.
Forum is therefore important. To teach how to be a leader, to talk about how to manage departments, companies etc. and exchange lessons learned.

Dr. Bargstadt, Bauhaus University, Weimar

Head of the management program for real estate, BA and MS. Filling the management gap in the university in AEC area.
Leadership: Get a good basis, technological basis. Creating the openness for uncomfortable questions.
What assets are needed for good pm? Ingredients of leadership, spent time in the industry himself and moved to academia, try to combine research and industry in leadership.

Dr. Lu, CCCC

Importance of honesty and integrity. A leader needs a broad knowledge, including construction engineering expertise but also appreciation of other areas of expertise. Ability to learn something new is the bottom line. Making people exposed to other areas; such as music, literature and making them rounded.

Dr. Flanagan, Reading

You cannot buy leadership, you earn it. By being humble, respectful and seeing the good in things. Need to be positive. Story in Oslo with the Skanska CEO. Just listen people. Motivation of your people at all levels. Do not dominate, listen. Example of looking at your phone vs looking at the person you are talking to.

ADMIN wrapping up initial views. Remarks about learning and developing.

Dr. Hastak: What would you be your opinion on a good manager vs a good leader?
Dr. Bargstadt: A good manager does not exist by itself. You have to be a good manager to be a good leader.

Dr. Wium: Leadership is much more being a servant, taking people into consideration.

Dr. Soibelman: Leaders are managers; leadership comes from setting up the division. Leaders define vision, managers implement.

Q2: Are leaders born, or are they… Captains of sports teams, leaders are best players vs leaders are veterans although not the most talented all the time.

Dr. Flanagan: Importance of the culture. Assumptions not fitting the culture is a problem. You have to earn the respect and respect the culture you are working in.

Dr. Bargstadt adds: There are lots of talents out there that can be developed. Look for talents and make more out of your resource afterwards. It can be developed.

Dr. Wium adds: Both. It is born and cultivated, looking at examples.

Q3: Is there only one definition of leadership, regarding to the culture?
Q4: What about ownership, not leadership?

Dr. Bargstadt: I consider military leadership as the most harmonized, still has limitations. etc.

Q5: How do you realize transferring from engineering positions to leadership in the industry? What’s the universities’ role?
Q6: How to be sure about future? How to deal with unclear future?

Dr. Lu: Universities should teach basic ABC management skills & knowledge. If you can convert that to your tasks is your capability. Interaction with schoolmates and professors, open your mind, participate in different activities outside academic curriculum, be well rounded. That will help your abilities develop. Different environment at school and at work. It’s a process but not a shortcut way.

Dr. Flanagan: Future is fabulous, no need to put ourselves down. Materials, technicis, everything is advancing.

ADMIN: Being an authentic leader is an issue. Pressure points revealing real characteristics in people.

Dr. Wium: It’s about honesty, accepting things that one does not know. Admitting weaknesses.
Dr. Soibelman: Knowing how to delegate is a key capability.

Dr. Bargstadt: The shift is going on. I cannot teach everything to my students any more as a professor. Veterans are not enough to catch up the pace in the industry. Need to motivate younger people to develop their own skills.

Q5 (Dr. Law): Should not we thrive for excellence instead of leadership? Learning vs listening as a more important behavior. Engagement and integrity are key aspects.

Dr. Soibelman: We are talking about the same thing. Objective is to achieve excellence. We do not look for leadership for the sake of leadership.

Dr. Bargstadt: Leaders are missing in the industry.

Q6: Key element to generate vision?

Dr. Lu: Passion.

Q7: Difference between Chinese leadership and Western leadership?

Dr. Soibelman: Passing it to Dr. Lu.

Dr. Lu: Adjusting tension and pressure based on the situation. You must have a competence to convince others. Does not agree with cross cultural explanation.

Dr. Soibelman: It’s at other levels too. Cross cultural issues. Example: Industry complaining about globalization education at schools. Blaming universities. How to teach that? The course that had schools from all around the world bringing students together for issues related to cross cultural problems. Cultural conflicts, nightmare for students revealing the gap in education.

Dr. Flanagan: How much of the audience is engaged right now? How you really earn it? Engagement is a huge issue. The problem of the younger generation, think and act and learn in a different way. Universities have to wake up to this fact, pointing to the bored audience at the back.

Q8: About leaving the developing countries behind. Story about a 5 year-old in Tanzania. Emergency situation to take her to the hospital in a condition of poor infrastructure. What is our role in that? Yes, lack of investment is an issue for the third world but right investment is a bigger issue. Research and research quality is another issue in the developing countries.

Q9: To Dr. Lu on how he is dealing with cultural conflicts.

Dr. Lu: Spend a lot of time for communication. Been humble and respectful, example regarding John Holland acquisition in Australia.
Q10: Asking about integration and lack of Latin American schools represented. Women leadership as well?

**Dr. Soibelman:** Admits the fault of the group, explains the Women in Science initiative and efforts in the US.

Q11: How to assess failure? What are the metrics? How to learn from failure?

**Dr. Soibelman:** This is not only our problem. Look at software development being behind budget and performance all the time. Example on MS Windows.

**Dr. Bargstadt:** We still measure everything with money. Need to find other ways to assess.

**Dr. Wium:** Budget and cost remarks. We never question the initial budget and planning when looking at failures. Need to look at the projected performance before actual performance.

Q12: What values do you look for in the global market vs local market?

**Dr. Bargstadt:** Values may be similar but outcomes are different. Baseline is respect, curiosity. Being humble and curious. Awareness of other people’s way of thinking.

Q13: Once you have a vision and you convey that to your people, what are the challenges to convince your people? From academic side, it is totally different from industry perspective.

**Dr. Bargstadt:** I hate quality management, it’s the most conservative tool we have.

**Dr. Lu:** Important for academia to come up with an education tool for students to learn conceptuality. People are good with talking but how to reach that goal is less emphasized.

**Dr. Soibelman:** Hard to answer as it is relative. Depends on size and other factors. At USC CEE, change is discussed with all the faculty so agreeing on change is easier. Answer depends on the context.

**Final suggestions and take aways:** **Dr. Wium:** Enhance discussion, more communication. **Dr. Soibelman:** More representation is needed, finding more people. Target globalization of the group. **Dr. Bargstadt:** Future is very positive, challenges to be solved. **Dr. Lu:** Keeping big picture in mind all the time. **Dr. Flanagan:** Focus on vision.
8. Parallel Session

8.1 Parallel Session I: Trends and KPI in CEM

Minutes of the Meeting:

16
1. **Introduction**  
**By Prof Mike Kagioglou, University of Huddersfield**  
GLF Purpose: Be at forefront of development in CEM. Be ahead of new trends.

4 trend groups:  
- CEM programs  
- Industry  
- Funding trends higher education and industry  
- Research  
Starting to identify de gaps for all directions

Survey Results:  
- Classification of course priorities Project management climbed to 1  
- 46% response rate (12/26) from US, but response rate too low.  
- 13/26 offer Civil Engineering as undergraduate  
- 12/26 Construction Management undergraduate  
- Most prevalent degree construction engineering and management.  
Another objective is to look into founding amount going into CEM research (0.2-0.5% of GDP)

2. **Global Hub for Construction Performance Analysis and Improvement**  
**By Prof Makarand Hastak**  
Benchmarking construction industry performance

Issues: Importance of agreed KPIs, and how to measure them. The data availability and granularity. Reluctance of information exchange.

Aim: promote Research and knowledge exchange on CP and enhance curriculum of CEM.

Presentation of portal for indexing current research for researchers to know the current status, industry tap into talent in concrete field.

Relevant Work in:  
- South Africa, Dr. Wium  
- HK, Compare KPIs with Singapore, IK, USA. Industry level.  
  3 tier approach: Generics, Region specific (conversion factors to compare), Region unique KPIs (non-comparable)  
- Doctor from India: Different approach project and organization level

**Prof M. Hastak:**  
Introduction of Purdue index for construction Pi-C (US focused):

Porting it globally, replicated for the global market

**Open question for KPIs plan:**

Which areas should we follow trend (research, education, health of Construction Industry?)

3. **Discussion:**

Flanagan: Importance for KPI outcome to be competitive, market it to industry, what’s the added value?

Prof Anumba: What’s the incentive? Who’s profiting?

Time and resource demanding process.

Prof Hastak: Recommends if agree, to start at a high level.

4. **Conclusion**

Multilevel: education, industry, research, programs…

Which level of granularity are we aiming for?

Determine information process, how to manage and what output is desired.

Open call for collaboration: 3 people replied positively regarding their intention of contributing to KPI research. A board was left open for collaborations in any of the four identified domains.

**8.2 Parallel Session II: Student Education and Young Researcher Cultivation**

**Minutes of the Meeting:**

1. **Introduction: Institution and student collaboration**

Objectives:

- Provide students with international exposure
- Develop teamwork strengths across distance cultures and institutions
- Leadership development of students
- Development of collaborative networks between institutions
- Identify common research areas and programs
- Building of a network of international connections
- Develop distance communication skills

Add on: curriculum sharing
Students:

PhD

Full time masters:
- Course based
- Research based

Part time masters

Add on: Undergraduate students

Comments:
Several schools around the world are working for joint course (two class rooms in different university and having a share screen). Two Professors from different universities design the course. Each professor teaches half of the course. Students form groups and working on the same project. Professor could teach similar material in different perspective.
The plan for the future is that students could choose the best professor from any universities and join his/her class. However, many problems exist in this type of course such as schedule of the course is difficult because time difference in different countries.

Options:

Collaborative short-term student projects:
  - Large – semester/year (example: Bauhaus Stanford…)
  - Small – short, not necessarily based on student research

Course attendance:
  - “block week” plus assignments (summer school format)
  - Collaborative course presentation across institutions (lecture exchange)
  - Distance learning (sharing of course contents and presentations)

Collaborative research (PhD, MEng):
  - Productivity
  - Safety
  - IT in construction
  - Procurement methods

Comments (add on):

1. Researchers from UK and Brazil come together and discuss career development this year. (Workshops)
2. Student working together through internet (e.g., Student not in the same place but work together on the same project)
3. Joint design competition (team formed up by student from different university from different countries)
4. Joint internships
5. Extended program agreement between universities (students go abroad and funded by the university)
   a. Credits transfer is an important issue
6. Language is the limitation; student ends up in the similar university where they come from.
7. Student expectation is very important:
   a. (Student) Having more opportunity to getting hands on experiments. Credits are more important for the undergraduate student.
      • Professor responds: balance of theory and real life experiments would be nice during the class.
      • Theory is very important; students need to understand theory in order for them to learn new things on their own.
   b. Explore the culture
   c. (Comment) For a year, student could pick the language, but short time visiting student may not be able to learn the language.

2. Questions:

Credits and recognition
   Comments/issue:
   Budget for letting students to go to other University.

Champions for driving the process:
   Student short term projects-student self (accreditation)
   Quality of collaboration (for credits)
   Funding (exchange etc.)
   Add on: Professional recognition
   Comments (resolve the problem of credit change or tuition fee): class offered at same time and same course (sharing class online), but no credits are exchanged no money is exchanged between two universities.

Implementation:
   Create a facility to bring people together and let interested individuals take their own initiative
   Comments:
      Let professors from different universities list their offers or their demand. Then people could find the best collaboration opportunity.
   Comments (issues with credits earned from different universities):
      Not that flexible in terms of substitute of the credits (Brazil)
US are more flexible in terms of substitute of the credits. France, on the other hand, since the structure of the program are more restricted, not much students go abroad for mater or PhD program.

Two ways to resolve the problem in terms of being flexible for substitute credits:

- Professor who teach the class have the power to allow the substitution of credits.
- The department chair has the power to allow the substitution of credits.

Accreditation would be an issue with substitution of credits.

Define alternative options

Make web space available for “signing up”

Comments (basic idea, initial step to take):

Different universities could list what we do and what we want to do. Then letting other people (faculties or students) to sign up.

People could put list of things they are willing to do for the next year. Then people could check and connect that person. Match mating through different universities, it is also an opportunity for funding from the universities.

3. **Options: Priorities for launching the initiative**

Student projects

Comments (topic):

Students are working on project outside of the schools. Students’ organization run the project and asking professors for advise during the project. The question is should professors be more active during such event? Answers to the question: students take the leadership is a good thing, let them develop their leadership skill during the process.

Issue:

Student working together for joint project, issues including native students end up of doing all the work (creating some free riders).

Balance student in the group is important.

Exchanges (block courses)

Comments:

Funding is one of the issues for student to go to other university. Their own university sometimes funding the students, sometimes the university they are visiting students are funding them.
Issues with joint course from different universities: time difference between the two countries.

Web space and manager
Comments:
Web database is hard to keep because no one is trying to update and fill out the database.

Description of options
Actions and needs
Comments:
- Hybrid class, classify things that need to be taught face to face things can be taught through web video.
- Invite guest lecture from other university and industrial.

Comments (questions):
What should be the out of these classes (joint class oversea)? What is the added value to the students?
Learn from cross culture through the assignments. E.g., Students try to resolve the communication problem (time difference, culture difference).

Alternative funding opportunity for oversea program:
- Governmental funding at Europe
- For oversea joint program: University funds the staffs and students are self-funded.

Sending students abroad:
Chinese students go to universities at US or other countries for summer school. Issue is that universities at US do not have students on campus during the summer, so no interaction between Chinese students and US students.
Making joint program (joint masters etc.) from different universities.

Ideas:
Making an international workshop for students, each year at different place. And having real project that provided by company for the students to work on
Bring PhD students to the workshop next year, and letting PhD students to work together.
Letting PhD students to share their work online like joint class from different universities.

4. **Conclusion:** Summary of the Professors’ views
Prof. Jan Wium / Hans-Joachim

- Described the objectives of the presentation: Provide students with international exposure, develop team work strengths across distance, cultures and institutions, leadership development of students, development of collaborative networks between institutions, identify common research areas and programs and finally build network of international connections between the students.
  - Divided the topics in Bachelors, Master and PhD Students.
  - Analyzes the options: Collaborative short term student projects, different mode of course attendance and collaborative research.
  - Opened the discussion with the following questions; How to deal with credits and recognitions, who is the champion for driving the process? How to measure the quality of collaboration? And finally how to get more funding in the exchange programs?
  - Recommend some implementations like; create a facility to bring people together, define alternative options, make web space available and allow for volunteers to take the lead.
  - Defined the priorities for launching the initiative with student projects, web space and managers, description of the options and define the needs.
  - Asked to the participant to define the student need and expectations
  - Asked the student to describe his experience studying in China.

Prof. Lucio Soibelman

- Recommend add Bachelors student in the future exchange programs.
- Recommend do some online workshop between students.
- Described the vast experience in exchange programs in the American university
- Emphasized that the big cultural barrier is the language, where most of the courses are in English.
- Described the importance of improve the credits system communication between universities.
- Explain the difficulties doing online courses with different cities in a different time zones.

Prof. George Ofori

- Described his idea to increase the number of exchange student in the future.
- Mentioned the exchange experience in Singapore.
- Emphasized that one of the key issues is help the student with fundings.
Prof. Charles T. Jahren

- Recommend do some flexible curriculums between universities.
- Suggest to have a more active participation of the professors in the exchange programs.
- Describe his experience with a New Zealand University in a half online half face to face course.

Prof. Patricia Tzortzopoulos

- Suggest to update the universities website more often.
- Ask the possibility to invite professionals of different industries to give classes in the university for the exchange students.

Prof. Hongling Guo

- Describe his experience doing online classes in Tsinghua University and other universities.

Prof. Guiwen Liu

- Depicted his experience sending Chinese student to U.S.A
- Pointed that in China exist around 400 different degrees that offer a Construction Management.

Prof. Patricio Rivera / Prof. Nigel Francis Jr.

- Answered the Professor's question about the experience of study in China.
- Recommend put more soft skill courses in the exchange curriculum to help the student to get involved in the different culture.
- Recommend give to the student better tools to make connections between the universities and the companies in the effort to find a job.
9. Slide of the Presentations for the Parallel Session

GLF – Trends Committee

Mike Kagioglou
University of Huddersfield

July 4th 2016
China

Contents

• Background to the Trends Committee
• Terms of reference and mandate from the Banff workshop
• Report on progress made
• Suggestion on the way forward

The Genesis!

• GLF purpose:
  – 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.
• Trends Committee purpose:
  – Report and articulate construction/Built Environment Industry, educational, and research trends that have the potential or already impacting CEM and CM graduate programs

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).

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

limitations

• Just about everything!
  – Sample size and representation
  – Validity
  – Breadth
  – Resource available
  – etc
However (as presented at Weimar)

- 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

Major Categories (Industry Survey):
- Management
- Behavioral
- Technical – disciplines
- Technical – Management process
- Other Practical Skills
- Course Category priorities

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

CEM (educational programmes) 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

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>12</td>
</tr>
<tr>
<td>Europe</td>
<td>4</td>
</tr>
<tr>
<td>India</td>
<td>4</td>
</tr>
<tr>
<td>China</td>
<td>4</td>
</tr>
<tr>
<td>Canada</td>
<td>4</td>
</tr>
<tr>
<td>Korea</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
</tbody>
</table>

CEM Survey Results

- Overall results:
  - 11 of 26 universities offer Civil Engineering as an Undergraduate degree option
  - 16 of 26 universities offer Construction Management as an Undergraduate degree option
  - In the United States, the most prevalent degree option is construction engineering management (20 out of 32 U.S. universities have a program)

<table>
<thead>
<tr>
<th>Undergraduate Degree</th>
<th>Number of universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Engineering</td>
<td>11</td>
</tr>
<tr>
<td>Construction Management</td>
<td>16</td>
</tr>
<tr>
<td>Architecture</td>
<td>2</td>
</tr>
<tr>
<td>Environmental Engineering</td>
<td>2</td>
</tr>
<tr>
<td>Landscape Architecture</td>
<td>1</td>
</tr>
<tr>
<td>Geotechnical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>Materials Engineering</td>
<td>1</td>
</tr>
<tr>
<td>Structural Engineering</td>
<td>2</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>1</td>
</tr>
<tr>
<td>Environmental Engineering</td>
<td>1</td>
</tr>
<tr>
<td>Land Use and Urban Design</td>
<td>1</td>
</tr>
<tr>
<td>Urban Studies</td>
<td>1</td>
</tr>
<tr>
<td>Water Resources</td>
<td>1</td>
</tr>
<tr>
<td>Marine Engineering</td>
<td>1</td>
</tr>
<tr>
<td>Nuclear Engineering</td>
<td>1</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>1</td>
</tr>
<tr>
<td>Transportation Systems</td>
<td>1</td>
</tr>
<tr>
<td>Energy Engineering</td>
<td>1</td>
</tr>
<tr>
<td>Safety Management</td>
<td>1</td>
</tr>
</tbody>
</table>

Number of faculty per programme

<table>
<thead>
<tr>
<th>Program</th>
<th>Average</th>
<th>Range</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEM</td>
<td>10</td>
<td>3 to 48</td>
<td>6</td>
</tr>
<tr>
<td>CM</td>
<td>12</td>
<td>4 to 25</td>
<td>9</td>
</tr>
<tr>
<td>Civil Eng</td>
<td>36</td>
<td>1 to 58</td>
<td>50</td>
</tr>
<tr>
<td>ALL ENTRIES</td>
<td>13</td>
<td>1 to 58</td>
<td>8.5</td>
</tr>
</tbody>
</table>
Methodology (Kasun’s paper)

Areas of research

<table>
<thead>
<tr>
<th>Area</th>
<th># of Universities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction: IT, Simulation, Automation</td>
<td>12</td>
</tr>
<tr>
<td>Green Building (energy efficiency, sustainability ...)</td>
<td>7</td>
</tr>
<tr>
<td>Building and Information Modelling</td>
<td>7</td>
</tr>
<tr>
<td>Infrastructure Management</td>
<td>6</td>
</tr>
<tr>
<td>Lean Construction</td>
<td>6</td>
</tr>
<tr>
<td>Risk Management</td>
<td>6</td>
</tr>
<tr>
<td>Housing</td>
<td>5</td>
</tr>
<tr>
<td>Project Management</td>
<td>5</td>
</tr>
<tr>
<td>Safety</td>
<td>5</td>
</tr>
<tr>
<td>Supply Chain Management</td>
<td>2</td>
</tr>
<tr>
<td>International Construction</td>
<td>2</td>
</tr>
</tbody>
</table>

Research framework

Methodology (research and funding)

- Survey under CEM university departments/chairs/divisions
- 26 responses returned (round 1)
- 40% from USA
- 15 responses returned (round 2) (doubles)
- 67% from USA

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

What next?

- Global Hub for Construction Performance Analysis and Improvement
- Discussion on way forward

26 responses
GLF-CEM

INSTITUTION AND STUDENT COLLABORATION

Jan Wiium/Hans-Jochim Bargstadt

Students:

- PhD
- Full time masters:
  - course based
  - research based
- Part time masters

Objectives:

- Provide students with international exposure
- Develop team work strengths across distance, cultures and institutions
- Leadership development of students
- Development of collaborative networks between institutions
- Identify common research areas and programmes
- Building of a network of international connections (students)
- Develop distance communication skills amongst students

Options:

- Collaborative short term student projects:
  - Large – semester/year (example: Bauhaus-Stanford-
  Stanford-...)
  - Small – short, not necessarily based on student research
- Course attendance:
  - ‘Block week’ plus assignments (summer school format?)
  - Collaborative course presentation across institutions (lecturer exchange)
  - Distance learning (sharing of course contents and presentations)
- Collaborative research (PhD, MEng):
  - Productivity
  - Safety
  - IT in construction
  - Procurement methods
  - Others

Questions:

a. Credits and recognition
b. Champions for driving the process:
   - student short term projects - student self (accreditation?)
c. Quality of collaboration (for credits)
d. Funding (exchange etc)
e. Professional recognition
f. Scheduling the collaboration

Implementation:

a. Create a facility to bring people together and let interested individuals take their own initiative
b. Define alternative options
c. Make web space available for “signing up”
d. Allow for volunteers to take the lead

Priorities for launching the initiative:

- Student projects
- Exchanges (block courses)
- Web space and manager
- Description of options
- Actions and needs
Global Hub for Construction Performance Analysis and Improvement

Prof. Thomas Ng, The University of Hong Kong
Prof. Makar and (Mark) Hristak, Purdue University
Prof. Geoffrey Shek, Hong Kong Polytechnic University
Prof. Jan Wiim, University of Stavanger
Prof. Mohsin Kumaraswamy, The University of Hong Kong and ITM University
Prof. Mike Kagioglou, University of Huddersfield

Contents

➢ Background
➢ Aims and Objectives
➢ Deliverables
➢ Relevant Initiatives
➢ What’s next?

Motivation

➢ Poor performance of the construction industry
  ➢ Benchmarking against the world’s best practices and outcomes can help improve industry performance

Key Challenges

➢ Lack of an agreed set of key performance indicators (KPIs)
➢ Method of measuring KPIs may vary between different countries
➢ Data availability and level of granularity
➢ Information exchange between different countries or cities is rare
➢ Impossible to benchmark against some other countries?

Way Forward?

GLOBAL HUB FOR CONSTRUCTION PERFORMANCE

Objectives

➢ To identify a set of key performance indicators (KPIs) for measuring the performance of (1) the construction industry, (2) CEM Programs, (3) CEM Education programs, and (4) CEM Research
➢ To collect and compile relevant data for extracting and weighting/adjusting the identified KPIs for special conditions
➢ To compare the collected data to assess the strengths and weaknesses of the construction industry in different places
➢ To develop new research agendas to address some of the key issues identified
➢ To formulate guidelines for CEM curriculum with due consideration of construction performance
➢ To set up a Team to implement, continuously improve & monitor the above and to present ongoing findings at GLF-CEM forums and other appropriate venues
Relevant Works in USA

• Extensive efforts at Purdue University to enhance data driven decision-making:
  – Emergent construction technologies (ECT)
  – Academic breakthrough in Construction (AB)
  – Purdue Index for Construction (Pi-C)
  – In addition to research on profitability, infrastructure analytics and risks analysis

Construction Analytics

• Definitions:
  – Analytics:
    • Application of data and development of insights to drive fact-based decisions (Kim and Shookley 2013)
    • These insights are created by application of:
      – statistical
      – Contextual
      – quantitative
      – qualitative
      – predictive
      – cognitive models

Target Groups

• Non Profit Initiative
  – Spread Knowledge and Information in both the construction industry and the academia

• Target Groups
  – Technology developers/distributors in the construction industry
  – Researchers from academia and other organizations
  – Contractors and owners from the construction industry

Emerging Construction Technologies (ECT)

[Image: Emerging Construction Technologies chart]

Academic Breakthrough

[Image: Academic Breakthrough website]

Academic Breakthrough

[Image: Academic Breakthrough data points]
Academic Breakthrough

Areas of Research (Themes)

Purdue Index for Construction (Pi-C)
Index for the health of the construction industry

History of Pi-C

- Objective: Create an index to gauge health of the construction industry
- Philosophy: Health is beyond financial indicators
- Initial Step: What is healthy construction industry?

Framework

- Proposed five-dimensional definition that describes the construction industry as healthy, if the industry:
  - Indicates positive economic/financial performance
  - Is stable and resilient to internal/external shocks
  - Provides a pleasant working environment
  - Applies the best of expertise/science/technology
  - Produces high quality products

Philosophy of Pi-C

Social Well-being of the Industry
Economic Performance of the Industry
Workforce & Resource Development, Innovation
Stability and Resilience
User Satisfaction and Quality of Production

Pi-C
Relevant Works in Hong Kong

Working on an industry driven study on "international benchmarking of construction performance"
Identified a set of KPIs which can facilitate international benchmarking at the industry level
Collected data related to the KPIs from open sources of USA, UK, HK and Singapore
Analyzing the trend of construction performance in these four constituencies

Productivity
- Construction GDP = No. of workers
- Construction GDP = Overall GDP
  - Gross floor area = On-site worker
  - Public works expenditure = GDP
  - Public works expenditure per capita
  - Gross value of construction works per capita

Safety
- No. of fatalities = No. of workers
- No. of fatalities = construction GDP
  - No. of reportable accidents = No. of workers
  - No. of reportable accidents = construction GDP
  - No. of summonses convicted per HK$100,000,000 gross value of construction works
Relevant Works in Hong Kong

- Environment
  - Construction waste ∝ Construction GDP
  - Energy consumption ∝ Gross value of construction
  - Water usage ∝ Construction GDP
  - CO2e ∝ Construction GDP

Relevant Works in India – BACKGROUND

CII India - Construction Industry Improvement Initiative India
- launched in October 2015 from IIT Madras
Aims to trigger & empower the industry transformations by engaging all major stakeholders in stages, starting with major clients

Objectives of CII Indi:
- To identify current and imminent critical issues in the Construction Industry - in India.
- To compile a Roadmap for industry improvements - in strategic high (10%) impact domains.
- To launch (a) System Improvement Initiatives and (b) demonstration projects - in prioritized focus areas within the above strategic domains.

Relevant Works in India – BACKGROUND continued

Major Milestones so far:
- Mobilized & Motivated a core group of Large Construction Clients – kicked off with 2 landmark Regional Roundtable ofBuilding Construction Clients – in Chennal (Oct. 2015) and Mumbai (Feb. 2016) – see http://ciiindia.com/
- Formed 7 Action Teams in March 2016 – acting through multiple modes - Workshops, Conference calls, project data collection etc.

Action Item 1: Identification and formulation of KPIs

Action Item 2: Strategies for significantly reducing Construction Project Time, Frames & Costs

Action Item 3: Design process and technology adoption

Action Item 5: Human Capital (Including Labour, Technical & Managerial) and Skills Development and Productivity

Action Item 6: Construction Clients Charter

Action Item 7: CII India Institutional Platform

Relevant Works in India – by CII India Action Team 1 on KPIs

NOTE – Present Focus is different from Hong Kong (Industry Level)
since CII India is initially targeting Project Level and Organization level KPIs

- however there will be complementarity + overlap + synergies
Rationale – CII India targets Construction Industry IMPROVEMENT
- But we can’t improve what we don’t measure
- And Measurement needs KPIs
What gets measured and rewarded is what gets done
CAUTION! Beware: Some things that count can not be counted
Some things that get counted do not count!

So we need the “right” set of KPIs
Different sets of KPIs for different purposes, and also under different categories:
- for the whole industry, or for Organizations, or for Projects
- for different Construction/Project Types
- at different levels of detail - Primary (e.g., ‘headline indicators’ for Top Management); Secondary (for middle management / medium term control); Tertiary (for day-to-day)

So, a family of KPIs – if a top level KPI ‘rings alarm bells’
then a manager may probe levels below and drill further to root causes of problems

Relevant Works in India – KPI TEMPLATE

- Identifying VALUABLE & USEFUL KPIs – WORK IN PROGRESS - by CII India Action Team 1

Now circulating following template (which below is from Page 1 of 12 only) to Team 1 members for 2nd stage inputs:

Client Effectiveness
- Safety & Compliance with laws
- Workable & manageable - project
- Profits and cash flow - project
- Customer satisfaction
- Constructability

Project Performance
- Efficiency of execution
- O&M effectiveness
- Project duration

KPI Framework
- Measurements
- Feedback
- Performance
- Work plan

KPI Structure
- Important
- Relevant
- Measurable
- Actionable
2016 GLOBAL LEADERSHIP FORUM FOR
CONSTRUCTION ENGINEERING AND MANAGEMENT PROGRAMS

Relevant Works in South Africa (2)

- More relevant information on industry trends are found at:
  - Construction Industry Development Board (CIDB)
  - SAFEC (South African Forum for Civil Engineering Contractors)
  - Department of Labour:
    - Health and safety statistics (limited)
    - Productivity
    - CESA (Consulting Engineers South Africa):
      - Professional fees, skills

Tentative Program

- At GLF-CEM 2016: Invite and identify GLF-CEM members interested in such KPIs development and applications
- Tentative Schedule:
  - Months 1-3: Identify suitable construction KPIs which can facilitate international comparison
  - Months 4-9: Develop common templates and pass to Members
  - Collect local data using these templates
  - Months 10-12: Conduct preliminary analyses based on the collected data – by a special KPI Task Force
- At GLF-CEM 2017: Report the findings and set directions for future research, development, dissemination and education
- Also at GLF-CEM 2017: Set up a team to implement, continuously improve & monitor the above; and to present future findings at relevant fora.

Relevant Works in South Africa (1)

- Different organisations address industry trends, however mostly directed towards industry economic confidence, providing economic indicators:
  - Bureau of Economic Research (Stellenbosch University);
  - Industry Insight (private industry)
  - KPMG;
  - PWC
10. Professor notes of the Parallel Session
11. Event Photos
Looking Forward to Meeting Everyone Again in Los Angeles, USA in 2017

12. Upcoming GLF-CEM
See You!