5th Lean Construction Institute Academic Forum 
May 18-20, 2009 – Louisville, Colorado, USA

Forum Minutes

by

Daphene Koch
Tariq Abdelhamid

Forum Attendees: Baabak Ashuri (Georgia Institute of Technology), Colin Milberg (San Diego State University), Daphene Koch (Purdue University), Don Schafer (Michigan State University), Forgues Daniel (University of Quebec), Glenn Ballard (University of California – Berkeley), Greg Howell (Lean construction Institute), James Folkestad (Colorado State University), Joachim Knuf (Organizational Learning Systems, Inc.), José L. Fernández-Solís (Texas A&M University), Ken Bertolini (Minnesota State University-Moorhead), Mike Osterling (White Collar Lean), Tariq Abdelhamid (Michigan State University), Yong-Woo Kim (Washington State University).

Forum Location:
Offices of Lean Project Consulting located at 625 Main Street 1-B, Louisville, Colorado 80027

Forum Schedule:
The schedule was as follows (all times in MDT - Mountain Daylight Time):
Monday, 5/18/09: Workshop from 8am to 5pm
Tuesday, 5/19/09: Symposium from 8am to 5pm
Wednesday, 5/20/09: Symposium from 8am to noon

Forum Registration/Logistics:
The registration fee was $150. Lodging, transportation, meals, and other expenses were the participant responsibility.

As-planned Meeting Objectives:
1. Presentation of Lean Construction classroom instructional simulation models.
   a. Designed for academics who have research and/or teaching aspirations in Lean Construction.
2. Lean Construction research and teaching symposium, dedicated to:
   a. Accounts of Lean Construction research and teaching taking place at LCI, and at LCI affiliated research centers (P2LS, C2P2ai, Edgility, etc)
   b. Cataloging ongoing research and teaching efforts in Lean Construction
   c. Research and teaching plans of new LCIAF members.

As-Realized Meeting:
The meeting began on Monday May 18, 2009 with a brief overview of the Lean Construction Institute history and mission. The Academic Forum aims and activities were
briefly stated as well. The participants then introduced themselves. This was followed by simulation games designed to facilitate the understanding of Lean Construction concepts. The games were: The Silent Squares; the Dice Game, and the Airplane Game. After each game, a group discussion took place for debriefing and further explanation of the concepts.

The meeting on Tuesday May 19, and Wednesday May 20, 2009 took the form of group discussions that focused on Lean Construction research and teaching. Presentations were made by each participant regarding the ongoing and planned Lean Construction activities at each university. Glenn Ballard then discussed the Lean Project Delivery System. The group then discussed shared research topics that can be advanced through collaborations. The main vehicle for this is going to be in the form of a document titled “process benchmark”. An intense session on construction safety took place, which concluded the 2nd day. The last day was spent on discussing tenure, certification, and the Last Planner System.

The group agreed to schedule a virtual meeting in 6 months to report on progress with respect to the process benchmarks, as well as any other efforts. The 6th LCI-AF will be held in May 2010, with the exact time to be announced later.

Detailed Accounts:

**Group Discussion on the video that Greg sent**

(http://www.ted.com/index.php/talks/dan_ariely_on_our_buggy_moral_code.html)

Discussion: Ariely demonstrates our bias towards certain beliefs (intuition) that are refuted by simple experiments (e.g., how and why people cheat). The overall message is to systematically question our intuition through setting up experiments.

**Faculty reports on LC news:**

Colin Milberg, San Diego State University

- Building off of dissertation; tolerance management and civil systems; special variability; construct modules; changing where there is a connection and the adjustments needs to be made in the field.
- Interfaces of components are where we run into quality problems; bring into design phase; having process capability; working with American Concrete Institute; 3D laser scanner; and have contractors collect data, historical and dimensional tolerances. What is the location variation; Database that can be accessed and hope to connect with past action research, other how can they observe what goes on?
- Developing construction program so they have few grad students,
- Creating a lean construction certification program for industry professionals.
- Researching in other fields from educational point of view, attitudinal change, best practice, research on coaching and mentoring. What can we bring to the table, what makes things stick?
- Ken Walsh: looking into investigating the last responsible moment; you know it when you hit it; hard to predict when you are planning; can we identify when something is approaching. Looking at integrated agreement and negotiation that goes on; social interaction that happens and what kind of trust gets built or not built.
- Action research courses. What is this? Came from the social science?
- Education in LCI: Ken Walsh and Colin envision SDSU (San Diego State Univ.) to have Lean as a part of their curriculum; Lean Construction in program culture, Jnr level 300; review overall flow of the project; flow of operation, the panama canal as an example is that they did not realize that earthwork is a process, it is a simple example to introduce the concepts of lean; scheduling and estimating with Lean flavor; still talk about earned value only in concept what you see and its limitation; Last planner and work flow perspective is stressed.

- Senior project, improved flow, improved safety,

Tariq Abdelhamid, Michigan State University

- Teaching: Attended meeting 9 yrs ago and Glen and Greg, wanted to challenge them; Was at ford, and it did not work to copy Toyota; At MSU, he wanted to be engaged with LC; best way to learn is to attend LCI and IGLC events and teaching; Teach a class in Lean Construction at grad level, not in undergraduate as because harder to get in there; Feedback from students on course has taken course into better format; Teaching UG and GR CPM scheduling and slip in where the CPM falls in Lean Construction; and what it gives you from a planning tool; stressing that CM is targeting macro-level project planning and not good for field planning.

- Supervised internships, some employers (companies) are teaching lean construction (DPR, Mortenson, Alberici, Walbridge)

- Working with Bob Mauck to create Midwest LCI chapter, having trouble getting enough people to come together on the launching. Motivation is there. We might call it Great Lakes LCI chapter. Greg and Glenn want the industry to pull. Bob Mauck has a membership profile in mind before it can launch.

- Invite faculty to submit papers to Lean Construction Journal (www.leanconstructionjournal.org); Alan Mossman as co-editor

- Working on edited volume on Lean Construction with Alan Mossman. Invite contributors, specific sections of a chapter or section.

- Research: University sponsored center launched 3 yrs ago; center for construction project performance assessment and improvement (C2P2AI). Project production systems lab was seen by arch as too engineering and the production and systems ideas takes out the fun of buildings and arch. The center addresses projects that the construction group at MSU is interested in. Projects range from change orders, project closeout, cost overruns, process manual for projects. Interject lean construction wherever applicable; the underlying philosophy of the center is the Lean Project Delivery System (LPDS); publish white papers for how can you deploy lean construction. Hit or miss with different people, Hopefully build up more interest. Fund 5 students per year. Don is here and a PhD students. Thesis and supporting MSc projects. Could be same or do something different. Conduct energy code training, work on project controls model for power plant in MI that was using time and material and found best thing to do is productions control using Last Planner.

Jose Solis, Texas A & M

- Linbeck champion
- They have a regional LCI chapter and they will do LCTX – Houston, Austin, Dallas
- Linbeck started, learning session, Glenn, had 51 companies attend. The profile was owners through manufacturers, contractors, a little short on design. The first dinner chapter meeting and have 35 attendees already. DPR, Dean Reed will speak on PPC. Create a learning community where the participations. DPR Austin, San Antonio, Turner,
- Help companies that already have internal learning capabilities teaching internally what they are doing. Help them identify what they need to do to get the critical mass. Important to understand that tenure faculty is not to start chapters, it belongs to the industry. Academics move the process along and provide reaching out lists, assuring that the supply chain is represented and looking at research opportunities
- Texas A&M construction program has 650 undergraduates and 150 graduate students (95% come from IIT in India.), 24 faculty. So far the best they can do is teach one session of a class and bring students to LCI chapter meetings. Industry Advisory board is challenging program to be brought to 21st century; BIM, Lean, and Green (BLG) will revamp entire program.
- Research: BIM virtual model for applying the Lean concepts; Use BIM as lowest level common denominator – can help with projects in different parts of the world (George Burns is a mechanical guy in Qatar); Working on Taxonomy that Glenn suggested (Project, Phases, processes, operations, steps, elemental motions) using fractals to pick up on trends; Surveying and documenting how 10 companies are getting started in Lean: The process that they use, analyze and document it.
- Have identified Lean teaching and research in business school, operations management and trying to bring them in.
- Jose is interested in theoretical side of Lean, and Zophia, if she joins, will bring empirical side.
- Jose personnel research is in the full integration of green and lean – green tells what to build and lean tells us how we build it efficiently – BIM putting it in a model that can be captured and passed on.
- How is A & M changing for accreditation? Taking advantage of crisis, their advisory council said that they will not continue funding the program unless they change. Curriculum change out of the 10 tenure track, 4 are BIM they get in and tweak any program and make it align with that; 2 on green, and no one on Lean except Jose and Zophilia, hiring 3 this year, and 4 next year. Changing mix of faculty to move it along, if Jorge becomes dean the top down will be changed.
- Create a center for sustainable construction where lean would be a part of this, there are 6 centers at A&M so this would be a part of it.

Yong Kim, University of Washington
- Research: Established a P2SL lab at UW. Working closely with LCI Cascadia Chapter (meeting each month, invite guest speaker, forum for discussion). Work with P2SL lab at Berkeley, worked as consultant to GC children’s hospital, first lean construction project in NW. Set up workshop for Last Planner, 25 people all day session, how to implement for this project. BMWC applied Washington
project SKANSKA did not know what last planner system. They want to investigate the relationship between PPC and schedule and cost performance. Collected data last week. Original BP whiting data.

- Teaching: Taught grad level LC at U of Houston, and at Syracuse. Now teaching Lean construction as part of 2 existing undergrad classes, cost acct and PM; Seems that the mention of Lean Construction brings up preconceived ideas; will teach Lean Construction class at grad level but after tenure. U of W fortunate to receive $3 million endowment to update research and education in Construction Engineering.

Babaak Ashuri – Georgia Tech
- BS Civil, MS Construction, PhD industrial systems; Met Tariq and Glenn at CRC in Seattle; Followed publications; the 5th AF gave him neat things to incorporate in classes. Was not aware of the magnitude of the Lean Construction initiative.
- Research: Real options is his main research thrust; interested in how changing workspace planning, risk management, etc., can be priced such that cost estimates exhibit flexibility; studies the work of Francis Duffy, theory of flexibility for design.

Jim Folkestad, Colorado State University
- Jim is here to appreciate the weak ties of networks, bridging connections, then think out of box and be innovations.
- Worked in manufacturing, CM at CSU, now in School of Education. Did not like the direction of the construction program.
- Created Edgility (see edgility.net): having the capability to leverage the power of networks (Edge Power) to rapidly learn and innovate in order to compete globally for work."
  - Power to the edge in the military; designed to get the right people to the best place, John Boyd (Tariq and Greg working on), read the book “Boyd”.
  - What happened to the horseman? Jim needs to work on it more in project environments – looking for collaborations.
- How to rapidly learn using networks; how we learn quicker today; shifting from push system of education to pull system of learning; mass customization;
  - If we were all on twitter we would learn from each other and quicker. How do we leverage the power of networks and learn quicker. Twittering hash tag #leanPC see all of our threads as other people are talking.
  - Tweeting, limited to 140 characters, get point across in few words.
  - Some may feel having more information is not worth the investment.
- His department offers Interdisciplinary PhD in Education PhD level research methods program.

Greg Howell – Lean Construction Institute
- He feels at the hub at the different networks as a consultant
- Lean expanding: India Lean Construction Institute, network of Skanska in India and make the networks come together.
- Not doing it well because there are so many other things to do. The arch will bridge and the industry will shift as the connections are building so it is an interesting time and the web connections of the world are coming together.
- Envisions LCI to be at the intersection of the three big associations; CURT; AIA; and AGC/ABC – but not a part of any one association
  - CURT interested in Lean Construction and has task force
  - AGC wants to have LC under their authorship
  - AIA came out with IPD but with no Lean Construction emphasis because of considering the application of IPD to be in the domain of methods.
- Wants to keep the following going:
  - LCI 2-day intro workshop
  - LCI research meetings (one on safety, one on relational contracting, and one on LC in the public sector)
  - Keep For a active (academic and design)
  - Memberships – Cynthia Tsao
  - Certification – Colin Milberg
  - Lean Construction Journal – Tariq Abdelhamid and Alan Mossman
- Greg offered to collaborate on papers with anyone interested to write. Daphene has an interest in writing a paper on simulations.

Ken Bertolini, Morehead State University
- 2 yrs at Morehead, 3rd career, undergraduate only, across from North Dakota State, U, tenure track, 145 students 1 of 3 faculty, want to pursue PhD, research and publish. Wife working on her PhD and wants to have the ability to move in the future. M.S. from MSU, met Tariq and learned about Lean Construction. Looking for the opportunity in research. Area Lean and sustainability. Does not have the ability to do a grad class, because there is no grad program yet. Has sustainable class and has had it approved from the life cycle aspect, where they come from and what. Asked to incorporate class and make it liberal arts core class, core curriculum class for the university curriculum. Opening up to the rest of the university, will instruct construction but also the rest of the university.
- MS. With Matt Syal at MSU; worked on research through manufacturing housing institute in modular homes and manufacturer homes. Some manufacturers talked about Lean but not focus of research. Did some research and publishing, try to establish Lean and Green links for sustainability to do some writing and research in those areas.

Daphene Koch, Purdue University
- At Forum to expand the Lean Construction concept into a upper level class for Mechanical and Electrical concentration students.
- I have learned the games and will apply
- Talk to Messer and BMW about the Lean construction

Glenn Ballard, P2SL - UC Berkeley
- Conducting experiments with industry partners; Coming together with companies and present the current prescription, this is what we advise people to do, and
balance that with what people are actually doing; can we agree on what advise we want to agree with industry.

- Research: Target Value Design: How do you get value where it needs to be so that we can give more to the owner
  o Studying by looking at the reasons why cost estimates keep increasing over the life of a project.
  o The cost reduction comes from 3 things:
    - scope control: you are controlling scope if scope and cost are connected, batch size, culture, arch and builders, contractual, get builders in early on
    - scope refinement: engage specialists in development of design, cathedral hill hospital proj; associate a trade in cost estimate down with the introduction with a new trade partner and contingency reduction.
      - cathedral hill the client required them to control humidity over 80 degree; but what are you trying to prevent in return for investing as much amount of money for a situation that occurs only 6 days a year. Put heat trace on the window sills and turn it on when there is humidity - challenging mech contractor role, but to ask why do you need that. Why should this be done?
    - pro active value engineering in making that a design tool rather than a design fix; value engineering is used when you go over budget and you search for ways that you get cost our of an existing
  o Cost estimate and outturn costs are lower than market.
  o Underun to be used as an investable pool of money at the beginning of the project rather than the end.
  o Research directions, more rigor in determination in the customers allowable cost. Even the most sophisticated client does not have a good sense of allowable cost
  o Need a Cost model; working with Shell oil;
  o Rigor of allowable cost through an operations cost model to predict future use ROI. Client to give that model to the integrated team of builders and designers so that they can re calculate their own budget so they can input the life cycle cost of alternatives . Moving the decision point and included the financial institutions, we are relaxing the constraint of ROI because we are allowing the ROI to fluctuate , bottleneck would be ability to finance, but the design is integrated.
  o Working on big grant with Dept of Energy to increasing energy efficiency in buildings
  o Working on standard work, lean leadership, improving look ahead process, model-based estimating, and lean into public sector, set based design, target value design, lean logistics, supply management design.
**Process Benchmarks**

Glenn Ballard indicated that the experience and knowledge gained from the activities at P2SL are summarized in a document titled “Process Benchmark”. This document captures the state of practice and theory to date on a particular topic (the current state of standard work), and serves as advice to industry that is grounded in research. The Process benchmark establishes a point of departure from where we can improve on standard work. Customer (owners, arch, engineers, constructors, etc) education is part of developing the benchmark.

Glenn suggests that AF member should take the lead on process benchmarks they feel comfortable with. Assistance and collaboration can come from others as well as a process of peer-review.

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Tenure Discussions
- Understand what the expectations of the following groups are: Colleagues; Department (chair); College; University; peers
- Request written annual reviews
- Collaborations on and off campus
- Keep documentation (teaching evaluations, rejection rates of conferences and journals, etc)
- Networking
- Service to associations and industry groups

Certification Discussions
- Why certification?
  o Grow the community of practitioners
  o Develop a cohort of Lean Construction professionals
  o Focused know how
  o Value-added to industry
  o Directs people to LCI
  o Establish a practice constitution, with provision to allow for amendments (improvements)
  o Creating the operational interface between project participants
  o Learn how to become lean and not just do lean
  o Operating language
  o Capture fundamental principles
- Certification format?
  o Validation levels – basic levels and advanced levels
  o Study materials
  o LCI acts as accrediting body
  o Coursework, Exams, practice/implementation project
  o Continuously updated
  o Failure rate
- Certification Concerns
  o Slide into certainty!
  o Provide point of entry but recognize that boundary of knowledge is fuzzy
  o Learning to see