



ISSUE 3
March 2013

EVENTS

MAY 14-15, 2013

COAA Best Practices Conference
Shaw Conference Centre, Edmonton

JUNE 9-11, 2013

Innovation in Construction: Forum 2013
Northlands Expo Centre, Edmonton

JUNE 24-28, 2013

IFSA-NAFIPS Congress/ Meeting
University of Alberta, Edmonton

INDUSTRY PARTNERS

Aecon Industrial Western

Building Trades of Alberta

Capital Power Corporation

Christian Labour Association
of Canada

Construction Owners Association
of Alberta

Merit Contractors Association

Progressive Contractors Association
of Canada

Suncor Energy

TransAlta Corporation



Labour productivity study to boost construction efficiency

The IRC is currently working closely with a number of partner organizations on a major Labour Productivity Analysis and Modeling research study that will ultimately help increase construction efficiency, giving partner organizations and the Alberta economy a competitive boost.

Dr. Adel Awad, IRC postdoctoral fellow, says that productivity is one of the most important and influential variables affecting any construction or industrial organization, and it holds particular significance in Alberta. The province's construction industry is growing, but it is not without challenges. In an environment where both regional and international market interests are at play, Awad says it is imperative that construction organizations focus on increasing labour productivity as a means to bettering their competitive position. "Due to the prominence of construction in Alberta, productivity trends in this industry affect the productivity of the whole provincial economy"—and indeed, the whole Canadian economy.

Though vital to success, labour productivity is notoriously difficult to study and improve. Abraham Tsehayae, IRC PhD student and researcher, points to the nature of the construction industry as the reason why past studies have failed to provide a meaningful modeling approach that provides realistic predictions and facilitates the development and implementation of improvement strategies. "Unlike the manufacturing industry, the construction industry relies heavily on the use of a human workforce. And humans mainly work with approximate reasoning based on their past experiences."

In order to predict and measure construction



Researchers Abraham Tsehayae and Adel Awad

labour productivity, numerous and diverse factors must be quantified and considered. These factors are often uncertain or subjective; furthermore, while some factors are quantitative, others are qualitative. It may seem like an impossible situation to overcome, but the IRC team wields a powerful weapon that will enable it to address these challenges: fuzzy logic.

Fuzzy logic is an artificial intelligence technique, and it is a valuable tool for modeling concepts like labour productivity. Tsehayae says fuzzy logic and its hybrid forms allow the researchers to "capture human experience" and apply a "logical, mathematical approach to processing subjective variables" like linguistic information and approximate reasoning. By combining fuzzy logic with other artificial intelligence techniques like neural networks, the IRC researchers take a hybrid approach that allows for adjustment of the models to improve prediction ability and adapt to varying contexts—a capability that Moataz Omar, a PhD student also working on the project, recognizes as "crucial" when dealing with the varying project contexts of the construction industry.

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Message from the Chair

Local research of global significance



Dr. Aminah Robinson Fayek

In the last newsletter, we highlighted the significance of collaborations between academic researchers and industry partners within the IRC. The IRC's ability to engage in relevant research and deliver applicable results arises from this partnership structure. Our partnerships inspire us, support us, and hold us accountable as we look for solutions to the Alberta construction industry's most pressing concerns.

As we work to understand and address the issues that affect our partners as individual organizations, as a group, and as players within the provincial construction industry, it quickly becomes apparent that factors of global significance are at play within our own backyard. As Brian Lacey of Clark Builders mentions in "Labour productivity study to boost construction efficiency", labour productivity in the construction industry is a critical issue worldwide. Consequently, though the IRC's research focuses on a regional construction industry through the lens of our partner base, our research is of global significance.

Our close ties to a diverse professional network of academic and industry construction professionals beyond the IRC ensures that our research gains exposure and creates impacts across the country, throughout the continent, and around the world. Just as our IRC holds us accountable to our partner organizations, our affiliation with professional groups like the Construction Industry Institute (CII), the International Council for Research and Innovation in Building and Construction (CIB), the Canadian Society for Civil Engineering (CSCE), and the American Society of Civil Engineers (ASCE) is essential to ensuring our research innovatively builds on current and existing work elsewhere.

Facilitating interactions between construction researchers is important to me. As Chair of the CII Academic Committee's Technical Session

Subcommittee, every year I organize the CII Technical Session in conjunction with the ASCE Construction Research Congress and the CSCE Construction Specialty Congress. As Joint Coordinator of the CIB Task Group 85 in Research and Development (R&D) Investment and Impact, I have collaborated with researchers across Canada to co-author a chapter on construction R&D in Canada for an international book project; I will be hosting a conference for the contributors to this book here in Edmonton next winter so that they can disseminate their countries' perspectives. I have also contributed to the ASCE Journal of Construction Engineering and Management and the Canadian Journal of Construction Engineering, and serve on the editorial boards for both publications. These administrative, scholarly, and editorial positions keep my fingers on the pulse of cutting-edge research happening in the construction field today.

My involvement with these professional groups also leads to opportunities for my students within the academic realm. One of the IRC's priorities is to train highly qualified personnel who then go on to initiate innovative research and implement solutions as applied researchers in academia and, as in Jing Peng's case ("IRC grad Jing Peng launches promising career"), in posts with industry. Partners in the IRC are the first to benefit from the thorough, skilled work of our students; the industry as a whole benefits as a result of these skilled professionals entering the workforce.

I believe that in order to pursue unique, exciting research, it is essential that our research program does not operate in isolation. Researchers leverage each other's ideas and through sharing their research, they develop a common basis for their own unique projects. Through the IRC, we are developing and implementing methods, tools, and practices that enhance the competitive position of our partners. Our collaborative relationships not only promote but also embody innovation. Together, we are raising performance standards, leading the industry by example toward a more robust economy. ■

Profile

IRC grad Jing Peng launches promising career

Engineering is built into Jing Peng's DNA. With both parents working as cost engineers in the field of transportation, from a young age Peng knew that he too would enter the profession—but on his own terms. He grew to appreciate the way engineering connects science with society and found his own calling in construction engineering.

Peng spent two years studying and researching under the supervision of Industrial Research Chairholder Dr. Aminah Robinson Fayek. Over the course of his MSc program, he focused on workplace planning, measuring its impact on project performance and developing a unique implementation approach for the construction industry.

Peng worked most closely with IRC partner Aecon Industrial Western. As a graduate student, "PJ impressed me with his sound judgment, communication skills, his conscientiousness and his dedication," says Dr. Robinson Fayek. "He brought all these qualities to his interactions with Aecon."

(contd. on p. 3)



New home turf: An MSc graduate of the IRC in SCMD's program, Jing Peng has been working for Willbros since September 2012.

Project to measure, analyze underlying factors

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Having begun in January 2012, the project is currently in the data collection phase. Researchers are engaged in the identification of factors and practices that affect productivity; they are administering interview questionnaires at all levels within the participating organizations and projects, and are also conducting work sampling and field data collection. Dr. Aminah Robinson Fayek describes labour productivity as a “multifaceted” issue, further stating that “labour productivity cannot be studied in isolation of the project management practices of the organizations involved in carrying out the project.” Accordingly, the productivity study recognizes the fact that labour productivity is affected not only by what happens at the workplace level, but also by what happens at the project, organizational, regional and global levels.

“I think our whole sector is under-performing, and it’s time to start making changes.”

— Brian Lacey, Vice President Construction at Clark Builders

Project researchers including Dr. Awad, Omar, and Tsehayae must often visit current project sites, where they learn firsthand about the factors that affect construction productivity. Over the past eight months, Tsehayae has visited a major oil and gas project and has carried out data collection on commercial and residential projects. All the while, he says, industry personnel at partner organizations have been “exceptionally helpful” by “involving [him] in day-to-day discussions and weekly trade meetings”.

Study participants support the researchers because they look forward to the results. For Clark Builders, a member of IRC partner organization Merit Contractors Association, participation in the Labour Productivity Analysis and Modeling study is motivated by business goals and a belief in the potential of their people. Brian Lacey, Vice President Construction at Clark and Vice Chair of Merit’s board, notes that as Alberta construction businesses have to deal with increasing pressure from globalization, they are also facing labour availability and productivity issues.

“It continues to shock me that construction—worldwide—is one of the only industries that has actually seen a regression of productivity over the past twenty years,” says Lacey. “I think our whole sector is underperforming, and

“PJ” continues to draw on IRC education, experience

Continued from page 2

Unlike traditional MSc programs, which emphasize academic scholarship only, the IRC’s program combines this focus with applied, real-world research for construction companies currently operating in the field. Peng credits the IRC’s close ties with industry for smoothing his transition from school to career, noting “I got a lot of exposure to the industry and its people by working in that environment even as I was studying.”

The connections Peng made over the course of his degree did more than prepare him for work in the field—they also helped launch his career. “My resume was passed on to my current employer by someone I met and worked with during my time with the IRC,” he said. Peng has occupied a post as field engineer with Willbros Canada since September last year.

He may have moved on to new opportunities, but he hasn’t forgotten his experience with the IRC. While Peng continues to draw on the education and training he received, his lasting impressions are of the people he met

it’s time to start making changes.”

The Labour Productivity Analysis and Modeling study will provide industry participants with much-needed tools to assess and address labour productivity issues. As a result of this study, Clark and other participants will be able to measure productivity and examine, then tackle contributing factors. These deliverables will ultimately help the participating organizations draw conclusions about the most significant factors affecting their labour productivity, optimize their use of skilled labour resources, and increase their overall project efficiency. Omar adds that the project will “allow for better assessment of current performance... and more accurate project estimates”.

Stellar Electrical Edmonton Inc. initially volunteered for the study as a member of Merit Contractors in the spirit of community and for the benefit of the industry as a whole. “This study is different because it’s not bringing the hammer down on people. It’s looking at the bigger picture,” says President David Pohl. His company has been surprised and pleased at the feedback they have already received. “The guys have actually been enthused to have the researchers on site—they’re invisible, but very aware of everything that’s going on.”

According to Lacey, response to the IRC’s study has been equally positive on Clark’s work sites because his employees care about the quality of their own work. In Lacey’s mind, “the guys on the tools” hold the key to improving productivity. “If you tell them what the situation is—how we’re doing, and how we need to be doing, they will be the ones who can find a way to get there. They are creative. We have to get into their heads and utilize that experience.” The labour productivity study will facilitate this process.

The study provides a rare opportunity for the participating organizations to incorporate analysis and feedback from an external source. For this reason, Curtis Monsebroten, Managing Director of Merit member Montech Mechanical Industries Ltd., says his company is eager to have “front line involvement” in the study. “There is an ever-changing set of variables in the industry, and I think the importance of the project will be to assist in determining what is working well and where there are opportunities for improvements.”

For Dr. Awad, a feeling of satisfaction and accomplishment comes from knowing that the IRC research team is “helping organizations get feedback from their own people” that will lead to improved project performance across Alberta’s construction industry. ■

during his degree: Dr. Robinson Fayek, who “genuinely cares about her students and their success”, and his fellow student colleagues, who he still considers “like family to me”.

Peng will always consider himself a work in progress. He firmly believes that he “can always learn from others”. At Willbros, his open mind helps him tap into the vast pool of knowledge his current colleagues represent. Peng has a civil engineering background, so at first, “I didn’t know much about piping and other mechanical work”. However, his ability to quickly translate learning into practice means that “I’m definitely developing new areas of expertise, like how to plan, bid, and construct piping projects.”

Dr. Robinson Fayek isn’t surprised at Peng’s progress. “His willingness to learn and share his ideas with others is a tremendous asset to him and to those he works with—in his studies and in his career,” she says. “He is not afraid to take risks in terms of innovative ideas, but he is always willing to consider the opinion and expertise of others.”

Peng can be sure that this is only the beginning of an exciting journey. ■



Event Spotlight

International fuzzy experts to meet in Edmonton

The International Fuzzy Systems Association's 2013 World Congress and the North American Fuzzy Information Processing Society's annual meeting will convene in Edmonton this year. The joint congress provides an interactive, multidisciplinary venue through which scientists, engineers, students and practitioners may present their recent work in fuzzy logic and related fields.

During this event, Dr. Robinson Fayek will be coordinating a focus session on Fuzzy Logic Applications in Construction Engineering and Management. International speakers will present current research and applications of fuzzy logic and fuzzy hybrid techniques that have been used to model aspects of the construction industry that are complicated by subjectivity, uncertainty and a lack of comprehensive data sets. Fuzzy logic and fuzzy hybrid techniques have successfully been applied to planning and scheduling, estimating and bidding,

productivity, project control, structuring projects, process improvement, and risk analysis; however, these innovations have encountered unique challenges over the course of their development. This focus session will provide an opportunity for researchers and practitioners to discuss specific methods for addressing these problems, and will generate further ideas for how to adapt fuzzy logic and fuzzy hybrid techniques so that they better suit construction industry applications.

The focus session will allow Dr. Robinson Fayek and IRC students to present their work to the world's experts in fuzzy logic and will provide an important venue for the exchange of ideas.

The 2013 IFSA World Congress and NAFIPS Annual Meeting takes place June 24-28, 2013 at the University of Alberta.

For more information, please visit ualberta.ca/~reformat/ifsa2013/. ■

Invitation

Forum in lieu of spring meeting, committee to meet in September

As a result of a decision by IRC Management Advisory Committee members at the January 24, 2013 meeting, the committee will not be meeting in the spring.

Instead, members are encouraged to attend **Innovation in Construction: Forum 2013**. This event will focus on how to innovatively address challenges facing industrial and civil construction in Alberta today--and how to boost competitiveness and productivity in the process.

The next committee meeting is scheduled for **September 19, 2013** at the University of Alberta. ■



Innovation in Construction: Forum 2013

June 9-11, Northlands Expo Centre
Edmonton, Alberta

Are you an innovator on site? A leader in managing human capital in a sector with fluctuating needs? An inventor with a new technology or software development that has the potential to change how Alberta construction organizations do business?

Join us for **presentations, workshops, a trade show, and networking opportunities** with others who are as passionate about innovation in construction as you are.

Construction Management

- Human health factors in workplace performance
- Cultivating human capital to meet future demands
- Fit to work initiatives

Construction Engineering

- Automation and robotics
- Construction modularization
- Lean construction
- Innovative construction equipment



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