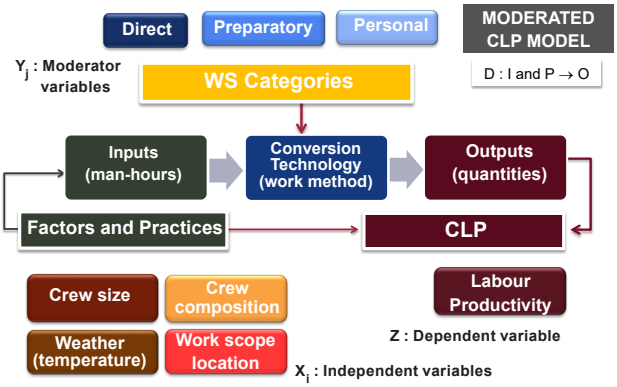
STRATEGIC CONSTRUCTION MODELING AND DELIVERY
INDUSTRIAL RESEARCH CHAIR

KEY RESULTS AND RECOMMENDATIONS WORKSHOP:
Practices & People Skills for Productivity and Performance

BACKGROUND

The NSERC Industrial Research Chair in Strategic Construction Modeling and Delivery (IRC in SCMD) is a collaborative research partnership funded by the Natural Sciences and Engineering Research Council of Canada (NSERC), the University of Alberta, and a number of Alberta-based construction groups. In June 2016, the IRC in SCMD hosted the *Key Results and Recommendations Workshop*, which covered critical findings from two province-wide studies on (1) improving construction labour productivity and (2) organizational competencies and project performance. Summaries of both studies are provided below:

IMPROVING CONSTRUCTION LABOUR PRODUCTIVITY



Construction labour productivity system model formulation. UNIVERSITY OF ALBERTA/ **DR. ABRAHAM TSEHAYAE**

This extensive multiyear study on construction labour productivity (CLP) was conducted by the IRC in SCMD over the course of the 2012–2016 term. During this time, substantial labour productivity and job site data were collected from a number of Alberta projects using factor surveys, factor documentation, and crew efficiency measures, such as work sampling, foreman delay surveys, and craftsman questionnaires.

Utilizing responses gathered from project management personnel (i.e., project managers, supervisors, and superintendents) and trade-level respondents (i.e., foremen and craftspeople) working in building and shutdown project contexts, critical factors and practices influencing CLP were identified. Accordingly, “adequate and quality work tools”, “aging of Canadian population”, “job site orientation program for new craftsmen”, and “lack of protection from weather effect” were determined to be the most influential factors and practices in the building project context. In contrast, in the shutdown project context, the most critical factors and practices influencing CLP include “use of daily job hazard assessment system”, “presence of many competing projects within the province”, “good cooperation between craftsmen in a crew”, and “work conditions compromised by excessive noise, dust, and fumes”. Interestingly, in both project contexts, significant differences were observed in regards to how project management and trade workers perceived the influence of some factors, such as “stringent safety rules are negatively affecting productivity”.

This study also examined the work time proportions for various activities. The mean tool time (direct work) proportions for concrete, electrical, and shutdown activities were found to be 44%, 55%, and 60%, respectively, which is in line with industry trends. However, the delay or wasted time proportions for concrete, electrical, and shutdown activities were found to be 34%, 21%, and 13%, respectively. The basic assumption that CLP improves with increased tool time was tested for several activities. The results showed that tool time has a very low correlation with CLP and is therefore not a good predicator of CLP. Further modeling of the relationship between CLP and its influencing parameters indicated that work sampling proportions, such as tool time, do not directly affect labour productivity, but rather, strengthen the impact of factors and practices on labour productivity. For example, the model for concreting activity showed that factors, such as structural element type (e.g., working on slabs and walls as compared to columns and footings), owner staff on site, and project work times, together with direct work proportion, have a significant impact on CLP. This knowledge will help practitioners to better predict and optimize construction labour productivity in different project scenarios and in turn improve project performance and working conditions for project personnel at all levels.

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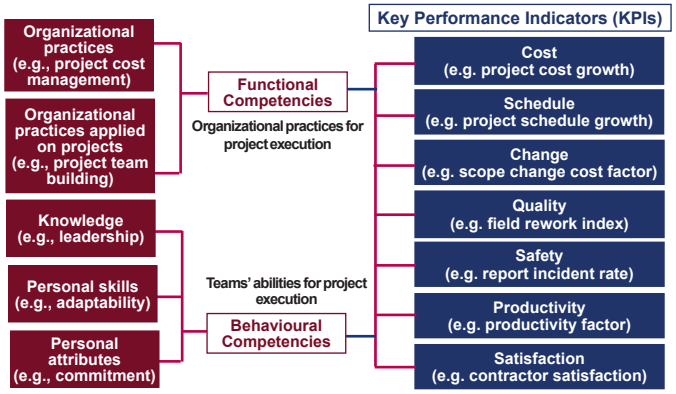
ORGANIZATIONAL COMPETENCIES AND PROJECT PERFORMANCE



Construction organizational competencies and project performance. UNIVERSITY OF ALBERTA/ **DR. AMINAH ROBINSON FAYEK**

The IRC in SCMD's research on organizational competencies and project performance was conducted with several Alberta-based organizations to identify and compare critical functional competencies (organizational and project practices) and behavioural competencies (people skills) for owners and contractors. Using data collected through surveys, the identified functional and behavioural competencies were then assessed for their impact on project key performance indicators (KPIs). More specifically, KPIs measure project success against planned values related to cost, schedule, safety, quality, productivity, and satisfaction.

The study resulted in the development of a competency model that measures the different competencies that exist at the project and organizational levels and determines how they affect the outcomes of construction projects. Although owners and contractors evaluated the importance of certain competencies differently, they agreed on the relative importance of functional competencies related to safety, engineering and procurement, cost, risk, integration, quality, communication, and human resources, as well as behavioural competencies related to training, consultation, motivation, negotiation and crisis resolution, self-control, reliability, and commitment. Owners showed a higher maturity level in some functional competencies, such as safety, environmental management, contract administration, and commissioning and startup, while contractors showed a higher maturity level in other functional competencies, such as scope management, cost management, time management, and resource management. In terms of behavioural competencies, owners agreed more strongly than contractors that their teams possessed certain competencies.

By modeling the relationship between behavioural and functional competencies and performance (KPIs), the study found that significant improvements in project KPIs could be realized by increasing the level of maturity of functional competencies or by increasing the level of agreement of behavioural competencies. Moreover, it was found that when simultaneous improvements in multiple competencies were made, the improvements in project KPIs were even more significant. The results of this study provide practitioners with a method for evaluating their projects and teams and for benchmarking their competencies against other owners and contractors. In addition, these results will help organizations to quantify the relationship between project competencies and project performance in order to identify areas for improvement. Such changes will lead to improved project practices and the development of more targeted and effective training programs for a greater return on investments in training.

PROJECT PARTNERS

Tel: 780.492.1205 | **Fax:** 780.492.0249 | aminah.robinson@ualberta.ca | **www.strategic-construction.ualberta.ca**
7-203 Donadeo Innovation Centre for Engineering | 9211-116 St. NW | University of Alberta, Edmonton, Alberta, Canada | T6G 1H9