Discussion on Paper "Industry Structure: Misunderstood By Industry and Researchers"

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The authors suggest a radical proposition to the construction industry professionals and construction management researchers if the construction industry is to leapfrog from its existing state of poor performance. The reasons for construction industry's under-performance are not just skin-deep; therefore, calling for fundamental change in Construction Industry System (CIS). According to the paper, traditional practice of construction research (inductive logic) which is based on expert opinion and hypothesis testing has not added any value to improving the performance of the construction industry. The authors propose deductive logic or common sense approach to finding a cure to the construction industry's under- performance.

The authors have pointed out how the current industry structure does not support the actual validation of the traditional inductive logic approach. By using deductive logic to establish an entirely new model based on Best Value Performance Information Procurement System and testing and validating using real projects over their life, the authors ascertain that deductive logic based theory reaches the root of the problem to find solutions to the existing construction industry under-performance. The authors claim that deductive logic and Performance Information Procurement System/Performance Information Risk Management System (PIPS/PIRMS) test results have identified that the traditional and current price based structure with the accompanying characteristics of client management, direction, and control approach as an inefficient and ineffective system for increasing construction performance. However, the paper remains vague on how the tests were carried out to prove this, and if any direct comparisons with the traditional approaches of project procurement and academic research were carried out to prove their superiority over the traditional approaches. Given the far-reaching consequences of the Construction Industry Structure Model put forward by the authors of these papers on the performance of the industry as a whole, comparisons of performance of only similar construction projects with the traditional project management approach and the approach suggested in this paper by the authors will be more convincing for the project professionals and academic researchers.

<u>Authors responses to Discussion</u>

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The authors appreciate the discussion and interpretation of the author's research effort (PIPS/IMT). The reviewer is correct in proposing that:

1. The researchers are using deduction (observation of simple concepts) rather than induction (theory-based exploratory research) to solve existing construction problems.
2. Deductive concepts such as performance and value are increased with minimized management, direction, and control, decision making maximizes risk, and a contract is a control based mechanism which increases nonperformance are not only non-traditional experts communicate less than inexperienced personnel; experts need minimal direction from management; experts can predict a future outcome before it happens; experts preplan to reach the expected outcome; and it is impossible for one person to control another, have been used to design a new delivery system for construction and other services.
3. The researchers are running test after test to confirm the deductive model. The researchers have run over 700 tests over 16 years.
4. The action based research is totally different from the survey based exploratory research that proliferates the research publications in construction management.
5. It is very difficult to cover all 16 years of a constantly changing and improving research effort in any one journal paper.
6. It is also difficult to include into one journal paper all the details of a deductive test procedure and test concepts and integrate into the constantly changing research effort.

The authors also propose that the validation of the PIPS/IMT deductive action research is not the usual peer review by researchers, but the immediate results of the research tests and the propensity of research clients to continually use and fund further tests. Failure of action research usually results in discontinuation of the effort. The authors have been awarded over $8.5M of grants over 16 years for the development of PIPS/IMT, the last two years, being at $1M per year, the largest grant period years for the researchers.

The reviewer's recommendation for an analysis of similar project types within the PIPS and traditional processes argument may not yield a satisfactory analysis as project-specific variables are too extensive and realistically not replicable job to job. One would need the same contractor, same designer, project, time, location and other factors to allow for an objective conclusion that would meet the "convincing" that is necessary as is suggested at by the reviewer. The only achievable comparison point that would allow scrutiny in an analysis would be the client groups themselves, as they are a constant

factor on the projects within their organizations. Though there are different projects types and characteristics job to job, the delivery of projects for a specific client is a constant that could be examined empirically under a traditional vs. a PIPS approach. This perspective allows for the nearest comparison that the reviewer recommends. And in fact it is this comparison that the authors have employed over the 16 years of testing. It is the client groups who are the research partners that are testing the validity of the theories through repeated hypothesis testing on their projects. The client's system is the measured variable factor in the project execution and, with a large enough dataset of new test projects, and the client's past project data and institutional memory, allows for a comparison of project performance of the PIPS systems vs. their prior or "traditional" systems from both quantitative and qualitative metrics (budget, change order, schedule, schedule adherence, quality, customer satisfaction, etc.). This is then extended to numerous clients. If similar project performance improvements are seen within each specific client organization, and then this is repeated across numerous non-specific, potentially dissimilar client organizations, it is reasonable to conclude that deductions proposed within the Industry Structure Model are valid and further point-to-point project specific comparisons are not necessary for further validation.

The authors propose the deductive logic based test results has been successful and dominant enough to persuade industry owners/clients, contractors, engineers, designers, and project mangers to get involved in the research testing. The following clients have participated in the action research:

1. The General Services Administration (GSA), the largest buyer of nonmilitary services in the United States.
2. Arizona State University (ASU)), the home university of the researchers. The success of the system in prototype tests has convinced the university to replace its traditional process with the PIPS process in the delivering of non-construction services. The implementation of the PIPS process at ASU, has led to a cash payout from the vendors to the University of $100 M. The identification of the efficiency and value of the new process was determined from documented cost and value of the services under the traditional process.
3. Rijkeswaterstaat (Dutch national infrastructure agency), the national agency of the Netherlands. They used PIPS within the constraints of European law and a different (Dutch/eurpean) culture to run 6 test delivering $1B of infrastructure.
4. The states of Idaho, Alaska, Oregon, Oklahoma, Arizona, and Minnesota (over 10% of states in the United States) are testing the process.
5. The universities of Minnesota, Boise State, Idaho, Arizona State, and New Mexico State to test the process.
6. One of the largest contractor developers in Malaysia (which is operating in a more underdeveloped culture) to use the best value PIPS and IMT concepts to optimize their operations in support of their effort to continue to increase the value of properties (which they are currently achieving a ten times increase.)
7. Due to the success in delivering construction, the researchers have convinced industry research partners to use the PIPS/IMT process to procure a $200M ERP software

implementation and the creation of a $30M Department of Motor Vehicles (DMV) system.
8. Due to the success of test results, research partners also used the PIPS/IMT to deliver a 10 year $400M food services contract, and health care services for four universities and for correctional facilities.

The research testing done by the authors is unique in the delivery of construction and other services area. The researchers are simultaneously doing theoretical basic research, prototype testing, and implementation research. The research is action research. The researchers are allowed by the government agencies to test the concepts in the project/process, designing the process according to the PIPS/IMT concepts, create the appropriate documentation, run the process, and analyze and measure the results.

The research results themselves seem dominant when compared to any effort in the construction management, project management, and risk management areas:

1. 16 years duration.
2. $8.5M research.
3. Five countries.
4. Largest federal buyer of non-military construction services.
5. Six states participation.
6. Over 700 tests.
7. All funding by industry using operational funding.
8. Movement into non-construction areas.
9. Tested by eight universities, including researcher's home university.
10. Delivered $100M value increase to university based on technology.
11. Received the 2005 H. Bruce Russell Global Innovator's Award sponsored by CoreNet.

The authors agree with reviewer that more testing will make the results even more convincing and add greater value to the industry. Other researchers should start testing the concepts of PIPS/IMT. Both the deductive approach being used by the researchers, and the deductive concepts and process of PIPS and IMT are areas of potential research. The current industry test results from the 16 years of testing, and over 700 tests in the construction and other industries does show a tremendous potential in improving the construction industry.