Solving the Malaysian Construction Industry Research Environment

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Abstract

Traditional practices has not lead to the expected results in the Malaysian construction industry research environment. The Malaysian construction industry has identified the weaknesses of the academic research groups as the cause of not meeting the expected results. As for academic research groups, they have complained that the industry is not looking for change, and research grants are difficult to obtain. Performance Based Studies Research Group (PBSRG), a forward thinking academic research group, has had tremendous success with industry research in multiple countries. Those countries are: Netherlands, Canada, Finland and Botswana. PBSRG is running a test in Malaysia using both the traditional model and the "out of the box" PBSRG research model to determine which methodology is more successful in solving the industry divide with academic research and thereby the problem with research results. The new model being tested differs from the traditional model. For example, the industry continues to fund the research effort and it is the only source of funding, aligns research expertise with academic classroom teaching, uses a deductive approach rather than the time consuming inductive approach, and accomplishes simultaneous basic theoretical research, prototype testing, and implementation research. The authors developed a hypothesis and started the test in July 2010.

Keywords

Malaysian construction industry research

1. Introduction

The Construction Research Institute of Malaysia (CREAM) was established by the Construction Industry Development Board (CIDB) to increase Research and Development (R&D) for construction in Malaysia. From 2001- 2009, CIDB through CREAM spent over RM (Ringgits Malaysia) 18.9 million ($) to fund 39 research projects at academic research institutions. Research from CREAM has yet to be commercialized or used by the industry. A conference called "Bridging the Gap between Construction Industry Stakeholders and Researchers (University / Academia)" was held on July 2, 2009 with industry participants and academic research participants in attendance to attempt to identify what the problems were (Kashiwagi et. al., 2010; CIDB, 2009). The following conclusions were made:

1. Industry cannot wait four or five years to see the payoff of research.
2. The industry does not respect the academic research capability.
3. The academic research groups do not have credibility with the industry.
4. There is difficulty in identifying what research is required to help the industry.

On November 3, 2009, Tan Sri Ir. Jamilus Hussein (2009), the Chairman of CIDB Malaysia, gave the visionary and unusually blunt assessment of the gulf between the industry and academic research units. This was the keynote address for "The Second Construction Industry Research Achievement International Conference" (CIRAIC 09 sponsored by CIDB and CREAM) to Malaysian academic researchers and industry personnel. It follows up the earlier CIDB forum where researchers and the industry identified

research issues in the Malaysian construction industry. Hussein stated "…The Construction Industry Master Plan (CIMP 2006 – 2015) has outlined the importance of R&D... However, the majority of construction activities are still what it traditionally used to be, there is a lack of innovation and modernization in construction industry, and existing researches are not commercialized (applied.)"

He pointed out "…The business community is skeptical about the value of [academic] R&D and considers [research] to be out of touch with reality. Collaboration between the industry and academia in Malaysia exist in splendid isolation between company and particular researchers. There is a "lack of technology development, transfer and absorption, skills and manpower development, commercialization and production management and logistical requirements." There also is a "lack of knowledge entrepreneurship spirit."

He identified the requirements of the construction industry as the "…Industry needs research that can produce short term output rather than research that take four to five years to be completed. There are no takers for R&D. The current research outputs are perceived by the industry as not practical and viable to support the industry. Research should heavily consider end-user participation through a systematic feedback mechanism. The industry involvement and commercialization planning should be initiated at the onset of the research. CREAM can start their technology incubator program specifically to cater demand on R&D in the construction industry. The period of undertaking R&D should be reduced from the current three to four year span to three to six month for applied research. There should be a change of mindset…CREAM should realign their trajectory of focus and initiative awareness-rising activities to encourage more industry participation in R&D."

The problems have been ongoing for several years. It is a problem that seems to have no proposed solution. Deming (1982) and Goldratt's (2004) system concepts can give insight on the solution. When problems seem unsolvable and require constant decision making with poor results, the overall environment may be stable. The problem is possibly systemic and not due to a lack of technical expertise or knowledge.

2. Hypothesis

The authors propose that the gulf between academic researchers and the construction industry is a systemic problem and not a technical issue. The problem is caused by the following characteristics of the traditional academic research model:
1. The traditional researcher model uses inductive research methodology of analyzing industry responses to questionnaires. It has proven to be unsuccessful in bringing change in the industry.
2. Dependency on government research funding forces researchers to chase grants and different areas of research. It makes it impossible to become an expert in the construction management area and to have an impact on industry practices.
3. Inductive construction management research model results are too slow and cannot have a positive impact on construction industry practices.
4. Academic researchers are academics first, and researchers second. Their research is academic based and their approach to research is less industry oriented and more directed towards supporting their academic career.

The authors propose that the structure of the traditional academic research model is the reason for poor industry participation and results. There are very few academic researchers that are funded by industry partners and who are doing repeated hypothesis testing to become experts in their research area (Adeyemi, 2009; Kashiwagi, 2008; Kashiwagi, 2009; Kashiwagi, 2010; Mselle, 2009; Muatjetjeja, 2009). A nontraditional deductive and observation based research model is needed to break the stalemate. This model that the authors propose would take a highly successful and robust research technology, and the

implementation of best value Performance Information Procurement System (PIPS). Both approaches would be tested in Malaysia; using the more traditional path of working with a traditional research group, and a successful non-traditional approach by using the research model of the PBSRG at Arizona State University (ASU) to impact the Malaysian construction industry. The following steps will be taken:

1. Identify the current traditional academic research model as a model with systems issues. Attempt to work with the traditional model to overcome previously identified industry/research identified issues.
2. Identify and use a successful "out of the box" and non-traditional research model. Attempt to work directly with a Malaysian construction partner using the PBSRG model.
3. Simultaneously use the traditional and non-traditional academic approaches to start research in Malaysia and compare the effort, time, and results.
4. Compare the results of the two approaches. Document problems and successes.
5. From lessons learned, develop a sustainable solution to integrate industry and university research.

3. Traditional Research Model in Construction Management

The traditional research model in construction management is dependent on government funding. In the United States, the funding sources include the National Science Foundation (NSF), Construction Industry Institute (CII), Department of Transportation (DOT), and other government research funding organizations. These organizations annually put request research proposals in the traditional research areas. In most cases, the funding may last up to three years, and the researchers must then submit and compete for further funding. In Malaysia, the main research-funding source is the CIDB/CREAM (CIDB, 2009; Kashiwagi, 2008). The traditional research model has the following characteristics:

1. The researcher must create their own research area while teaching undergraduate/graduate classes. Many universities give new faculty a lighter teaching load so that they can create their research niche.
2. Researchers have a difficult time developing depth in their area of expertise due to limited funding in their area of expertise and the difficulty in getting industry research partners to test their hypothesis.
3. Researchers have a difficult time identifying and working with industry research partners, including clients, professionals, and contractors in the construction industry. The difficulty is to determine how to align the industry partners' resources with the actual research area expertise where there is a "win-win" for both the researcher and industry partner. Research partners cannot afford to participate unless the research will have a dominant impact on their transactions, cost, and profit margin.
4. Researchers are rated in an academic system that rewards research grants and publications, but do not affect industry practices. Their reward may not be more research opportunity, but given an opportunity to get promoted to academic administration positions, where they can direct less experienced professors to get research grants and do publications.
5. The deliverable for academic researchers is a research report and journal publications based on the research. In the construction management research area, most research work is survey based and not the development and testing of concepts in real life tests. A literature search is done to identify the problem, find a potential solution, identify the construction industry population sample, complete the survey, and test the hypothesis against the survey results. Statistical modeling is done to usually validate the survey solution. In other cases, case studies are used. The weakness of this type of research is not that the inductive methodology is being validated with the possibility that the results may not accurately reflect the reality of the construction industry, but what the industry perceives. The results are what the industry "thinks." In many cases if the industry knew what the answers were, they would have solved the problem. However, if the industry does not know what the problem or solution is, they are a manifestation of the problem, and they are using their lack of perception of the problem to shape the future

solution to the problem. This may be why the inductive research approach using surveys to industry personnel, may not be a good methodology to solve industry problems in the management and delivery of construction.

4. Successful Industry/Academic Research Model

A authors defined a successful research model as the opposite of the traditional model in terms of industry impact, research funding, number of tests in real life situations, longevity and depth of research, and deliverable products (Badger, 2008; Kashiwagi, 2010). The research is:
1. Recognized as successful.
2. Integrated with industry partners.
3. Has created impact/change in industry practices.
4. Delivered technological solutions to industry problems.
5. Has longevity, sustained research funding, and integrated into the academic environment.
6. Has non-traditional funding and operational practices.

The PBSRG research model has been identified as a successful model due to the following research results: creation of new technology in the delivery of construction services that is not based on any existing models (minimizing risk by aligning expertise instead of management, direction, and control), has received no government research funding, longevity (17 years) in the same research area (longest running academic research effort in construction management at a major academic research university), highest funded single university based construction management research effort at $9M, most licenses issued for any construction management university research program generated procurement/contract technology (20) generating $250,000 in licensing fees for Arizona State University, most research tests controlled by research group (900), most publications on the same research effort (200), research claims and validity checked by another university PhD program (Van Duren and Doree, 2008), and tested/licensed/implemented by major government groups (General Services Administration (GSA), US Army Medical Command, Corp of Engineers (COE), states of Wyoming, Hawaii, Utah, Idaho, Oregon, Alaska, Arizona, and Oklahoma, the Western States Contracting Alliance (WSCA) who represents an alliance of 26 of the 51 states, the Rijkswaterstaat, Arizona State University, Boise State University, University of Idaho, Idaho State University, New Mexico University, and University of Minnesota. (Kashiwagi, Savicky, et. al., 2010; Meyer, et. al., 2010; Kashiwagi, Byfield, et. al., 2002; Sullivan and Michael, 2008; Kashiwagi, 2011; Kashiwagi, Sullivan, et. al., 2009; Kashiwagi, Malhotra, et. al., 2010; Goodridge, Sullivan, et. al., 2007). The details are described below (Kashiwagi, 2011; PBSRG, 2011):
1. PBSRG has been doing Information Measurement Theory (IMT), Performance Information Procurement System (PIPS), Performance Information Risk Management System (PIRMS), and Industry Structure research for 17 years, funded at over $9M, has run over 900 real tests, delivering over $2.5B of services. PBSRG is the worldwide expert of the technology.
2. PBSRG is the creator of the IMT, PIPS, PIRMS, and Industry Structure technology. PBSRG's technology replaces management, direction, control, and decision making with the alignment of expertise. The entire package is licensed by Arizona State University, and there are currently 20 licenses issued.
3. It has impacted the delivery process of an entire country. For example, the Netherlands. The government procurement education group PIANOo, the industry procurement group, NEVI, and the largest government infrastructure agency group, Rijkswaterstaat has requested repeated presentations, educated their personnel, and implemented and espoused the best value PIPS to replace the traditional procurement systems. NEVI has an objective of certifying professionals at different levels to protect the clients who are interested in using the best value PIPS technology.
4. PIPS/PIRMS went through a third party university research study analysis. This study analysis was conducted by the most highly rated procurement expert in the Netherlands. The analysis was performed on Rijkswaterstaat's $1B test of the delivery of 16 fast track infrastructure projects.

5. PBSRG helped create a best value PIPS platform (Scenter) to proliferate the technology in the Netherlands. Scenter proceeded to publish 2,000 copies of a Dutch version of best value PIPS, and is ready to publish their second edition of the Dutch best value PIPS manual .

6. PBSRG research results include minimizing up to 90% of construction delivery transactions and 98% customer satisfaction, increase vendor profit up to 100% (from 5% to 10%), redefining project and risk management, and creating a new procurement/contracting model. It also replaces the management, direction, and control, where both project management professional organizations adopt, with the alignment of expertise.

7. The PIPS best value technology was run with Entergy who is a power provider in the Louisiana area. The tests resulted in the following: best value PIPS took a "non-performing" blacklisted contractor and resulted in high performance results. Entergy, did not believe that PIPS structure was the source of the performance, and ran another test with the now "high performance" contractor without the PIPS system. This resulted in paying twice for the project and terminating the non-performing contractor. Other PIPS test with Entergy resulted in the PIPS structure minimizing the cost of construction by up to 50%, minimized the need for construction management, direction, and control, and identified that current management, direction and control environment may be increasing the construction cost as much as 100%. The same results were obtained in different areas in facility management of services used by industry partner Schering Plough in New Jersey.

8. PBSRG is the only construction management research based group, where the host university of the researcher used their research technology outside of the area of construction. This gave the research full control over the supply chain/procurement process, and used the technology in areas where PBSRG had no previous technical experience or expertise. These areas include, food services, sports marketing, IT networking services, help desk services, long distance education, documentation services, and bookstore services. The first three delivered services resulted in the university receiving a differential of $100M (due to the new PIPS environment) in the first ten years, the greatest documented ROI (5,000/1) for a university research delivered technology in construction/project management. This accomplishment is made even more dominant due to the university coming to an engineering based construction management group instead of one of the top rated business schools on the Arizona State University campus (W.P. Cary School of Business). Arizona State University is also the home for the International group, the Institute of Supply Chain Management (ISM.) The university also faced a protest on the use of the technology, and the protest ended in supporting the use of the technology.

9. The research is based on deductive logic and observation and not inductive exploratory methodology. Basic conceptual research, prototype testing, and implementation of prototype systems are done simultaneously. Validation of concepts are done by case study and industry clients using dominant measures, and not by industry peer review nor academic peer review. In addition, academic peer review is done, but is insignificant to the industry partner funding and participation of the industry. This does not always bode well with the traditional academic research philosophy and constituency, who may be threatened by the existence of a very successful research effort and technology that has been validated by industry testing and not necessarily the same source of validation as their research (academic peer review.)

10. The PIPS research program has received several awards. For example, professor Kashiwagi is the only Fulbright Scholar identified for a project management expertise. Kashiwagi, ran research testing during the Fulbright assignment to Africa Sub-Sahara region, where the Fulbright program allowed the Fulbright scholar to serve concurrently between the university of Botswana and Arizona State University. Kashiwagi and PBSRG were also awarded the 2009 Educator of the Year award by the International Facilities Management Association (IFMA) for having the most innovate/successful research/based graduate education program in the area of facility management. After PBSRG was denied a NSF grant due to the value of the research for not being understood by the NSF board, it won the 2005 CORENET Global Innovation of the Year award with Harvard University. The State of Hawaii Department of Administrative Government

Services (DAGS) also won the Pono Tech award in 1999 for innovative use of technology in the delivery of services.

11. The PBSRG model differs from the traditional model in the following academic management operations:

- Professor/researcher has full time coordinator/marketing/administrative management staff funded as a part of the research operation.
- Professor/researcher's coursework/research area is aligned to the research technology. All graduate and undergraduate classes use the results of the IMT/PIPS technology. This includes engineering statics, construction contract management, and IMT/PIPS courses.
- The running of the undergraduate classes is a part of the research in using the IMT technology to develop totally new teaching techniques for the research clients.
- Graduate degree class curriculum is based on the research results.
- All research grants are used in conjunction with each other. Research tests that assist one user may be run on another user's system. The research is synergistic, allowing great freedom in the use of funding even in a very bureaucratic university environment.
- Researchers are selected on capability and not academic degree or status.

5. Research Tests

PBSRG has been visiting Malaysia for six years attempting to transport the very successful best value PIPS industry backed research to Malaysia. In the six years, Professor Kashiwagi has met interest from two major universities, UITM in Kuala Lumpur and USM in Penang. The interest to bring the research model into UITM came from the vice chancellor. At USM the interest came from a visionary researcher in the School of Housing, Planning, and Architecture, and from a business unit coordinator. Despite the interest of the vice chancellor, UITM has not had any movement/success. USM becomes the university who is trying in the more traditional way to bring the best value PIPS effort to USM. The effort has resulted in the following:

1. Identification of the best value PIPS technology of having extreme value in the Malaysian research environment (Kashiwagi, 2009).
2. Funding Professor Kashiwagi into Penang in 2010, to be an external examiner of how to improve the undergraduate and graduate programs, to give a presentation on the impact of the best value PIPS environment, and to assist in creating a strategic research plan to transport the technology into USM (PBSRG, 2010).
3. Funding the project manager of the USM business unit to attend the 2011 annual Best Value Education meeting in Tempe, AZ (2011.)
4. Working on a MOU between the two universities.
5. Applying for grants to assist a USM researcher to learn the best value PIPS technology research, and identifying a future USM faculty as a funded PhD candidate to PBSRG/ASU.

At the same time, PBSRG applyied the PBSRG research model directly into the Malaysian construction industry. PBSRG identified Brunsfield, a developer contractor, as a very visionary contractor in 2009. The following are the results in applying the PBSRG model to the Brunsfield application:

1. Brunsfield executive team of four attended the 2010 best value PIPS conference.
2. Professor Kashiwagi visited Brunsfield for a week in July 2010, using a combination of funds; Professor Dean Kashiwagi revisits Brunsfield in Nov 2010.
3. Dato Gan, Brunsfield president and CEO and Brunsfield's executive team visits ASU in Tempe, AZ in Nov 2010.
4. Brunsfield signs a three-year contract with ASU/PBSRG to implement the best value PIPS model in their entire delivery chain.
5. Brunsfield executive team (5) attended 2011 annual PIPS education.

6. Professor Kashiwagi visited Brunsfield for two weeks in March 2011 with the following objectives: implement the weekly risk report (WRR) and risk management plan (RMP), realign the Brunsfield development and construction delivery system by implementing best value PIPS concepts, design a new educational plan to identify and train younger visionaries in Brunsfield, create a strategic plan for developing a research center within Brunsfield that mirrors PBSRG, and to organize a professorship role at a Malaysian university to support the Brunsfield effort.
7. Professor Kashiwagi returns in July 2011 to expand the effort to educate professionals, vendors, and OEM suppliers who service Brunsfield in the best value environment, continue the effort of the first March trip, and expand the effort to utilize the visionary UTAR university engineering staff/institution to bolster the research effort in Malaysia.

6. Preliminary Conclusions of Research Test

There is a "catch 22" problem with changing the academic research model in Malaysia. This problem is because Malaysia research academics need professors who have the experience and capability with the PBSRG research model, and who can run the PBSRG "model" research in Malaysia. Preliminary results show that Professor Kashiwagi was able to penetrate the industry and setup an industry/academic research effort with the PBSRG model. The efforts to take the traditional route of government/university funding with USM is far slower and cumbersome, and two years of effort have yet to produce substantial results. Efforts at UITM, with a pull situation from the Vice Chancellor have been less successful. In the past two years, Professor Kashiwagi was able to use the PBSRG methodology, and bring the best value PIPS technology, and made outstanding movement in the Brunsfield research effort. Follow on papers will get into the details of the PBSRG research model and the best value PIPS technology.

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