

Sustainable Research Platform at the University of Botswana

Keneilwe Ntshwene¹, Jacob Kashiwagi² and Dean Kashiwagi²

¹Faculty of Engineering and Technology
University of Botswana, Gaborone,
Botswana

²Performance Based Studies Research Group
Arizona State University, Tempe, AZ
United States

Email: keneilwe.ntshwene@mopipi.ub.bw; Jacob.kashiwagi@asu.edu;
dean.kashiwagi@asu.edu

Abstract:

The Project Management Section at the University of Botswana has been undergoing a test to transform the section from an education based faculty to a research based faculty. The test was initiated by a Fulbright Scholar (FS) from the Performance Based Studies Research Group (PBSRG), bringing a new research model, a new risk management (RM)/project management (PM) model, and a concept of a research based graduate education that had been very successful at PBSRG. They proposed increasing the level of research activity of the UB PM section by merging the graduate MPM program and the industry research effort. They proposed using a research based graduate program, treating the graduate students from industry as a resource instead of a student, and their organizations as a potential testing laboratory. The mechanism to make the effort a success is the very powerful technology of the Performance Information Procurement System (PIPS) and the deductive logic of the Information Measurement Theory (IMT). This paper captures the case study results and future potential of the concept, highlighting the operational model to sustain the research platform in an underdeveloped country in a resource starved environment.

Keywords: research based graduate education, increased research activity

1. Introduction

The University of Botswana (UB) project management (PM) section staff is in a reactive mode as a result of seemingly high workload requirements. The majority of staff is lecturers and senior lecturers without research experience (Mselle *et al.*, 2009). The UB PM section has difficulty in attracting additional qualified staff. There is no current strategic plan for research development of its staff. The PM section staff is required to support the Masters of Project Management (MPM) program. After four years, and four generations of MPM program students, one of the difficulties has been the graduation rate

(Adeyemi *et al.*, 2009). The thesis requirement is proving to be insurmountable to a large number of MPM students.

2. Literature Review

The MPM program coordinator, through the sponsorship of the U.S. Fulbright Scholar program of the U.S. State Department, brought a Fulbright Scholar (FS) Dean Kashiwagi from one of the most successful research based project management programs in the world (the Performance Based Studies Research Group/Council for Research and Innovations in Building and Construction (CIB)W117 Performance Measurement in Construction) headquartered at Arizona State University, Tempe, Arizona (Kashiwagi *et al.*, 2008). The FS is also the editor of the CIB Journal for the Advancement of Performance Information and Value. The FS brought a research based education and strategic plan for research. He also brought the dominant PIPS/IMT technology that uses deductive logic to improve PM project delivery. He proposed to the UB staff that they should focus on their entire education system and not the limited financial and human resource constraints (Muatjetjeja *et al.*, 2009). He proposed that they may have a systemic problem which continually constrained their already resource constrained environment. He proposed to optimize the entire system (staff, graduate students, and potential industry research partners) by using a proactive research based model instead of reactive transaction based model (Adeyemi *et al.*, 2009).

The FS proposed a strategic plan. The UB PM section and MPM program should:

1. Be research based.
2. Considered graduate students as resources.
3. Consider their industry organizations as research laboratories.
4. Make the technology a part of the graduate student's curriculum (weekly risk reports of risks that the students did not control, would bring transparency and accountability while teaching the students project management skills.)
5. Have a research based strategic plan with a timeline and goals.
6. The technology should be implemented to monitor deviation from the strategic plan.
7. Strategic planning would bring transparency and help the PM section to work together, to plan ahead, and to use resources wisely.
8. The PM section, CE department, and MPM program would become the research model and example of Africa, as well as the expert in PM project delivery, PIPS/PIRMS expert in Africa, and African platform for CIB W117/PBSRG.

2.1 Problem

The UB MPM program is an education based program. The faculty are not trained researchers. The structure is setup for education, and not research. The majority of the staff has the perception that they are being overworked teaching classes and doing administration, and there is no time to do research work. The FS also perceived that the

research skills (writing papers, doing research tests, managing and minimizing risk, coordination) are weak and the faculty may not know how to do research based research work (research that changes systems, environments, and industry processes.) It is unknown whether the FS can implement the same concept from the most progressive research based unit at Arizona State University, and increase the level of research effort in the undermanned PM section. It is different from anything the MPM program, the PM section, CE department and FET have ever seen. There is a natural reluctance to change, and to use a nontraditional model which has not been proven in Africa. The problem is twofold: the first phase is to prove it can work. The second phase is to identify if the existing faculty can make the change.

2.2 Hypothesis

The FS can accomplish the first phase: run a scaled test of the research based graduate education, and show dominant results that prove the UB PM section can move from an education based to a research based graduate program, increase research activity, and create a sustainable research platform by copying the PBSRG research based model. The test will use the technology of PIPS, PIRMS, industry structure and IMT based on previous test results from PBSRG testing. The FS will then setup the second phase.

3. Research Methodology

The methodology to test the hypothesis will have the following steps:

1. Identify differences between PBSRG and UB PM Section
2. Identify philosophy/model of PBSRG
3. Identify constraints of UB PM section
4. Run a scaled down test on a MPM course using the PBSRG model
5. Mentor PM section faculty who want to participate in the new model
6. Capture results
7. Theoretically design the education based and research based programs
8. Correlate the results of the scaled down tests with the research based program
9. Give a presentation to the graduate students of the program to identify if they can understand the model and get their reaction
10. Present the model results to the graduate students who are still in the program, but have not graduated, and to the Dean of the Faculty of Engineering and Technology (FET)
11. Create an operational model to support the research based program that includes continued mentoring of PM section faculty

4. Findings and Discussion

4.1 Differences Between PBSRG and UB PM Section

Table 1 shows the major differences between PBSRG and UB PM Section. PBSRG has the following advantages:

1. Experience in doing the research (number of years), research grants, tests, and publications.
2. Support staff (internet/video staff, marketing staff)
3. Annual strategic plan.
4. Operate as a business (not dependent on government funding.)
5. All components are aligned.
6. Minimized transactions.
7. Greater percentage of post graduate students graduating.

Table 1. Differences Between PBSRG and UB PM Section

Characteristic	PBSRG	UB PM Section
Staff	15	7
PhD	2.5	2.5
MS	6	4
Marketing/Admin	2	0
Research PMs	6	3
IT/Video/Internet	2.5	0
Aligned	15	4
Research Experience (YRS)	15	1
Research Tests	600+	6
Research Budget/contingency funding	\$1M/\$.7M	0
Publications	160	20
Research Laboratory	50 US States	Gaborone, Botswana
International Connections	CIB W117 CIB Journal COBRA CITC PBSRG	
Graduate students MS (program/graduated)	50/20	80/4
Research partners	20	3
Number of classes taught/per person	2	3
Number of undergraduate classes taught/per person	0.5	2
Presentations/Year	75	10

UB PM staff has the following advantages:

1. MPM graduate program is cross disciplinary.
2. Number of graduate students.
3. The dominance of the PIPS/IMT technology vs. existing technology in the industry.
4. The potential of the staff getting their PhD at the UB.
5. The mentorship of the FS.

The methodology of the test is shaped by the dominant differences. The test will be run by the FS. The FS will be responsible for all planning, running the small scale test, generating the research, and be the main component in generating publications. The FS would then transfer the responsibilities of managing the transformation to the UB Staff. In the transformation the UB staff would have to minimize their current amount of transactions. The FS proposes that the current number of transactions may be caused the reactive nature of their business, and the lack of alignment between themselves.

4.2 Philosophical PBSRG Research Based Model

The engine behind the PBSRG success has been the understanding of the Information Measurement Theory (IMT) and dominant (simple, easy to understand, deductive logic based) models including the Construction Industry Structure (CIS) models, the Performance Information Procurement System (PIPS), Performance Information Risk Management System (PIRMS), and Leadership Based Alignment Model (LBAM.) These deductive logic based models that go against current industry practices, eliminate transactions and help PBSRG minimize the risk of failure and maximize the value of their effort (J Kashiwagi, 2007; J. Kashiwagi *et al.*, 2008; Goodridge *et al.*, 2007; Kashiwagi *et al.*, 2009; Sullivan and Kashiwagi, 2007; Kashiwagi, 2009). These models have minimized the need to do endless literature searches, minimized the use of inaccurate or unproven concepts, and maximized the success (worldwide leadership of research based efforts in CIB W117, 15 years, \$7.5M of research grants, 600+ tests, 98% success, application of PM models in many different industries, penetration into organizational optimization tests, and simultaneous concurrent basic research, prototype testing, and implementation projects.) Other dominant results are the accomplishment of having the technology used and tested continuously as the procurement/contract administration model/operations of the largest university in the United States, the only university based licensed technology being used by a European Union (EU) country to deliver construction projects, and the only university licensed technology being used by a U.S. federal agency to transfer the risk of documenting/justifying project deviation caused by risk that they do not control to the vendor. Other major characteristics of the PBSRG model include (Kashiwagi, 2009; Pauli *et al.*, 2007; Sullivan *et al.*, 2009):

1. Win-win overtakes leveraging position and authority.
2. Alignment model as assessment tool and as business placement.
3. Measurements overcome false expectations, identify actual capability.
4. Strategic planning overcomes transactions.
5. Accountability overcomes relationships.
6. Control over future replaces “being controlled” syndrome.
7. Proactive instead of reactive.
8. Weekly Risk Report (WRR) and Risk Management Plan (RMP) integrate project management into doing the research based program, teaching the research based program, and doing the research activity.
9. Constraints are now defined as risk that can’t be controlled, and managed by the staff.

PBSRG faced the same or worse constraints that are faced by the UB staff (Kashiwagi, 2009; Kashiwagi *et al.*, 2008). The authors are proposing that the only constraint UB staff will have is in the understanding and implementation of the technology.

4.3 Constraints of the UB PM Section

One of the major constraints of the UB staff is the fear of change, of being in control, and being accountable to manage the transformation. Due to the current education based program, the state is a perception of being managed and being reactive. It also places staff members in silos, forcing short range planning, and creating inefficiency due to a loss of synergy. There are fewer cooperative efforts, staff members are caught uninformed of events that they should know, and the loss of synergy causes duplication of efforts and transactions. The largest constraint is the inexperience in managing and controlling a research based program.

4.4 Scaled Down Test of the Research Based Model at UB

The FS was assigned a graduate course (MPM 655 Assessment, Monitoring, and Alignment) and transformed the class into a research based class (deductive logic, processes, transfer of technology to student's organizations/other organizations, research testing, and documentation.) Organizations involved were the US Embassy, Bank of Botswana, UB IT/Finance, Botswana Development Corporation, and (DBES.) The philosophy of the research based course is that the students do their best to do research tests and documentation. If they cannot for any reason, the faculty member/instructor ensures that based on the class effort, research is conducted. The FS in this test also did the assignment of the students into turning the class into a research test with the objective of making the next research based class easier. The FS also went out to organizations and presented, attempting to convince the clients to use the technology in research tests. The FS also used the class to introduce/train the UB staff on running the course and doing the research. The course was very successful, and the test results are documented in another conference paper (Mselle *et al.*, 2009)

4.5 Results of Scaled Down Test

The objective of research based program is to produce research, significant impact on industry, increase research funding and activity (publications), and ensure students are recognized as resources and as experts. Although academic rigor is required, it should not fully supersede program results. The results of the scaled down test included 21 peer reviewed conference papers, potential of 5 journal papers, 6 research tests, and the securing of a \$25K research grant from two users to guarantee the extension of the overall research test to transform the UB PM program into a research based program. There were profound changes in two UB PM staff members. The first UB staff member became an expert in a new risk model, was approved in a PhD program, and has a great potential to be promoted to senior lecturer after being a lecturer for 16 years. Another UB staff member was

mentored on how to teach a research based course, found a PhD topic using the research based technology, and has committed to changing his vision using a strategic plan. A third faculty member has incorporated the research based technology into the MPM procurement class. In total, the research based technology has been implemented in four MPM courses, by three faculty members, and has affected many of the graduate students in the program.

4.6 Initial Response of Participating Faculty

Of a preliminary faculty group who were educated on the research based approach (three lecturers), the following responses were collected. Their response were from a range of 1 – 10, 10 being dominantly agree, 5 being don't know, and 1 being dominantly disagree:

1. Research based approach (RBA) would save 50-75% of the faculty's preparation time: 9.67
2. The RBA will allow the identification of student thesis in the beginning of the program: 9.0
3. The RBA would be very beneficial for students: 10.0
4. The RBA would prepare students for completing their thesis requirement: 10.0
5. The RBA tremendously increases research activity of the faculty: 10.0
6. The RBA minimizes the faculty preparation by what percentage: 53%
7. The RBA would increase research activity by what percentage: 50%
8. The RBA would minimize preparation time and transactions: 9.67
9. Everything that is done in the RBA classroom assists overall research effort: 9.67
10. The effort increases the faculties research capability, ability to be promoted, and be an expert: 10.0
11. The RBA give us hope of becoming researchers and help the industry: 9.67
12. The RBA gives us a new vision in which we can control our own destiny instead a career of constant reactive transactions: 9.33

From their responses, it can be seen that the RBA has the potential to increase research effort, and provide an opportunity to have an impact on industry practices.

4.7 Creation of the Strategic and Operational Model

The Dean of the UB Faculty Engineering and Technology (FET) identified the research based graduate program approach as the way to:

1. Assist graduate students finish their thesis.
2. A method to integrate the industry with the MPM program and increase research activity.
3. A method to do research with less effort.
4. A method to impact industry practice.

The Dean of the FET put the following plan in motion:

1. Identified the FS as a potential visiting professor to mentor the lecturers to gain their PhD to increase the number of PhDs from two to five and be a continual foundation of the research based program.
2. The PhD thrust will be to implement efficient PM practices that will apply to technology and the development of the research based programs.
3. PhD candidates will stay in place at UB, and integrate their dissertation with the graduate classes and the research effort.
4. Implement the research based approach to the graduate program.

The FS recommended to the MPM program coordinator to implement the Information Measurement Theory (IMT) and Performance Information Risk Management System (PIRMS) on each graduate student. The FS also recommends the following:

1. Identify every student who has not completed their thesis to sit down with their mentor and outline their thesis from beginning to end (problem, hypothesis, methodology, and conclusion. If the graduate student could not see how to accomplish a component, the faculty would fill in the unknown area.
2. Encourage the graduate student to identify the thesis topic as improving or solving an ongoing problem at their workplace.
3. Have the graduate student to outline their thesis before starting any work.
4. Identify the value of the thesis before starting.
5. Present the thesis work to the student's organization, convince the client of the value of the thesis, and if substantial school resources are required, charge the organization a research grant fee.
6. The graduate program coordinator should track the progress of all graduate students through a scope, monthly risk reports and a risk management plan. There should be a director's report that gives the performance information on the graduate program and the graduate students who are at risk.
7. Information should also be kept on research organization, type of research, the mentor and the students.

The performance measurements of the program should include:

1. The maximum, minimum, and average length of time of thesis or dissertation work.
2. The number of total students, students who completed, and number who are not completed, number who are over the two year period, and average time over the two year period.
3. The ten riskiest graduate students based on not being completed on time.
4. Percentage of student did the outline before starting, used a monthly risk plan, risk management plan, and one page scope statement.
5. Graduate student satisfaction with their thesis subject, mentoring, and progress.

These actions are moving the MPM program from an education based to a research based program, treating the student as a resource instead of a student seeking a degree, with the objective of changing the industry practices. This is a huge step and is based on the relative

success of the small scale test, the deductive logic of increasing the level of research effort with minimal resources, and perceiving the objective of the graduate MPM program as producing research, research results, and impact in the industry instead of a program with classes that are based on textbook education and training. Graduate students are now viewed as a valuable asset that is the mechanism of change.

4.8 Continuing Effort to Transform Graduate Students into Research Resources

Over the next quarter, the FS will continue to work with MPM graduate students to:

1. Test the new research based approach model.
2. Work with 15-20 graduate students in the new approach.
3. Measure their status to confirm the perceptions of this paper.
4. Measure the performance results of the new approach.

In order to get a preliminary glance at their understanding of the new approach, the following questions will be asked and their responses will be quantified:

1. The objective of the graduate students who entered the MPM program was to get a degree.
2. The objective of the graduate students who entered the MPM program was to change and improve their work environment.
3. Students were required to return the information taught by instructors through exams and homework.
4. The classes were much like undergraduate courses, with lectures, homework, and exams.
5. Students were more reactive than proactive, trying to pass the coursework.
6. The coursework was closely tied into the thesis work at the end of the program.
7. Students finished the coursework and found themselves unprepared for the thesis work.
8. Students integrated their work environment with the coursework requirements.
9. Students tested what they learned in courses in their workplace.
10. Courses introduced concepts, and allowed the students to use their creativity to solve workplace problems.
11. The majority of the students used the courses to do their thesis.
12. Each class helped the students finish a part of their thesis.
13. Students would start doing their thesis work without knowing the end.
14. It is common that students would start, stop, and start on a new thesis topic.
15. The students were treated as a resource that brought contribution instead of a student who would be tested on how well they listened to the instructor.
16. Each student had a strategic plan from the very beginning of the program on the value they would bring to themselves, the organization they worked at, and to the program.
17. After passing the coursework, the majority of the students became bogged down with the thesis.
18. Students tried to attack the thesis by writing volumes of work, and by collecting as much data as possible.

19. Students sometimes were doing thesis work without realizing the objective of their thesis.
20. Many students simply quit doing their thesis because they didn't know what to do.
21. The thesis seemed like a mystery to many students.

4.9 Major Challenges to Overcome in the Attempted Transformation

The FS has identified numerous challenges in attempting to facilitate the transformation in the UB PM section environment. In discussions with other lecturers from other African universities, the environment seems not to be unique to the UB. The challenges include:

1. Changing the paradigm of the lecturers from reactive to proactive.
2. The difficulty of faculty to set a strategic plan and follow the plan, despite the numerous transactions created by the resource starved environment.
3. The difficulty for faculty to coordinate and respond in a timely manner.
4. The inadequate internet and email access due to limited connectivity and band width in the African continent.
5. Lack of business acumen regarding the use of research funding.
6. The inability of the university to fund the presentation of papers, forcing faculty to pay a large share of any conference presentation.
7. The lack of research experience and maturity of the faculty.

The transformation from an education based to a research based approach to graduate education will be a tremendous and a bold move. The success of the transformation will depend on the alignment of resources, the cooperation of the key decision makers at UB, and the changing of the paradigm of the participating UB faculty. What makes the effort possible is the research technology being used and its dominant impact on one of the most critical industry problems. Without the alignment of all the pieces, this effort will not be successful. The financial support of PBSRG and the U.S. State Department (\$60K U.S.) has been critical thus far in sustaining the effort.

5. Conclusion and Further Research

The scaled down test results show that there is a potential to transform the UB project management section and the graduate MPM program to research based program. The transformation will place the graduate students as resources, their organizations as the PM laboratory, and increase the number of MPM program graduates. The faculty will work with students to set their thesis topic at the beginning of the program, and courses will become more conceptual, allowing students to apply the theory to their organizations. Each class will assist the students to complete their thesis by giving them the opportunity to do hypothesis testing to change their work environment. Students will do outlines of their thesis, see the beginning to the end of their thesis work, and publish before defending their thesis. This will transform the faculty from educators to researchers, or research based faculty. Research activity will become focus of graduate program. The research test to

change the graduate program from an education based program to a research based program is in its inception stage. As the test continues, the results will be published in future papers. The results of this test will immediately be published in the CIB W117 journal, and be implemented in the next test scheduled for the fall of 2009 at RMIT in Melbourne, Australia and at the University of Science Malaysia in Penang, Malaysia. For more information, see pbsrg@botswana, or email msellep@mopipi.ub.bw or dean.kashiwagi@asu.edu.

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