AC 2012-3236: IMPROVING STUDENT LEARNING IN DISTANCE-BASED GRADUATE PROGRAMS: A RESIDENCY LIVE CASE COURSE

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IMPROVING STUDENT LEARNING IN DISTANCE-BASED GRADUATE PROGRAMS: A RESIDENCY LIVE CASE COURSE

ABSTRACT

A case study of a real world project-based course designed for Master of Science in Industrial Distribution (MSID) program at XXXX[1] University is presented. It primarily focuses on a week-long residency course offered as a part of fall semester course work for the second year students. During the week, students work on a company-sponsored real world project. At the end of the week, students present their analysis and results to faculty and industry executives based on which their course performance is evaluated. In the paper, we first briefly describe the objectives, learning outcomes, and schedule of the course. Next, we present the case study on an animal health care distribution firm, which was used for 2011 class. The case study provides the problem statement, analysis methodologies, and important results. The case study firm has already implemented a part of students' recommendations. The paper also presents a survey of the residency class over the past four years with respect to its contribution to student learning. Our results show that project-based course enhances student learning far more than the traditional topic based learning.

I. Introduction

Distance based programs have been growing rapidly over the past two decades. The growing market for distance based programs can be attributed to the globalized competition in the labor market, as well as the widespread availability of internet access. One report in the US News shows that the online-based degree programs are increasing at a rapid pace, generating billions of dollars for universities and other institutes of higher learning (Greer, 2010). These programs have now expanded beyond traditional distance based disciplines such as liberal arts and business schools to technical programs like engineering and technologies (Griffin et al., 2008). While the growth in distance learning has created a new opportunity for the educational institutes, it has also brought up new challenges for educators in providing the same level of learning experience to the online students as that to the traditional in-class students.

Speaking of learning experience for students, different types of learning approaches are practiced in higher education. The most common approach is topic-based learning in which the mode of instructional delivery and learning are based on the sequence of materials presented in a textbook

[1] Name of the university is hidden for blind review purpose.

(Yousuf et al., 2010). In other words, the knowledge transmission depends upon the instructor and how he or she designs and delivers the material given in the text book. It has little correlation with what is the contemporary need of the industry. The more recent learning approach that has been widely adopted across all the majors is project-based learning, which provides environment for active learning (Bayles, 2005), and application of knowledge to solve real-world problems (Perrenet et al., 2000).

In summary, while it is critical to have academic rigor based on theory offered by traditional topic-based learning, it is equally important to develop an innovative pedagogical approach with hands on tools offered by project-based learning (Esche and Hadim, 2002). More importantly, learning also depends upon the profile of a student such as age, industry experience, full time versus part time, etcetera. The profile of the graduate class, presented in this paper, is very diverse and mature with respect to areas of work experience and age of the students. The average work experience of students is about 10 years and the average age is about 35 years. To this end, our experience has shown that for mature and experienced students like those in our MSID program, project-based curriculum is more effective than the traditional topic-based courses. Pedagogically, the project-based learning is founded on the principles of constructivism (Merriam et al., 2008). It is a process of active learning which focuses on students' learning rather than an instructor's performance and teaching tools.

While project-based learning is considered the best approach for adult learning, it is very difficult to offer a fully project-based course in a completely online environment, especially when project sponsors do not know who they are sharing their internal data with. It also creates logistic challenges due to different time zones if the project requires live meetings. In order to overcome such challenges, the XXXX University has created an on campus residency course for its industrial distribution graduate program. In this paper, we present a case study of real world project that was conducted in this past fall semester.

The remaining sections of the paper are organized as follows. In section II, we briefly describe the course and its objective. Section III presents course design and detail schedule of activities during the residency week. In section IV, we present a case study on an animal healthcare distribution company from a recent class. Section V describes the key findings of the project. In section VI, we conclude the paper with some remarks from students' survey.

II. Course Description

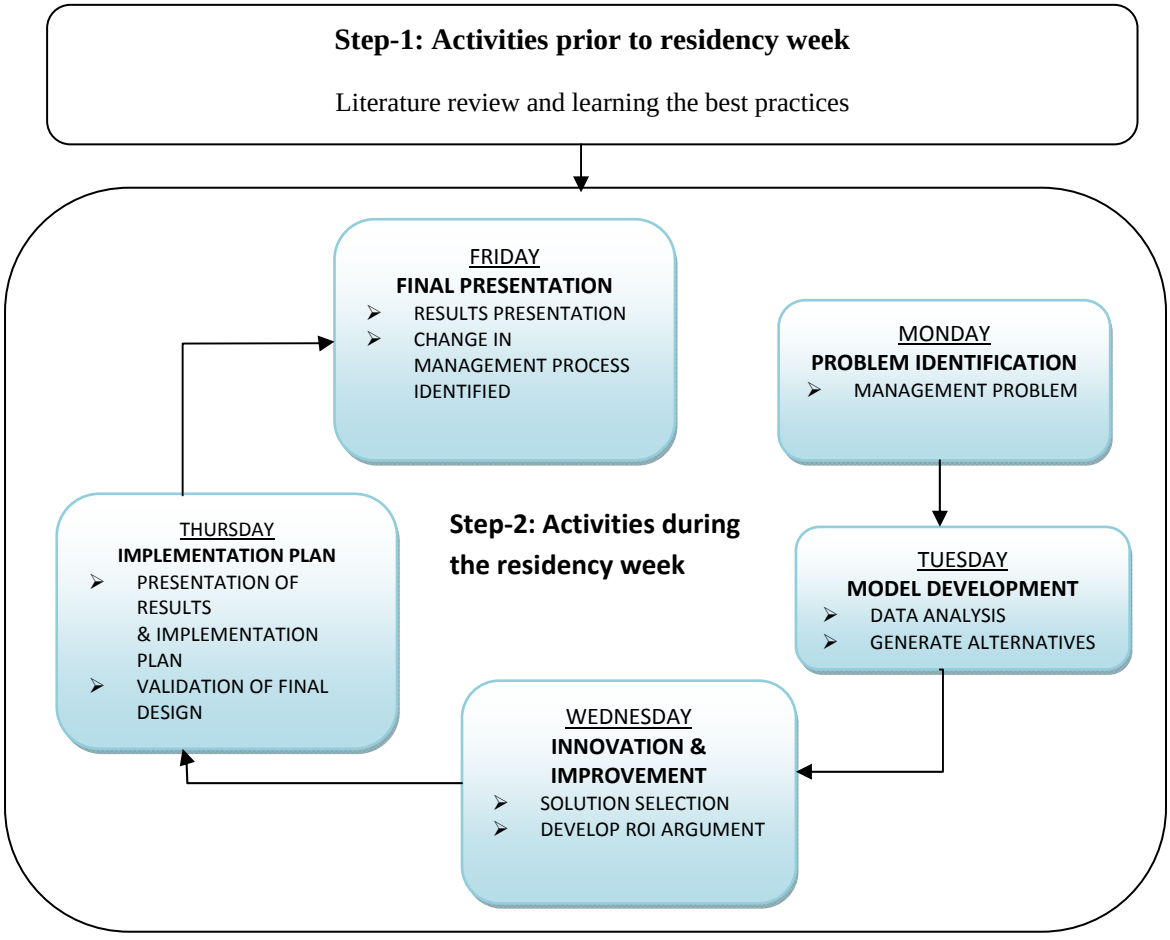
This is a project-based course designed to enhance students' experience in quantitative research and analysis. The main objective of this course is to provide students with sufficient exposure and training to perform applied research in their post graduation career in general, and to carry out their capstone projects in particular. It involves practical applications of research methodologies and best practices in distribution environments. Students carry out a professional

assessment of current business practices to determine the current status. If an as-is practice is not optimal, they recommend a solution to convert the current practice to "the best practice," The value of the proposed solution is judged based on a cost-benefit (or, return on investment) analysis. The project is designed provide solutions to managerial issues faced by a distribution firm.

III. Course Design: Class Schedule and Activities

This is a three-credit course offered in the beginning of the second year of the MSID program during the residency week. It is designed as a weeklong intensive course in which students work from Monday through Friday, 8:00 AM to 5:00 PM with after-hours group meetings and other studies. Exhibit 1 depicts the design and schedule of the course.

Exhibit 1: Class activities for prior to and during the residency week



The figure demonstrates that actual course learning process starts prior to residency week. students receive their course packet which includes the course outline including, class schedule, background of company, project focus areas, expected deliverables, and suggested references at

least one month before the residency week. After receiving the packet, student teams will be formed and identify tentative areas of study is assigned to each team. The study areas cover the seven basic process groups of a distribution firm as described in Lawrence et al. (2008). The seven broad processes include *sourcing, store, stock, sales, support services, shipping, and supply chain planning.* The focus areas can vary from year to year depending upon their relevancy to the sponsoring company

Prior to the residency week, each student prepares a 5-page report on their initial understanding of the case, proposed methodology, and expected results. Students were also expected to review the best practice literature associated with their group assigned area of study and any relevant (animal health distribution related) industry specific information to support their analysis. During the residency week, they follow the schedule of activities shown above in Exhibit 1.

On day 1 (Monday), students along with the instructor(s), will travel to visit the company facility. The objective of this visit is to understand the current business process and refine their problem statement. The typical sequence of events on Monday is as follows: a) students arrive at the company premises and are guided to the conference room by company associates; b) the top executive(s) of the company will give a brief presentation on the broader vision, mission, strategy, business model of the company; c) students will be divided into a few small ad hoc groups for facility tour; and d) after the facility tour, students assemble back in the conference room for more question and answer sessions. The question and answer sessions are generally with functional managers depending on focus areas. Students also create necessary process maps to improve the understanding of their project. More importantly, they establish contacts within the firm in case they need more data for the analysis. Students are also allowed to bring a digital camera to take pictures of the facility (subject to approval of the company) that can be used during the analysis and presentations.

On Tuesday, students will spend their time in model development and data analysis. First, they will perform the process assessment. Based on the assessment results, students will determine state of current processes as common, good or best practice. In the next stage, students will generate alternative solutions for the company towards achieving the best practice with some guidance from the instructors. The major data collection work is done prior to students' arrival so that they can spend more time in discussing problem with the company than collecting the data. Wednesday marks the innovation or solution selection day. Among other things, the main criterion for solution selection is return on investment (ROI) for the company. Thursday morning, students will work on draft presentations and implementation plans and present that to instructors. Typically, these presentations are enormously interactive and draw immense constructive critiques, and suggestions. Students generally work until late hours on Thursday to incorporate the feedback and prepare the final presentation for the project sponsor on Friday. The final results and recommendations for implementation and change management are presented on

Friday morning to a team of senior executives from the sponsoring company. The team may include the company CEO, senior vice presidents, and/or various functional managers.

IV. Animal Healthcare Distribution- a Case Study

In this section, we present a detailed case study of ABC Medical. It is an animal healthcare products distribution firm located in central Texas. As mentioned earlier, this case study was done by the Fall 2011 class. To protect the identity, the actual name of the company has been disguised.

A. Company background

ABC Medical is a wholesale distributor of veterinary medicines. The firm is a member of a large group of companies whose headquarters are located in a Southwestern US city. This group is a privately held enterprise with combined annual revenue over $1.2 billion. The group acquired ABC Medical in 2010, which specializes in companion animal drugs and medical supplies. Its main warehouse is located in central Texas where about 40 people work on full time basis. The company has another office in a nearby major city where 20 of its outside sales reps are located. Following paragraphs provide further details on the state of the company with respect to inventory management and customer support services.

- *Customer support and market size:* The firm has about 50 sales representatives composed of 29 ISR's (inside sales representative) and 21 FSR's (field sales representative) who generate annual revenue of $40 million for the firm. The case study facility has about 15000 SKUs.
- *Territory covered:* This branch covers a wide territory in the south, any location East of Colorado. Management is looking for growth opportunities.
- *Order fulfillment:* All orders that print before 4:30 P.M. in their respective warehouses will ship that day for next day delivery to customers utilizing ground and/or air services where needed. Order picking is done manually. To minimize picking errors, the firm uses a final check (100% inspection of the pick list) before shipping to the customer.
- *Warehouse management system:* The company currently employs SAP for managing its warehouse and other functions such as purchasing, delivery, and shipment. Some Items are bar coded from the manufacturer but ABC medical is not utilizing any barcoding systems. Bin location is not fixed which allows the manager to move the bin from one aisle position to another with very little effort.
- *Warehouse design:* The current warehouse design consists of a traditional cross-aisles type design with a wide middle aisle for two-way traffic. There is only one receiving and shipping dock.

- *Shipment volume:* They typically ship 400 boxes per day. Transportation cost is included in the product price. The company doesn't have its own fleet and mostly uses UPS for shipping. They are among the top five air shippers for UPS in that area with roughly $1.2 million in annual outbound shipping cost. Therefore, transportation is a big contributor in terms of overall costs of goods sold.
- *Purchasing:* Currently the system generates the min. value for the reorder point. SAP does have a max quantity function but it is currently not being utilized. The order quantity is determined based on the current and estimated (by experience) future demand. The parent company (group) is also a part of a larger buying group.

B. Problem Statement

As mentioned earlier, the ABC Medical was recently acquired by a large animal healthcare products distributor. Therefore, the top management of the large distribution firm was very interested in finding ways to improve the profitability of its newest subsidiary. At the time of this study, the ABC Medical facility in question carried $7 million worth of inventory at any time. The company currently had not implemented any formal inventory stratification method although they were keeping track of high demand items for which they have been maintaining a very high customer service level (that is about 98%). For other items, the service level varied from 80% to 95%. They offered a comprehensive variety of product lines with 6,500 products from over 165 leading manufacturers around the world. The first issue facing the company was excessive inventory, therefore, they were looking for ways to reduce that cost while maintaining the highest service level for their customers. The company was also looking for ways to improve the picking efficiency by reducing picking time and errors. Management was considering installing carousels in the warehouse for certain products but had not done any ROI analysis yet. Further, the company was also facing space problems in the warehouse, therefore, was considering the possibility of vertically extending the shelves. Thus, warehouse efficiency improvement was the second goal of the company.

In order to better analyze the challenges facing the ABC Medical, the above mentioned problems were classified into following four key distribution processes.

a. Outside sales and territory management (Sell)
b. Warehousing (Store)
c. Inventory Management (Stock)
d. Sourcing and supplier relationship management (Source)

C. Project teams and analysis plan

In Fall 2011, the class had 28 students. For project management purpose, the whole class was divided into five teams. Each team took up one process except the sell process, which was analyzed by two teams because of the amount of analysis involved. Exhibit 2 depicts a project plan and the work breakdown structure for the analysis work. As shown in Exhibit 2, students

were asked to review the relevant chapters from the textbook before they came to class. They were also given a hint as to how many students should be assigned to perform each task within a topic. This was done based on the rigor and the amount of work required in completing the analysis. However, each member of the team was involved in making the final recommendation. It was important to do so because otherwise students would not have an opportunity to learn the real purpose and the benefits of the whole exercise.

Exhibit 2: Team assignment for residency week

			28		*Number of students per task*			
Topic Group	Refer ODP Text Book	Analysis	# of Students	Dot Report	Analysis - Part 1	Analysis - Part 2	Results Generatio	Recommendations
S1 - SOURCE	Chapter 4	A1 - Supplier Performance Measurement	5	ALL	2	2	1	ALL
S2 - STOCK (Inventory)	Chapter 5	A2 - Inventory Stratification	6	ALL	2	3	1	ALL
S3 - STORE (Warehouse)	Chapter 6	A3 - Lean - Value Stream Mapping	5	ALL	3	2	ALL	ALL
S4a - SELL	Chapter 7	A4 - Customer Stratification	6	ALL	3	2	1	ALL
S4b - SELL	Chapter 7	A5 - Customer's Item Visibility - Pricing	6	ALL	3	3	ALL	ALL

D. Analysis methodologies

To help students with their preparation for analysis, they were provided with specific information on the analysis methodology for each process in the course manual before they arrived for residency week. The whole analysis was divided into two phases. In the first phase, each team assessed the current processes of the ABC Medical based on the information and interviewed they conducted during the company visit on the first day. The deliverable of the first phase was a process assessment report that identified each process as *common*, *good*, or *best practice* depending upon their level of effectiveness, and methodologies currently implemented by the company. In the second phase, students performed several analyses to determine the ways to improve the current processes (where applicable). Exhibit 3 describes how each step of the analysis methodology was carried out and what the expected deliverables were. For example, in the sourcing process, students were analyzing the performance of the suppliers with respect to four factors namely, lead time, lead time variability, on-time delivery, and order completeness. The whole supplier performance analysis was divided into two parts. In part 1, two students ranked supplier performance based on lead time, lead time variability, and on-time delivery index. Similarly, for part 2 analysis, two other students carried ranking of suppliers based on order completeness and also combined all the four factor ranks into an overall performance (of final) rank. The fifth student of the team then took all the results from the both parts of the analyses and created graphs and tables to present their results. Lastly, all five members discussed their findings and made a combined recommendation with respect to sourcing process. The similar process was followed in the other four analyses that included inventory stratification, lean

value stream mapping of warehouse processes, customer stratification, and customer item visibility and pricing analysis (see Exhibit 3).

Exhibit 3: Analysis methodology and expected outputs for phase II

Analysis	Analysis - Part 1	Analysis - Part 2	Results Generation
A1 - Supplier Performance Measurement	Rank Suppliers based on Leadtime, Variability and Ontime Index	Rank Suppliers based on Completeness index and combine all 4 ranks to determine final rank	Create graphs and charts for presentation
A2 - Inventory Stratification	Ranks items based on Sales and GMROII	Ranks items based Hits and combine all 3 ranks to determine final rank	Create graphs and charts for presentation
A3 - Lean - Value Stream Mapping	Value Stream Map to identify - CVA, BVA and NVA for - Receiving and Putwaway Process	Value Stream Map to identify - CVA, BVA and NVA for - Cycle Counting or Picking Process	Create graphs and charts for presentation
A4 - Customer Stratification	Ranks customer based on Cost-to Serve, Hits and Sales	Ranks customer based on Profitability and combine with the other 3 ranks to determine final customer type	Create graphs and charts for presentation
A5 - Customer's Item Visibility - Pricing	For one TOP CUSTOMER: Rank items purchased based on 1) Sales $ 2) Hits 3) Unit Cost and 4) Recency. Combine all 4 ranks to determine final rank	For one TOP CUSTOMER: Rank items purchased based on 1) Sales $ 2) Hits 3) Unit Cost and 4) Recency. Combine all 4 ranks to determine final rank	Create graphs and charts for presentation

V. Findings and Recommendations

In this section, we present results for sourcing process (as a sample) to demonstrate how students carried their analysis thereby made the recommendations to the company with respect to all the four process. As described earlier in section III.D, students first assessed the current sourcing process of the ABC Medical, and then analyzed the supplier performance with respect to four criteria.

Exhibit 4: Process assessment report for sourcing (Source: Class presentation, Fall 2011)

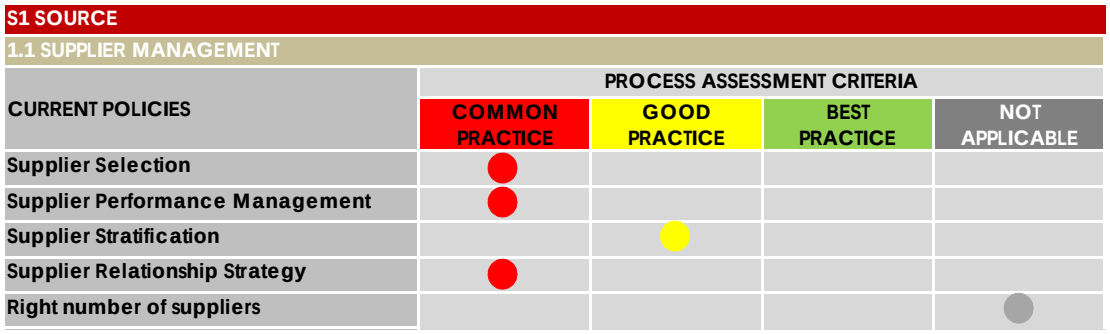
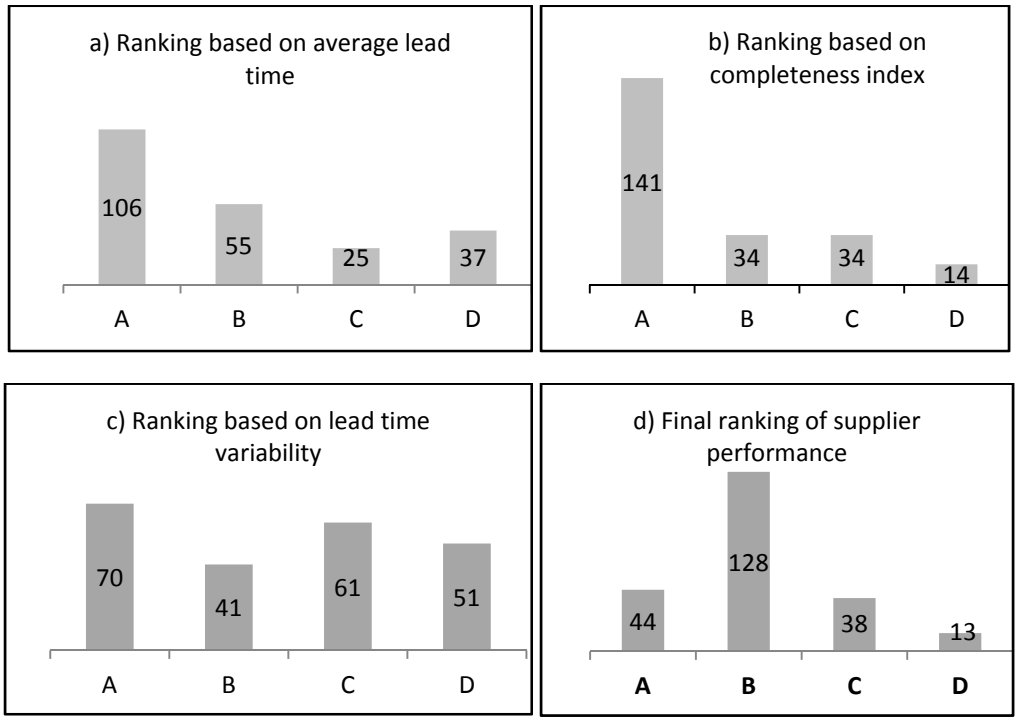


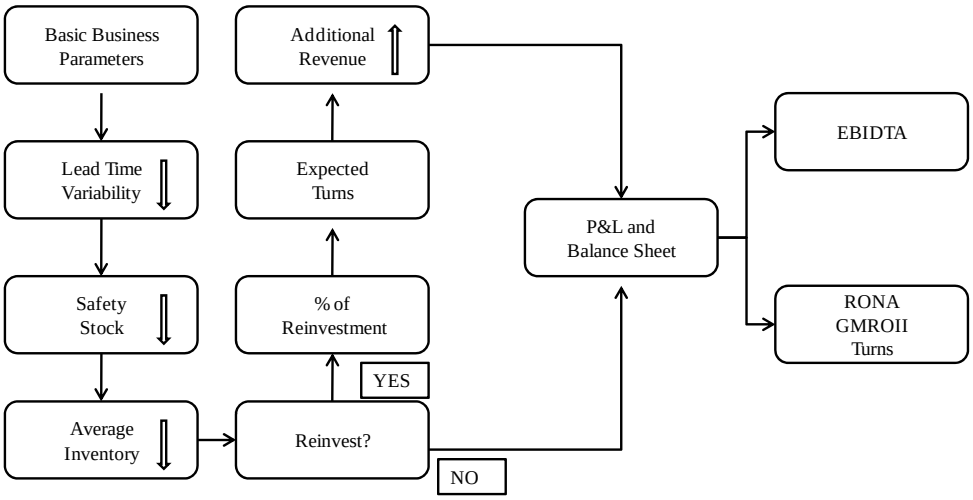
Exhibit 4 depicts the assessment results of sourcing process with respect to the policies described in Lawrence et al. (2008). As per this report, the ABC had largely a common sourcing process. They had some basic supplier stratification based on the product type only. There were no other criteria considered for ranking the suppliers. students took this as an opportunity to improve the supplier relationship and possibly change the supplier selection process. Based on their discussion within the team, they determined that the first step to that end was measuring the performance of the current suppliers by considering multiple criteria as described earlier in section III.

Exhibit 5: Supplier performance measurement results (Source: adapted from class presentation, Fall 2011)



In Exhibit 5, graphs a, b, and c show the number of suppliers in each category (A, B, C, or D) with respect to a criterion. Lastly, in (d), it depicts the final or combined rank of the suppliers. The results showed that nearly 50% of the suppliers were delivering complete order and had a reasonable lead time. However, their lead time variability was an issue. Therefore, students chose to undertake a deeper analysis of lead time variability thereby demonstrated how a reduction in supplier lead time variability can improve the bottom lines of ABC Medical. Exhibit 6 graphically describes the negative correlation between the lead time variability and the additional revenue for the company. In other words, the reduction of lead time variability will reduce the need for safety stock thereby reducing the overall cost of inventory. This savings will eventually be reflected in the company earnings before profit, taxes & deductions (EBTDA), and returns on net assets as shown in Exhibit 6.

Exhibit 6: Impact of reduction in lead time on the profitability of a distribution company
(Source: adapted from class presentation, Fall 2011)



As mentioned earlier, similar approach was adopted with respect to all four processes to analyze the benefits of the proposed solution by the class. However, those results could not be presented in the paper due to sensitivity of the information.

VI. Conclusions

It has been widely accepted in higher education community that project-based learning approach enhances student learning experience (Mills, 2002; Viswanathan and Evans, 2009). However, it is very difficult to offer such a course in a completely web-based program, not because of technology but due to perceived insecurity of the proprietary information. Companies are not comfortable sharing the cost and other proprietary data in an online environment. This paper presented a residency course for a distance-based graduate program in industrial distribution. The course involved a real world case study analysis. In this paper, we presented a real world case study of an animal health care distribution from the 2011 Fall semester class. It included problem statement, analysis methodologies, and important results. In the first phase of the analysis, students assessed the current processes of the case study firm to determine their status. In the second phase, the class performed a detail analysis on the current sales, sourcing, stocking, and customer pricing process and made recommendations based on their analysis. The validity of recommended solutions was demonstrated by showing a positive return on investment for the company. Since the class ended in early part of the semester, the case study firm has already implemented part of the student's recommendations.

At the end of the class, a survey was conducted to explore the student's learning experience. The students' responses were overwhelmingly positive. In other words, all 28 students unanimously

said that they learned much more in one week than they would typically have done in a topic-based traditional classroom in the entire semester. Similar results were found in another survey of former students who had taken the same course in the previous three years. The survey results showed that the project-based approach involving real world business problems had far more and long lasting learning impacts than the traditional approach of topic based learning.

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