OPTIMIZING LEARNING IN PROJECT-BASED CAPSTONE COURSES

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ABSTRACT

This paper addresses the design and implementation of project-based capstone courses in undergraduate and graduate management education programs. A team project methodology is proposed that involves collaboration with an external sponsoring organization and focuses upon such issues as strategic analysis and development, remediation of organizational problems, product development, entrepreneurial start-up, not-for-profit organizational development, etc. Key elements discussed include high level educational goals for the capstone, criteria for project selection, processes for sponsor relationship management throughout the project life cycle and the facilitative role of faculty in such experiential learning. Other methods that optimize learning in the areas of leadership development and team process learning are also described.

Keywords/Descriptors: Business education, capstone course, experiential learning, problem-based learning, project-based learning.

INTRODUCTION

Students, employers, accrediting agencies, and those financing higher education increasingly challenge educators to demonstrate learning outcomes worthy of their substantial investments. Traditional academic methods using textbooks, lectures, case studies and other didactic learning approaches all play a potential role in addressing this challenge. Nevertheless, upon completion of a degree program, these stakeholders also want to know that the student can actually integrate and apply what they have learned in the "real world". A recent survey of employers in the Chronicle of Higher Education supports this notion (Maquire Associates, 2013). This study showed that employers preferentially valued a student's real world experiences relevant to the challenges of the employment context versus evidence of time spent in classroom activities, reading assignments, essays, discussions etc. Employers want to know if the student can actually use the knowledge gained in such activities.

This paper explores one method for promoting learning grounded in this real-world experiential context - the Project-Based Capstone Course. Although the present analysis is drawn from a management education context, educators in other disciplines such as engineering, education or health care could also apply the approaches outlined herein. Topics discussed include delineation of capstone courses goals, criteria for project selection, processes for sponsor relationship management throughout the project life cycle and the facilitative role of faculty in such experiential learning. Methods for promoting leadership development and team process skills are also described.
WHAT IS A CAPSTONE COURSE?

Most programs place capstone courses at the end of the curriculum and emphasize integrative problem-based learning versus a more passive "content acquisition" approach (Elam & Spotts, 2004; Wood, Smith, & Powell, 1995). Professional schools often utilize a consultative project, simulation or other experiential process (Razzouk, Seitz, & Rizkallah, 2003; Zechmeister & Reich, 1994) as the heart of the educational endeavor. This experiential learning context challenges students to address "messy" problems in realistic contexts. Here students have to understand multifaceted problems within the frame of their own mental models rather than that provided by the professor or other text materials. As such, these courses rely upon a constructivist approach to learning (Springer & Borthick, 2004) in contrast to more traditional "sage on the stage" pedagogy. As Davenport et al noted, useful knowledge derives from information combined with experience, context, interpretation and personal reflection (Davenport, De Long, & Beers, 1998). These are the hallmarks of a superior capstone experience. These courses treat learning as a search for better ways to act versus a sole emphasis upon lower order learning outcomes (Cavaleri & Fearon, 2000). In addition to their learning potential, such project-based courses are highly motivating to students, encouraging them to become active participants rather than passive spectators in the learning process (Humphreys, 1981).

WHAT KINDS OF ACADEMIC PROGRAMS USE CAPSTONE COURSES?

Professional schools such as business, engineering, information technology, health care and education often place the capstone as the culminating experience in their respective degree programs. In management education, such courses may focus on strategy and business policy (Leontiades, 1979), (Greiner, Bham bri, & Cummings, 2003), accounting (Jervis & Hartley, 2005; Johnson & Halabi, 2011), entrepreneurialism (Boni, Weingart, & Evenson, 2009; Gilbert, 2010), public administration (Bowman, 1989), management information systems (Wright, 2010), economics (Brooks & Schramm, 2007) or ethics (Hensel, 1990). Similar courses appear in schools of education (Brown & Benson, 2005; Kerrigan & Jhaj, 2007) and engineering programs (Gnanapragasam, 2008). These references should allow the reader to explore capstone methodologies relevant to these common focal areas.

BASIS FOR ANALYSIS AND ASSOCIATED RECOMMENDATIONS

The analysis and recommendations in this paper are based upon the author's experiences teaching capstone courses at both the undergraduate, graduate and executive MBA levels since 1988. Approximately 180 team projects were supervised during this period. These projects were central elements of the capstone management courses conducted at the Helzberg School of Management at Rockhurst University in Kansas City, Mo. Typically, these courses contained approximately 25 to 30 students and were conducted over the course of a 16 week semester.
During this time, the author collected qualitative and quantitative assessment information from a variety of sources. These sources include formalized end-of-course surveys, student interviews, specific surveys designed to assess various elements of the capstone process, course embedded assessment activities and, more recently, assessment conducted by external executives interviewing capstone graduates to ascertain learning outcomes.

In the following sections, we will explore some of the clear patterns that have emerged in this 25 year experience base. The reader can view the methodology used here as a kind of longitudinal or composite case study based upon these collected observations in combination with data from other capstone practitioners as documented in the literature referenced herein. The paper's goal will be to highlight lessons learned with the hope that other academic practitioners might find practical approaches relevant to their own curricular needs. Given the relatively broad scope and practical emphasis in the paper, the author did not emphasize empirical hypothesis testing, but rather sought clear and consistent patterns that have emerged over this 25 year experience base as documented by the data sources noted above. Where possible, these observations are cross validated by reference to other research focusing on the capstone course methodology.

Although this paper uses examples in the management education context, many of the goals and recommendations forwarded here have application to other disciplines to include public administration, management information systems, engineering and other associated professional fields.

In the following sections, we will focus on a student team project as the primary vehicle for course learning in the capstone. Such projects typically involve a team comprised of 4 to 9 students who interact with a sponsoring organization in a collaborative relationship to address real world problems or opportunities relevant to the sponsoring organization. These courses also provide project focused "just-in-time" learning resources to include targeted readings, faculty tutorials, external consultants and access to other specialized faculty with skills relevant to the specific project.

The project life cycle shown in the next section will structure our discussion of recommended educational methods. We begin with a discussion of the goals of the project-based capstone and then discuss methods for designing and facilitating each of the project life cycle stages to optimize learning outcomes in light of the noted goals.

**The Capstone Course Project Life Cycle:**

1. Determination of project learning goals
2. Sponsor acquisition and project selection
3. Definition and refinement of project scope
4. Problem analysis (i.e., primary and secondary research)
5. Presentation of recommendations
6. Project closure & assessment
Capstone Learning Goals

Within the capstone course, professional schools typically place emphasis on the specific skill development areas central to the challenges of the professional discipline. For example, business programs might strongly emphasize competitive strategy while engineering capstones might emphasize project management methodologies. Although such profession-specific goals have impact on capstone design, it is possible to forward a set of general or “meta” educational goals that are common to project-based capstone courses in a variety of educational contexts. These goals are important in our present analysis because they represent key optimization targets for the capstone learning experience regardless of discipline.

Capstone Project Meta Goals

Goal 1: Focus learning on problems or opportunities in real world contexts
Goal 2: Challenge students to select and apply relevant theory/knowledge
Goal 3: Integrate knowledge and multiple theoretical perspectives
Goal 4: Promote individual personal growth
Goal 5: Develop leadership and team process skills
Goal 6: Create an experience that serves as a rite of passage

The following sections characterize the key elements of each of these high level goals and discuss ways in which learning outcomes can be optimized through the initial design and selection of appropriate capstone course projects. The author also asserts that the project-centric capstone course is an ideal educational vehicle to optimize these high-level learning outcomes in comparison with other educational methodologies that may be used in the capstone context. These other alternative approaches include simulation (Ganesh & Qin, 2009; Hanlon, 2008; Springer & Borthick, 2004), case study (Harper, Lamb, & Buffington, 2008), (Schaefer, 2009; Segev, 1988) and traditional lecture - discussion based courses. The author will also describe some of the typical problems that can arise that may impede success on each of these goals and suggests methods for mitigating such problems.

Goal 1: Focus learning on problems or opportunities in real world contexts

In problem/opportunity-based learning students are placed in a "real world" context and challenged with ill-defined or "messy" problems that often defy formulaic solutions. In this section we will examine the value of such real world learning contexts and explore some of the problems that can arise in choosing project sponsors, defining project scope and dealing with common problems that arise in this challenging and dynamic learning context.

In contrast to case studies or even simulations, the real world project context places students in a human drama involving multiple "flesh and blood" stakeholders. Student
interaction with the client organization places the learning in an organic context where such issues as communications dysfunction, differing mental models, and other complex organizational realities characterize the project experience. In this scenario, organizational leaders in the sponsoring organization have interests, biases, personalities and motivational vectors that play out in the course of the project. Another significant dimension of this learning context is that stakeholders often have substantial interests at stake - the project may have real consequences for them. This is inherently a less tidy and more realistic world than is often found in case studies or simulations. The project basis for the capstone forces students into a situation where they must construct valid mental models and often face highly ambiguous circumstances.

Such situations can be a bit scary to students, but certainly provide insights about organizational dynamics that students will likely face again in their professional lives. In fact, end-of-course assessment surveys often express student satisfaction with the fact that the experience was real for them and their analysis and recommendations had the potential to make a real difference in the sponsoring organization. In some instances their work was reviewed and applauded by the very highest levels in Fortune 100 firms. Such potential for real impact is one of the features of the capstone project that is highly valued by students.

**The Importance of Vetting and Socializing Project Sponsors**

The author's experience and assessment data shows that student learning outcomes are critically influenced by the choice of project sponsor, the specific focus of the project and the role expectations of the project sponsor. One way in which the role expectations of the sponsor can be shaped is by using the term "sponsor" rather than "client" as this acknowledges the mutually reinforcing goals of student professional development in conjunction with the value returned back to the sponsoring organization. When project sponsors are carefully vetted and socialized as noted below, sponsors are more likely to see that their investment in promoting student learning often returns value to them in the form of better analysis and conclusions. To foster this high performance collaborative relationship, the course facilitator should make every effort to socialize sponsors before the outset of the project to make sure that they understand the goals for the project and are cognizant of the specific ways they can support the learning process. These discussions should also seek assurance from the sponsor that have the time to commit to the project, that they are willing to share their "dirty wash " with student teams (this necessitates a confidentiality agreement) and they understand the overall capability of the teams to produce value within the limited 16 week runtime of the project. The author has developed a series of document templates designed to communicate these various goals and processes of the capstone project in the exploratory, project contracting, project execution and debriefing phases of the project life cycle.

One common sponsor-related problem is that the sponsor may have unrealistic expectations for the typical student group. To shape realistic expectations, sponsors should be informed that student teams are, in fact, not consultants in the usual sense of the word. In the author's particular educational context at the graduate level, students are typically
perhaps 25 years old, they are likely working full time and attending classes during the evening. This means that their project related activity often occurs on weekends or late in the evening. Although communications with the sponsor highlight the high performance potential of typical project teams, this author tries to honor the adage, "under-promise - over-deliver".

Another reality to be discussed with the sponsor is the relatively short duration of the project (16 weeks). When one subtracts the inevitable ramping up of project activities and the time needed for project presentations, students have about 10 to 12 weeks to complete the project. These time constraints should be discussed as the facilitator and sponsor plan the initial project scope.

To reach a mutual understanding of these project features, the author often spends perhaps an hour discussing these issues with the sponsor either telephonically, through a video teleconference or, ideally in person. Such communication is followed up with a document that overviews the project process and addresses the issues noted above. If the prospective sponsor desires it, previous project sponsors can be made available to share their past project experiences. Assuming that the sponsor decides to move ahead with the project, a letter of agreement is drafted and signed.

**Criteria for Project Selection**

Although vetting of the project sponsor is an important part of organizing the capstone project, another criteria for project selection is that the project should have an appropriate level of complexity. Although the nature of this complexity will vary from discipline to discipline, in the author's situation, ideal projects focus upon issues of strategic importance to the sponsoring organization. Rather than focusing upon highly detailed issues of a technical nature, students are challenged to grapple with multifaceted problems that often cut across organizational boundaries. Start-up entrepreneurial projects can also provide rich learning opportunities because these organizations are usually small enough so that students come to appreciate the organization's operations as a whole. Given the typical capstone goal of disciplinary integration, such projects can yield substantial learning in the dynamic startup context. Business accelerators and or incubators can be great sources for such projects and the sponsors are often highly motivated to work with students given their relative paucity of resources at this stage of their development.

Another dimension of appropriate complexity relates to what might be termed the stakeholder ecology of the sponsoring organization. Frequently the author finds that many inexperienced students may not appreciate the inherently political nature of organizational operations. Student interaction with internal and external stakeholders in the organization can promote learning by illuminating the interplay of stakeholder interests and the often complex trade-offs inherent in many organizational decisions. Such interaction also teaches the value of negotiation skills as the organization seeks to influence these various stakeholders to accept their project recommendations.
On selecting the appropriate level of challenge - Can a project be too complex?

Although an appropriate level of issue complexity is an important project criteria, sometimes the team will find itself grappling with a highly complex and potentially impenetrable problem that emerges as the central issue in the project. This seeming intractability can lead to a lot of student frustration and the perception that the team is simply "spinning its wheels" with little hope of sponsor benefit or useful learning. In this situation, the sponsor may also begin to lose interest as they may come to believe that the team has little to offer them. Although this situation can often be avoided with careful project vetting and scope definition, sometimes capstone projects are emergent and inherently exploratory. When project teams find themselves in such situations, the instructor should recognize that this frustration and potential panic on the part of the team, in fact, represents a learning opportunity.

In such situations, the facilitator should work with the team and sponsor to adapt or redefine project scope in a way where learning can continue. Facilitators can note that organizations often struggle with such problems that can frustrate the most skilled leaders and managers. The key learning opportunity is to explore how a team can pivot in such intransigent situations to find other ways to contribute value and to do so quickly with a minimal amount of friction and unnecessary "whining". This can be an outstanding lesson for "straight-A" students who may have otherwise glided through all their courses without ever having to address such "messy" real world challenges. Much like the greenhouse plant set out to adapt to a brutal outdoor environment, here the individual student and the team can practice and test strategies to respond to such exigencies.

In such situations, the course facilitator should structure opportunities for individual and team reflection and emphasize the value of learning how to adapt to situations where you feel stuck. In this scenario asking, "What can be learned here?" opens the door for growth and development. It is also essential for students to realize that, ultimately, the goal of the capstone process is not necessarily "solving the sponsor's problem per se". Such an outcome would be is ideal, but it is not necessarily the most important learning outcome of the course. The course facilitator should always stress that the student's individual learning is the super-ordinate goal. In fact, the author has seen many projects where substantial learning occurred even in those situations where students were unable come up with effective solutions to the problems initially central to their project. The facilitator should help students frame what they have learned in such projects and, at the same time, communicate with the sponsor to help them better appreciate the ways in which students benefited from the sponsors investment in time and energy. By providing the sponsor with insight into these student learning outcomes, the sponsor comes away from such less than optimal engagements at least knowing that they contributed to the student's professional development.
**Goal 2: Challenge students to select and apply relevant theory/knowledge**

Another capstone goal is the **application of relevant theory and discipline-based knowledge** to all aspects of the capstone project. Students should be encouraged to select those tools, perspectives and theories learned in previous classes and apply them in ways providing the most utility in the project context. In this applications process, students gain a greater appreciation for the relative power and inherent limitations of the such tools.

When teams offer recommendations to the sponsor at the end of their project, they have an opportunity to come to a deeper understanding of the many ways in which organizational decision-making may be less "rational" than students might otherwise expect. When a sponsor rejects their carefully analyzed recommendations, this experience reinforces understanding of such phenomena as satisficing in decision making and the ever present impact of perceptual biases and dysfunctional cognitive heuristics (Bazerman & Moore, 2009; Kahneman, Slovic, & Tversky, 1982). Students also learn that organization's have limits to their capacity for change.

An additional way to create opportunities for students to apply theory and other tools is to design a section of the course where it is possible to introduce "just-in-time" educational modules that are directly applicable to project issues. Sometimes these modules may be reviews of previous course content and other times new concepts and theories might be introduced. The ultimate goal here is to offer realistic context where these ideas and tools can be exercised and evaluated.

Sometimes any given project may not necessarily afford opportunities for students to apply important skill sets gained in previous coursework. An example might be a student majoring in finance who is not able to exercise the array of financial tools learned because the project has minimal financial elements. This is a fairly common occurrence as sponsoring organizations may want to avoid providing full access to all their financial information, a challenge particularly prevalent with privately held sponsoring companies. To address this challenge, ideal projects often contain multiple dimensions to the problem or opportunity being explored. We will return to this challenge in the next section on integration.

In terms of student assessment and grading, it should be noted that a grading rubric is utilized that specifically measures application of theory and previous course content. Although beyond the scope of this paper, the author has found that the capstone course provides a terrific opportunity for assessing courses upstream from the capstone experience. For example, if students face a problem best understood through the lens of organizational behavior (OB) and yet are unable to apply their OB coursework, then one can assume that there are potential problems with the upstream course or curricular sequencing.

**Goal 3: Knowledge and Theory Integration**

Another meta-goal in the capstone process is the **integration of knowledge** gained from a variety of discipline-based courses coming before the capstone experience. As Carlson and Bolton note, "a capstone course should give students a sense of coherence of
their program of study in a discipline and should deepen their appreciation of the discipline as an approach to specific problems" (Carlson & Peterson, 1993). The capstone experience should also be designed to help students see relationships between the various sub-disciplines they have studied in the curriculum (Marshall, Bolten, & Solomon, 2000). If properly designed and implemented, one study showed that the capstone course was five times more effective than any other format to help students integrate their learnings and academic experiences (McCambridge & Thornton, 1994).

To promote learning integration, projects should be chosen that afford an opportunity for students to utilize multiple skills sets and knowledge gained in previous discipline-based courses. As noted earlier, in the entrepreneurial context, the student team can make contributions in a whole range of discipline areas to include marketing, supply chain management, global issues, information technology etc. The key here is that the real organizational context of the project allows students to view any given discipline or functional area within the holistic organizational context. In contrast to academic courses that focus on a specific disciplinary lens and/or set of tools, here students address problems and opportunities that often defy disciplinary categorization.

One method the author has used to encourage learning synthesis and integration is for the project team to structurally differentiate itself into different functional areas such as information technology, media design, market analysis, financial analysis etc. This structural differentiation affords student learning regarding the interplay between each of these functional perspectives. Learning can also occur in those circumstances where the team fails to integrate their insights and associated analysis in each of these subspecialties. Needless to say, this challenge of cross functional integration vexes many organizations and early lessons in this area can save a lot of frustration in one's later career.

One other method for optimizing learning integration is to provide students with a carefully selected set of analytical templates designed to illuminate various organizational phenomena. Such templates encourage students to approach problems from multiple analytical perspectives versus focusing specifically within the domain of greatest comfort to the student. The McKinsey 7-S Model (Peters, 2011) is one example used by the author. When students analyze internal organizational strengths and weaknesses, this model deepens insights relating to issues of organizational structure, metrics, leadership, motivational dynamics etc. For students focusing on technical disciplines like accounting, IT or finance, this tool helps broaden understanding of the internal organizational dynamics influencing organizational initiatives in the sponsoring organization. Stakeholder analysis tools can also be useful in the problem analysis stages of the project to promote appreciation of the often complex external stakeholder dynamics influencing various aspects of organizational activity. Such tools can also help students identify interests, perceptions and motivational dynamics that will influence acceptance and possible later implementation of their recommendations. Although the reader will likely have their own favorite tools, these examples illustrate analytical models which have been shown to strengthen analytical rigor in the capstone project (Schwering, 2003).
Goal 4: Promote individual personal growth

Capstone projects also provide a significant opportunity for personal growth and professional development critical for high performance in the world beyond the classroom (Goldstein & Fernald, 2009; Zechmeister & Reich, 1994). Ideally, the challenging problem solving context of well selected capstone projects should help the student build self-confidence in realms outside the often antiseptic confines of the traditional classroom (Ramocki, 1987).

One method to optimize individual personal growth in such projects is for students to outline a personal development action plan at the outset of the project. These development plans can be informed by performance appraisal data for working students or 360 degree feedback such as might be provided by the Kouzes and Posner Leadership Inventory (Kouzes & Posner, 2010). This active engagement of the student in a personally relevant goal setting process has been shown to heighten learning outcomes in student projects of this sort (Grabe, 1986; Schunk & Gaa, 1981). This development plan should highlight individual strengths and areas for improvement that the student can address during the course of the project. Students can share these personal development goals with their teammates and encourage them to provide feedback supporting personal development. The author structures this feedback exchange into the last session of the class. One other mechanism promoting individual development is the requirement of a reflective essay at the end of the semester focusing upon individual lessons learned. Here the student revisits their initial professional development action plan and describes some of the kinds of insights, frustrations, and continuing developmental needs that have grown from their project experience.

Goal 5: Develop leadership and team process skills

Closely related to the goal of personal growth and professional development is the goal of leadership and team building competency development. Because so many capstone projects utilize the team structure, such projects provide rich learning opportunities as the team struggles through the various phases of the team lifecycle. Given this opportunity, courses are often specifically designed to optimize team process learning (Jervis & Hartley, 2005; Lueg & Molen, 2010).

It should be noted that the author does not attempt to manipulate project team composition other than a general approach to try to equalize the size of each group. Following individual sponsor presentations describing project opportunities, students mingle and negotiate with each other to form their student teams. This process has been shown to increase team performance and student motivation (Aller, Lyth, & Mallak, 2008). To afford some modicum of choice in these projects, more projects are cued up in the project portfolio than will actually be selected. Although this sometimes creates problems in terms of sponsors be disappointed by not being selected, it heightens student motivation because the students are able to work on projects of greater interest to them.
Another specific method used to promote learning in relation to the team and leadership development goal is to have each team formulate a team charter at the outset of their activity. Team members also discuss their own individual learning goals and attempt to build consensus around a set of operating values and team practices. This initial activity improves the performance of student teams and also sets the stage for further team process learning (Brownlee, 2012; Byrd & Luthy, 2010; Hunsaker, Pavett, & Hunsaker, 2011; Mathieu & Rapp, 2009).

One of the most significant methods the author has found to optimize leadership and team development is the use of a diagnostic survey that evaluates 30 attributes of team and leadership performance. This online survey is administered twice during the 16 week semester, once at the end of the first third of the semester and then again at the end of the semester. In the first iteration of this survey, teams are directed to produce a report of their diagnostic results and develop an action plan to build on their strengths and mitigate problems identified by the survey. Students report that they would have never attended to these team process issues had they not been forced to take the survey and discuss its results.

An additional technique is to request that teams keep a team journal describing team dynamics operating within their project context. One key component of this journal is the Plus/Delta technique whereby teams assess each meeting with the question: "What were some plusses about what we did today as a team, and, what were some problems to which we should attend?"

Goal 6: Create a rite of passage

The capstone course is often conceived as a kind of rite of passage bridging the student experience in the relatively cloistered academic situation with the vagaries of "the real world" (Wagenaar, 1993). In the undergraduate context, Durel notes, "the capstone course is a rite of passage that provides an experience in which undergraduate students look back over their undergraduate curriculum in an effort to make sense of that experience and look forward to building on that experience" (Durel, 1993).

The author has conducted capstone courses at both the undergraduate and graduate levels in the university business curriculum. This experience shows that the capstone course is a particularly salient rite of passage in the undergraduate context. At the end of the semester, the author often shares a luncheon with these students after grades have been submitted. In this setting, students often talk about ways in which the project built their confidence and encouraged them to take on new challenges.

One other method the author has used to create linkages between the collegiate experience and non-academic professional settings is a closure experience where executives from the community interview students in regard to the things they have learned in their project. Research shows that this ability to articulate the value of one's experiences is something that most employers value over a delineation of academic coursework (Associates, 2013). Knowledge that the project closes with this external assessment also strengthens student motivational expectancies (Driscoll, 1994).
FUTURE RESEARCH DIRECTIONS

Virtually all academic practitioners feel increasing pressure to provide proof of learning outcomes in the courses they facilitate. Although educators using project-based learning have published some assessment studies reviewing the effectiveness of capstone courses (see (Kerrigan & Jhaj, 2007)), we still lack methodologically rigorous learning outcomes data demonstrating that such capstones yield professional competencies valued outside academia. One way of assessing this competency development would be to actively engage the sponsoring organization or other external parties such as alumni or business practitioners in a process of assessing project-based student learning outcomes (Gnanapragasam, 2008; Linnan et al., 2010). The author has experimented with such a process, but this early attempt lacked the methodological rigor needed to firmly test the hypotheses in question. Related to this, it is sometimes possible to estimate the dollar value of any given student project based upon an assessment of the impact produced for the sponsoring organization. Although this economic valuation is clearly a proxy measure for learning outcomes, it does offer a way to quantify the value produced in such projects as measured by this monetization of value received.

Another assessment opportunity would be to explore the use of student or team portfolios as assessment artifacts (Jones, 1997; Kryder, 2011). These portfolios would challenge students to conceptualize and "market" their capstone learning in a way that might provide potential employers with a sense as to how the student might perform in realistic job contexts.

One additional future research opportunity involves harnessing the project-based capstone as a vehicle for assessing the overall performance of a given programmatic curriculum. As the capstone project challenges students with multifaceted and realistic organizational problems, it is possible to test hypotheses relating to learning outcomes in various areas of the curriculum. Such assessment data could then be fed back to faculty teaching upstream disciplinary courses in the hopes that their courses might evolve to better prepare students for these practical real-world challenges.

CONCLUSION

In this paper, the author has reflected upon lessons learned over twenty five years of capstone project facilitation in both the undergraduate and graduate business education contexts. Following the articulation of educational meta-goals foundational to the capstone experience, the author has also argued that a project-based capstone experience effectively promotes learning outcomes valued by students and potential employers.

Hopefully the reader has also gained some practical ideas on ways of optimizing learning within the experiential capstone and responding to typical problems that may arise in the project life cycle. Although these capstone courses are challenging to facilitate due to their inherent lack of predictability, they offer students an opportunity to test and hone their skills in preparation for their lives after graduation.
REFERENCES


