A Proposed Model for the Incorporation of the Enterprise Governance Topic in an Engineering Management Curriculum

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Abstract

Effective governance practices are essential to the success of both corporate and nonprofit enterprises. Although this topic is taught in some of the graduate business programs across the country, there is a noticeable void in this subject matter in the engineering management curriculum. This paper focuses on the topic of teaching enterprise governance in the engineering management curriculum. The objective is to propose what we believe to be a "first of its kind" model for the development of an engineering management course on enterprise governance. This paper will describe the development of this model along with a discussion of three major areas pertaining to the pedagogy of enterprise governance: Content, Delivery and Materials. We conclude with a discussion on how the proposed model can be adapted to fit the specific needs of an engineering management program.

1.0 Introduction

This paper extends the discussion of an ongoing research project on the study of enterprise governance that was introduced at last year’s ASEE conference in Charlotte, North Carolina. Last year’s presentation generated a lot of interest and positive feedback which encouraged us to present further findings from this work at the 2000 conference. Please refer to the Appendix for a description of this feedback.

Effective governance practices are essential to the success of both corporate and nonprofit enterprises. Engineering managers at all levels of management need to be skilled in successful governance board practices. It is likely that an engineer will chair a board, serve on a board or
provide service to a board at some time during their career. Henry Wiebe, Professor and Chair of Engineering Management at Missouri Rolla, commented that it was never too early to learn this subject. He reported that 11% of those students receiving a bachelors degree in engineering management from 1985-1990 were in the executive management ranks of their companies. In a more longitudinal study, 31% of their undergraduate alumni had reached the ranks of executive management just 20 to 30 years after graduation.

Introducing the concept of enterprise governance and successful board practices will provide engineering managers with valuable knowledge and tools that can benefit them throughout their careers. Jerry Westbrook, Professor and Chair of Industrial Engineering and Engineering Management at the University of Alabama, Huntsville stated that engineering management programs are educating people to be CEO’s of technology driven companies. We typically concentrate on educating these students about subordinates, the global economy and staff groups, but never about Boards. It is the Board to whom the CEO will ultimately report. He believes that it is our professional obligation to educate engineering management students about Boards. This begs the question, where can engineering managers gain knowledge and training about effective enterprise governance? At this point in time, their best opportunity would be to look at the business school course offerings and seminars. Although we have identified the topic of enterprise governance as being important for engineering managers, there is a noticeable void in this subject matter in the engineering management curriculum. Sadly, we know of no formal courses or seminars being taught on the subject of enterprise governance in any engineering management programs. It is believed that the engineering management curriculum is a primary vehicle for educating engineers in effective enterprise governance.

This paper focuses on the topic of teaching enterprise governance in the engineering management curriculum. The objective is to propose what we believe to be a "first of its kind" model for the development of an engineering management course on enterprise governance. This paper contains three sections pertaining to the pedagogy of enterprise governance: Content, Delivery and Materials. The Content section suggests primary topics that should be covered in a course on enterprise governance such as history, types of boards – profit and nonprofit, board structures, critical success factors (e.g., information and communication), and future directions of boards. A suggested course outline will also be presented. The Delivery section provides practical tips for teaching governance issues to engineering managers. A balance between lecture and practical, "hands-on" exercises will be prescribed with an emphasis on active and collaborative teaching methods. The Materials section describes specific in-class exercises and cases that will facilitate effective learning. We conclude with a discussion on how the proposed model can be adapted to fit the specific needs of your engineering management program.

2.0 The Research Project

The development of a course on enterprise governance for an engineering management curriculum has resulted from an ongoing research project at the University of Pittsburgh that investigates critical factors for successful enterprise governance. In this research, we hypothesized that a primary cause of enterprise success or failure is directly related to the quality of its board of governance. In this context, success is defined as the ability of the enterprise to
design and develop strategies which facilitate the accomplishment of key performance standards reflected in the organization’s mission, objectives, and goals – and in the process, provide maximum satisfaction to organizational stakeholders.

This enterprise governance project is being conducted in a cross-disciplinary setting with researchers from the Department of Industrial Engineering and Katz Graduate School of Business. It is being conducted using a systematic approach that can be broken into five phases: (1) Conceptual, (2) Literature Background Development, (3) Project Echo Factor Development, (4) Data Collection and Integration, and (5) Synthesis and Technology Transfer. Development of a course on enterprise governance is one of the deliverables within Phase 5 of the project.

3.0 Course Design

The importance of teaching governance has been recognized by the business schools and is reflected in their curriculum. Upon examining the courses on governance that are being taught in business schools, we find that they can be divided into several different formats including 1) general overview, 2) focused area, 3) separate courses for corporate and nonprofit governance, 4) interdisciplinary course, and 5) module of broader course. A review of the online curriculums of the top fifteen U.S. business schools provided examples for each of the listed course formats.

A general overview course on governance provides an introduction to various aspects of governance including types of boards, roles and responsibilities of directors, and board compensation, composition and evaluation. General overview courses are offered at the graduate schools of business at Harvard University and the University of Chicago. The Anderson School of Management at the University of California at Los Angeles and the Tuck School of Business at Dartmouth College offer more focused courses in governance which cover corporate governance during corporate takeovers and restructuring and governance of conflicts such as bankruptcy and forced downsizing respectively. The Kellogg Graduate School of Management at Northwestern University and the business school at University of Michigan offer separate courses in corporate and nonprofit governance. Each of these courses offers a general overview of its specified area of governance. An example of an interdisciplinary course can be found at Stanford University where they offer a seminar on governance for students in their business and law Schools. Columbia University’s business school teaches governance as a module within several courses including Management of the Socially Responsible Corporation, Strategic Management of the Enterprise, and Financial Management in the Nonprofit Sector.

Unlike the business schools, we are not aware of any courses on governance in any engineering management programs. When developing a governance course for an engineering management program, it is necessary to look at the existing curriculum and needs and skills of its students and their employers. This assessment will help to determine which format should be selected to teach governance within the program. The course that we will be developing and detailing in this paper follows the general overview format. This was based on the best fit into our current curriculum and the needs of our students at the University of Pittsburgh. This proposed course would be developed and taught jointly by faculty from the Department of Industrial Engineering and the Katz Graduate School of Business at the University of Pittsburgh. It will be a 3-credit, graduate-level, semester long course (16 weeks) targeting engineering managers. The course
would be offered as an elective to both engineering and business school students. It would be cross-listed in the curriculum of both departments. Currently there is no such course in either program at the University of Pittsburgh. The student that would be attracted to this course would most likely be a Masters level student, concentrating in engineering management, with several years of prior work experience. Their undergraduate degree would probably be in engineering or some other closely related field. This student would most likely be in a current management position, with aspirations toward reaching an executive level management position. This person may or may not currently serve on a board. As is the policy of the University of Pittsburgh, the course would also be offered to qualified students in other disciplines besides Industrial Engineering and Business such as Public Administration and Law.

Next, we present a model for a course on enterprise governance in an engineering management curriculum. Specifically, we discuss the course content, delivery and materials.

3.1 Content

Primary topics that should be covered in a course on enterprise governance are described next. The course can be broken into three main parts: Background and History, Critical Success Factors, and Future Directions.

In order to set the stage for the study of enterprise governance and in order to provide sufficient motivation to the student, the first four weeks of class should be spent on Background and History. Specific topics would include purpose of boards, functions of boards, evolution of boards, types of boards (profit, nonprofit, for a start-up company, etc.), board structures, board liabilities, legal responsibilities of boards, and the engineering manager’s role with the board.

The next ten weeks of class can be spent on a discussion of the Critical Success Factors for enterprise governance. This discussion, which will constitute the "meat" of the course, will describe what it takes to successfully function as a board. These critical success factors can be broken into five major categories: Board Policies, Communications, Governance Processes, Individual Board Members, and Information. Specific topics that would be discussed in each of these areas is outlined next:

*Board Policies* – selection and removal of members, allowable length of service (term limits), size of the board, the CEO as the Chairman, ethics, shareholder relationships, and social responsibility.

*Communication* – channels (internal and external), and protocol.

*Governance Processes* – use of committees (nominating, compensation, audit, and finance), board meeting structure and procedures, group dynamics, decision making, boards at work - normalcy, crisis management, and evaluation and assessment.
Individual Board Members – participation, commitment, responsibility, accountability, composition (background and diversity), skills (knowledge and experience), and inside vs. outside directors.

Information – type, quantity, quality, relevancy, and timeliness.

The final two weeks of the course would be used to discuss Future Directions of boards, thus bringing the discussion of boards to a "full circle." Specific topics would include global governance, virtual board of directors (e.g., impact of the Internet and World Wide Web), and future trends in governance.

3.2 Delivery

Recall that the proposed course on enterprise governance as described in this paper will be offered to Masters level students, with work experience, concentrating in engineering management. Thus, it will be important to keep a balance between lecture and practical, "hands-on" exercises with an emphasis on active and collaborative teaching methods, and on experiential-based learning. It is presumed that at least some of the students taking the course will be able to share some of their own experience while interfacing with or serving on boards. It will be valuable to use this information to supplement the course. Each class will be comprised of a mixture of lecture, case study analysis, and active learning exercises such as small group problem solving exercises or discussion of current events from the literature.

The course will be co-instructed by a faculty from the Department of Industrial Engineering and from the Katz Graduate School of Business. This should significantly enhance the course delivery as each faculty member will not only bring forth different experience, but also will present the information from a somewhat different perspective. It should be noted that this type of mutual collaboration is somewhat new at an institution such as the University of Pittsburgh, and is a sign of cooperation and the breaking down of "curriculum ownership walls." It is also believed that the students will benefit by working together with students from perhaps slightly different backgrounds than their own.

3.3 Materials

There have been hundreds of books and articles written on enterprise governance just in the last fifteen years. As part of the Literature Background Development phase of the research project at the University of Pittsburgh, the team performed an extensive review of this literature, focusing on the literature published since 1985. The team was surprised to learn that a textbook (with casebook supplement) that would be appropriate for the proposed course on enterprise governance did not exist. Thus, along with developing the course on enterprise governance, the team plans to publish a textbook and casebook for use in the proposed course.

In addition to the readings assigned from the proposed textbook and casebook, students will be required to stay abreast of the current literature published on enterprise governance from the premier journals / magazines / newspapers such as Academy of Management Review, Harvard

As mentioned previously, the course will make extensive use of case study analysis. This will be most pronounced in the second part of the course, i.e., the study of Critical Success Factors. Fortunately, a large number of high quality cases are readily available. Table 1 includes a listing of 18 case studies that have been published in either the Harvard Business School or Stanford Graduate School of Business case study series. These case studies are divided into three of the major categories of critical success factors: Board Policies, Governance Processes and Individual Board Members. Each of these cases also discusses the other two major categories of critical success factors, namely Communication and Information, throughout. This information was therefore not shown explicitly in Table 1.

<table>
<thead>
<tr>
<th>Cases</th>
<th>Critical Success Factors</th>
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<tr>
<td>American Express</td>
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<td>Appalachian Mountain Club</td>
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<td>Benjamin Rosen and Compaq</td>
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<td>CEO Evaluation at Dayton Hudson</td>
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<tr>
<td>The Del Webb Corporation</td>
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<tr>
<td>Eastman Chemical Company</td>
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<td>Empire Blue Cross and Blue Shield</td>
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<tr>
<td>Governance at Metallgesellschaft</td>
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<tr>
<td>The Historical Society of Pennsylvania</td>
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<tr>
<td>Joint Venture: Silicon Valley</td>
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<tr>
<td>Lukens Inc.</td>
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<tr>
<td>Lyondell Petrochemical Company</td>
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<tr>
<td>Managerial Duties and Business Law</td>
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<tr>
<td>Mondrian</td>
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<td>Praxair</td>
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<td>Revco D.S., Inc.</td>
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<td>Time Warner – Paramount</td>
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<td>USX Corporation</td>
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Table 1. Case Studies

In summary, along with the textbook and casebook that the authors will develop specifically for the proposed course on enterprise governance, the literature is rich with existing current articles and case studies on the topic.
4.0 Summary and Conclusions

This paper proposes development of a 3-credit, graduate-level, semester long course on enterprise governance to be taught in an engineering management curriculum. The proposed model is somewhat specific to the University of Pittsburgh, although it can be easily adapted to fit the needs of other programs. For example, if a two-credit course or a quarter long (as opposed to semester long) course is needed, the proposed course can easily be adapted. Possible suggestions would be to concentrate only on corporate boards rather than nonprofit boards. Less time could be spent on the Critical Success Factors part of the course by studying fewer cases. In addition, the Future Directions part of the course could be cut in half if needed. Another idea, might be to adapt this course to undergraduate students. The authors suggest that this approach should be pursued with caution, because there is a concern that many undergraduates will lack the sufficient work experience to make this course relevant and meaningful to them. In conclusion, the proposed course represents a new and exciting area of growth for which engineering management programs should consider adopting.

5.0 Acknowledgement

The research team expresses their deepest appreciation to alumnus Mr. Edwin V. Clarke, Jr. for his generous support of this research.

Bibliography
Appendix - Comments from 1999 ASEE-EMD Presentation

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<thead>
<tr>
<th>Institution</th>
<th>Contact</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Accreditation Board for Engineering and Technology, Inc. (ABET)</td>
<td>Kathryn B. Aberle, Associate Executive Director</td>
<td>• Showed interest in the project.</td>
</tr>
<tr>
<td>George Washington University</td>
<td>Robert C. Waters, D.B.A., Professor of Engineering Management and Department Chair</td>
<td>• Keep nonprofit and profit sample sets separate. • Examine board member selection.</td>
</tr>
<tr>
<td>Kansas State University</td>
<td>Jerome P. Lavelle, Ph.D., Associate Professor Industrial and Manufacturing Systems Engineering</td>
<td>• Showed interest in the project.</td>
</tr>
<tr>
<td>Miami University of Ohio</td>
<td>Karen Schmahl, Ph.D., Assistant Professor of Manufacturing Engineering</td>
<td>• Showed interest in the project, especially with the nonprofit enterprises.</td>
</tr>
<tr>
<td>Stevens Institute of Technology</td>
<td>Donald N. Merino, Ph.D., P.E., Professor of Engineering Management</td>
<td>• Nonprofits must be carefully considered. • Is considering adding this topic to curriculum.</td>
</tr>
<tr>
<td>University of Alabama, Huntsville</td>
<td>Jerry Westbrook, Ph.D., P.E., Professor and Chair of Industrial Engineering and Engineering Management</td>
<td>• Material would also be appropriate for undergraduate engineers. • Important subject, but not really considered. • Engineers could help boards. • Considering adding a module or perhaps a course on this topic.</td>
</tr>
<tr>
<td>University of Alaska Anchorage</td>
<td>Ted G. Eschenbach, Ph.D., P.E., Professor Emeritus Engineering Management</td>
<td>• Interesting project. • Cautions presenting this material to undergraduates. Best suited for graduate students.</td>
</tr>
<tr>
<td>University of Missouri, Rolla</td>
<td>Henry A. Wiebe, Ph.D., Professor and Chair of Engineering Management</td>
<td>• Material would also be appropriate for undergraduate engineers. • Students need to see the big picture. • Survey of undergraduates from Rolla show that 31% have reached top executive positions after 20-30 years after graduation.</td>
</tr>
<tr>
<td>University of Nebraska, Lincoln</td>
<td>Stephanie G. Adams, Ph.D., Assistant Professor Industrial and Management Systems Engineering</td>
<td>• Discussed special needs of nonprofit boards, specifically with the National Society of Black Engineers.</td>
</tr>
<tr>
<td>University of Tennessee Space Institute</td>
<td>Garry D. Coleman, Ph.D., P.E., Assistant Professor of Industrial Engineering</td>
<td>• Showed interest in the project.</td>
</tr>
</tbody>
</table>
KIM LASCOLA NEEDY
Kim LaScola Needy is an Assistant Professor of Industrial Engineering at the University of Pittsburgh and a Wellington C. Carl Faculty Fellow. She received her B.S. and M.S. degrees in Industrial Engineering from the University of Pittsburgh, and her Ph.D. in Industrial Engineering from Wichita State University. She has obtained nine years of industrial experience at PPG Industries and The Boeing Company. Her research interests include Activity Based Costing, TQM, Engineering Management, and Integrated Resource Management. Dr. Needy is a member of ASEE, ASEM, APICS, IEEE, IIE, SME and SWE. She is a licensed P.E. in Kansas.

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David I. Cleland is Professor Emeritus in the School of Engineering at the University of Pittsburgh. He is the author/editor of thirty-one books in the fields of Project Management, Engineering Management and Manufacturing Management. An active member of the Project Management Institute (PMI), he has published numerous articles, handbook chapters, and papers at professional meetings in his field. He has served as a consultant for both national and foreign companies, and is recognized as one of the best known members of PMI. He has been described as the "Father" of Project Management. In 1997, he was honored with the establishment of the "David I. Cleland Excellence in Project Management Literature Award" sponsored by the Project Management Institute.

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Dennis P. Slevin is Professor of Business Administration at the Katz Graduate School of Business, University of Pittsburgh. He received his education in a variety of university settings, starting with a B.A. in Mathematics at St. Vincent College and continuing with a B.S. in Physics at Massachusetts Institute of Technology, an M.S. in Industrial Administration at Carnegie Mellon University, and a Ph.D. in Business Administration at Stanford University in 1969. Dr. Slevin’s research interests focus on entrepreneurship in both large and small strategic business units, strategy, structure, and their impact on organizational effectiveness. He has also done work in the area of project management and keys to successful project implementation. His latest research interest focuses on issues of organizational complexity and the entrepreneurial management of transitions that high growth new ventures must accomplish as they sustain themselves. He has published widely in and is co-editor for a variety of professional journals.

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Heather Nachtmann is currently an industrial engineering Ph.D. candidate at the University of Pittsburgh where she also received her B.S. and M.S. in Industrial Engineering. Her research interests include activity-based costing, fuzzy set theory, engineering valuation and engineering education. She is a student member of AACE International, ASEE, ASEM, IIE, INFORMS and SWE.

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Steven L. Cohen is a graduate student whose main area of interest is in Engineering and Project Management. His background is rich and varied. He spent six years in the United States Navy where he served on board the USS Providence (SSN 719) Los Angeles class submarine as an Engineering Supervisor and Nuclear Reactor Operator. He worked in business for 7-1/2 years as a manager for The Food Gallery Inc. of Pittsburgh, and has been a craftsman and cabinetmaker for twenty years.