

Trends and Lessons Learned in Interdisciplinary and Non-Business Case Method Application

Chi Anyansi-Archibong

North Carolina A&T State University

Andrew J. Czuchry

East Tennessee State University

Claudia S. House

Nashville State Technical Institute

Tony Cicirello

Nashville State Technical Institute

ABSTRACT

This paper has two major objectives. First, results of a survey designed to test the level of development and application of cases in non-business courses such as Sciences, Mathematics, Engineering, Health, and Technology are presented. Findings support the growing popularity of case method of teaching and learning outside the Business School domain. The survey indicates that Education, Engineering, Technology, and Mathematics faculties rank the case method as very useful in teaching their subject matter. This same group is also actively engaged in case development.

However, survey results indicated that case writers in the disciplines cited above experienced several challenges in developing cases and instructor's manuals, and in obtaining support from funding agencies and employers. Implications of the survey results include greater awareness for the impact of case method of learning and the need for faculty development in case writing and teaching.

The second purpose of this paper is to draw upon the experience of two successful programs to identify ways for overcoming some of the challenges noted above. To aid in this process, a framework for establishing win-win partnerships with business, industry and the professional community is suggested. Lessons learned in applying the framework (shown in Figure 1) are also shared.

INTRODUCTION

As educators and the nation seek ways to affect learning and prepare young minds to become more competitive in a global society, the case for the case method as a learning tool continues to gain support. In the past two years Harvard Business School Emeritus Professors have continued to deliver monthly weekend workshops on what is titled "The Art and Craft of Discussion Leadership." This workshop attracts educators from MIT, Rensselaer Polytechnic Institute and many faculty from non-business related disciplines. Funding agencies such as Department of Education (DOE), National Science Foundations (NSF), and Business Foundations have initiated programs and set aside special priority funding for projects that integrate case method/ discussion learning in interdisciplinary course development. Emphasis is on interactive and practical approaches to learning with the capability of the case method to develop and enhance various skills such as analytic, interpersonal, critical thinking and many others. It is not surprising to see a growing interest among educators. This recognition is further endorsed by the international body of the American Assembly of Collegiate Schools of Business (AACSB) which is responsible for accrediting schools of Business programs. The recognition of case research with a blind reviewed Instructor's Manual as an Intellectual Contribution in 1992, has added momentum to application at all levels of education.⁽¹⁾

Motivated by this momentum, the research reported in this paper examined existing information on case method ap-

plication in non-business and interdisciplinary areas. This information covers trends in the past five years and presents information from a survey of non-business educators in and outside the United States of America. A description of projects from funded programs designed to implement the case method in areas such as engineering, technology, communications, and mathematics is also presented.

Results of this study suggest the need for faculty development in case writing and teaching. To be successful in conducting case research, faculty must have access to real world information on current issues and problems that are being taught. Without access to relevant information a case cannot be developed. Often case writers experience a reluctance to provide access to necessary information. In this paper the authors suggest a framework that provides a road map to overcoming this potential barrier. An essential part of this framework is the win-win partnerships that are established between institutions of higher learning and business, industry and the professional community. Lessons learned in applying this framework are shared with the hope of shedding some light on a path that others may choose to follow.

This section of the paper describes the survey and survey results. The purpose of the research was to determine the extent that the case method is used in non-business disciplines, and to identify challenges faced in developing and implementing the resulting programs. Programs designed for universities and colleges, technical colleges, and case activities at Primary and Secondary school levels were investigated.

RESEARCH METHOD

Data for this study was collected through a survey questionnaire. First a pilot study was conducted to test “the differences, if any, in developing teaching cases outside the Business Discipline”. Based upon the pilot study, the questionnaire was refined to identify the trends in developing and teaching cases in non-business disciplines.

The pilot study focused on thirty case writers in the United States. The comprehensive questionnaire was distributed to 150 educators nationally and internationally. The Pilot study survey had 63 percent usable return while the second survey resulted in 49 percent usable returns.

Survey instruments were designed to identify participants discipline, experiences in case development and use, courses taught, levels of courses, challenges in developing cases and instructors manual as well as challenges in teaching with cases.

SURVEY ANALYSIS AND FINDINGS

The pilot study indicated little or no difference between the case method applied in business programs and the case method applied in non-business programs. Seventy-two percent (72 percent) of respondents, who use cases and teach both in the business program and in other disciplines, reported that they have successfully applied the same case in both areas. Forty-seven percent (47 percent) reported the need to adjust available cases which “originally targeted a business course” before it became suitable for their non-business course. The same group indicates minor differences in the cases and a need to develop cases where non-business programs are the target audiences.

Survey results were analyzed in some detail. Exhibit 1 describes the participants’ disciplines and the level of educational institutions where they are currently teaching. Faculty participants by discipline include Business/Economics, Mathematics, Technology, Sciences, Education, Engineering, English, Communication, and Health Education. Over 52 percent of the faculty teach at the uni-

versity level, 25 percent teach at the technical college level, and many who identified “other” include teaching at executive management training, Engineering and Technology programs. Sixty-two (62 percent) percent of the Business/Economic participants were International faculty who teach applied economics or economic development.

Analysis of data in case writing, length of time the faculty has been teaching with cases, and the type of cases written and/or used show a prevalence of decision focused among the Business/Economic, Engineering and Science faculty. (See Exhibit 2). The same group of faculty appears to have longer experience in writing and application of cases in the disciplines (average-4-6 years). Faculty in Education Technology and Engineering develop and/or use applied and scenario cases while the Mathematics faculty lean towards illustrative and scenario cases.

Decision focused cases are those cases written and organized around corporate activities. These cases are very formal with corporate background, strategies, industry, and leaders, well defined and usually have a problem focus. These decision focused cases usually have a comprehensive teaching note as part of the published case. Examples include Harvard and North American Case Research Association (NACRA) cases. Applied and scenario cases are not as comprehensive as decision focused cases. This class of cases is written with a single issue or problem set designed to explain a concept. Formal analysis and identification of issues is not a requirement for a good scenario case. Illustrative cases are often fictional, and are intended to illustrate a specific point. Decision focused and applied cases are most often based on real organization data and often require permission from the supporting organization before the resulting case can be published.

Exhibit 3 presents data relating to the challenges faced by the respective faculty on case writing, teaching, and instructors’ manual development. Business /Economics found teaching with cases most challenging and so did faculty in education, and health. Engineering and technology found it less challenging to gain access to companies or firms willing to partici-

pate in project case studies. The majority of the faculty (85 percent) found it very challenging to conduct interviews and organize data for case development. Most participants outside the Business area found it less challenging to develop and teach with illustrative and scenario cases.

The second purpose of this paper is to draw upon the experience of two successful programs to identify ways for overcoming some of the challenges noted above. The first program has been conducted at the graduate level at East Tennessee State University (ETSU) for the past eight years. Based upon ETSU’s experience, a framework for establishing win-win partnerships with business, industry and the professional community is suggested. By win-win partnerships we mean that everyone in the partnership derives benefits as described below. Lessons learned in applying the framework (shown in Figure 1) are also shared. Hopefully, this framework will help others in gaining access to the information necessary to successfully develop interdisciplinary cases.

The second program is the South East Advanced Technology Education Consortium (SEATEC). Through discussions with presidents and vice-presidents of industry in Tennessee, SEATEC identified common needs for workforce development. In order to be successful, employees must be able to work in teams, possess leadership skills, possess oral and written communications skills, think both critically and independently, and solve problems. SEATEC’s experience suggests that case-based learning and other components of problem-based learning are the key to training tomorrow’s workforce. Important guideposts from the analysis of each of these programs are provided in the discussion below.

The East Tennessee State University (ETSU) Interdisciplinary Partnership Program:

The case method of teaching and learning fills an essential need in ETSU’s interdisciplinary partnership program. Over the past eight years, ETSU has developed several win-win partnerships with business, industry, and the profes-

sional community that have resulted in substantial benefits to the students, the faculty and administration, and the clients. The clients benefit from the outside perspective provided by the students and professors in addressing current real-world problems. Students benefit by working on real problems that require the synthesis of skills that they have acquired and refined during their graduate studies. Faculty benefit by keeping themselves current with issues and challenges faced by business, industry, and the professional community as they deal with the rapid pace of change of technology and globalization. An added benefit is that much of the work can be published to strengthen the faculty member's publication record, and to lay the foundation for improved classroom teaching and learning. This latter point is especially true for junior faculty members and this experience contributes substantially to their growth and development.

This section begins with the background that motivated an interdisciplinary program linking business and technology disciplines to solve current real-world problems. Then a framework is suggested to guide faculty members in establishing partnerships that help to overcome business and industries' reluctance to support case research. Several specific examples are briefly discussed to illustrate the process. These examples span the spectrum from discreet to continuous flow manufacturing and also include telecommunications and health care organizations. To date more than fifty projects have been successfully completed. Finally, lessons learned are briefly summarized to shed some light on a path that others may choose to follow.

Background

Those that hire our graduates tell us that today's workforce must be able to work in teams, communicate well in both written reports and oral presentation, and solve complex business and technical problems in order to contribute to their organization's continued success. Most businesses and industries are striving to maintain a sustainable competitive advantage in the global marketplace. Faced with today's competition, these same organizations can no longer afford expen-

sive training programs for their new hires, and expect to have our graduates hit the track with both feet running. Eight years ago, those that hired our students told us that our students didn't do so well in the areas of teamwork, communications, and problem solving. We were encouraged to overhaul our graduate programs to overcome this shortfall. Our faculty and administration responded by revising our Masters in Business Administration (MBA), our Masters in Technology, and our Masters in Accountancy Programs. Fortunately, we were successful and this success is measured in terms of the positive feedback that we receive from both those that hire our graduates and our graduates who are getting promoted and realizing significant financial rewards. This success has motivated us to revisit our undergraduate curriculum and make similar improvements there as well. We share this experience with the hope that it may prove useful to those facing similar challenges.

An important part of our strengthened MBA, Masters of Technology and Masters of Accountancy Programs has been the students' Strategic Experience. The fundamental purpose of the Strategic Experience is to place the students in the role of consultants to identify and solve the clients' current real-world problems. Faculty members serve in the role of coaches and facilitators and establish the relationships with potential clients. Care is taken to ensure that problems are strategic in nature, and require an integration and synthesis of skills to be solved. Interdisciplinary teams comprised of MBA and Masters of Technology students often have the greatest success. Students tell us that they gain a deeper appreciation and understanding of the benefits of working in cross-functional problem solving teams. This experience pays huge dividends in their future job assignments and careers.

A Framework

During the past two years, we have had the privilege of sharing our experience with the North American Case Research Association (NACRA), the Society for Case Research (SCR), the Southeast Case Research Association (SECRA), and the International Conference on Case Method Research and Ap-

plication. Several of our colleagues at these meetings have indicated that our approach, captured in the framework shown in Figure 1, is particularly helpful. Many of these same colleagues indicated that more complete documentation of the framework would help them in their current situations. Hopefully, this discussion is a step in that direction.

The framework provided in Figure 1 provides a road map for overcoming client reluctance to support case research. The client in this discussion is business, industry, or professional community partners. Often they are reluctant to share essential information because they see no direct benefit. A fundamental theme in the approach suggested here is that the resulting partnership becomes win-win. In other words, the client receives a measurable benefit for participating. As one client told us, "Most case researchers come in and ask us for our time and data. We generally say no! However, you come in and offer to help us solve a current problem. We see this as a substantial benefit and say yes!"

In the context of case research, it is helpful to introduce the concept of a "living" or "dynamic" case. There is no teaching note and the problem is current and pressing for the client. Faculty members serve as coaches and facilitators, and must have the courage to put themselves in this challenging teaching and learning situation. Generally, a faculty team works best. This is especially true when junior faculty members are involved. However, the rewards are well worth the risk because everyone benefits. Junior faculty members often find that the dynamic case method is an excellent way to learn how business functions in the real world. This practical real-world experience helps faculty members improve their classroom teaching and helps students feel that subsequent classes are more alive and relevant.

Prior to assembling the student teams, faculty members establish the initial partnerships with the appropriate business, industry, and/or professional community members. During this stage the faculty members discuss the strategic nature of the student experience and the benefits that all participants will realize. The win-win nature of the partnership is underscored. Projects are defined in terms of

broad parameters with care to ensure that project scope is such that the tasks can be completed in one semester. (We have had success with projects that take longer. However, in these situations, additional care must be taken to ensure smooth transition between student project teams.)

Once a general agreement to partner has been achieved, the project is scheduled for the appropriate semester. Faculty members review student background and strive to match student experience with project requirements. Cross-functional student teams are established when appropriate. For example, students with health care experience are assigned to projects with hospitals and the health professions, students with manufacturing experience are assigned to manufacturing projects and so fourth. However, the greatest benefits accrue when teams have a mix of directly related experience and broad management skills. This is especially true when projects require benchmarking efforts to establish best practices. Often best practices from one industry or profession can be effectively tailored to meet the needs of another, with substantial benefits. In addition, students learn from each other during the strategic experience. Our technology students tell us that they gain a deeper appreciation of business issues and our business students tell us that they recognize the importance of technology in the business arena.

Two other points are important during the dynamic case portion of the framework shown in Figure 1. It is important to have the students negotiate the final scope of the project with the client. This is best done during the first week of the semester and should be documented in a letter of agreement between the university and the client. This letter and the associated agreement helps the students “buy in” to the resulting scope of work and also helps ensure that the client will provide access to the required people and information necessary to solve the strategic problem. It is also recommended that the student team provide a project plan describing the tasks, time frame, and responsibilities for the efforts. This step helps ensure individual student accountability and provides a means for measuring progress throughout the semester. Again the roles of students and faculty members are stressed: students serve as

consultants and work with client team members, faculty serve as coaches. By fully empowering student teams in this manner, a high degree of learning occurs.

The dynamic case portion of the framework ends with a formal presentation and formal report to the client. A mid term presentation is also suggested to ensure that the project is on track and to allow for mid course corrections should they be required. Senior management and faculty members attend both the mid term and final presentations. This is a fundamental step in helping to ensure that recommendations will be implemented and also helps ensure client support for future publication of a full case should we make the collective decision to proceed.

Two outputs result from the dynamic case portion illustrated in the framework. (See Figure 1). First is the problem solution itself. This is of greatest benefit to the client and helps to strengthen the partnership. Many of our clients want to sponsor subsequent student teams. When we first started this program we were concerned about having enough client projects to support our student needs. Now our problem is that we do not have enough students to support all of the projects that our partners would like us to undertake.

Throughout this discussion we refer to a dynamic case as one that is evolving. The student, faculty, client team is jointly solving a current problem that is unfolding throughout the problem solving effort. This in itself is an excellent learning experience, because students experience exactly what they will experience in their job situations after graduation. In addition, it is important to note that at this stage much of the formal research for the classical case has been completed. By classical case we mean the traditional case research conducted with business, industry and the professional community. Using the approach suggested here, faculty members can now select the best projects to complete the full case method with full academic rigor as shown in the bottom half of Figure 1.

For projects with learning outcomes that stress fundamental learning experiences that could be shared with other classes, the full case method is recommended. Building on project results, the full case can be fleshed out and documented. Development of a detailed teach-

ing note is recommended at this point. Then the full case is tested with future classes. It is noted that most often the resulting problem has application in classes in the core curriculum. These make for the best cases, as the Strategic Experience itself derives maximum benefit from the dynamic portion of the process described above. Based upon results of testing the case in other classes, the case and teaching note are further refined and the case is submitted for publication.

It is also worth noting that the applied research with the client does not stop here. We have found that completion of the complete case uncovers other problems that should be investigated in further detail. This often leads to special topics courses for employees and in some instances to paid consulting opportunities for faculty members, and paid internships for students and faculty as well. In addition, further applied research results often lead to publications in business and engineering journals. This latter point suggests that case research is complimentary and synergistic with the more traditionally accepted forms of business research. When viewed in this manner, faculty members are more likely to collaborate rather than compete, when discussing the relative merits of case research and traditional business research. The final step suggested by the framework shown in Figure 1 is to capture the lessons learned and use these to continuously improve the overall process. Results of applying this framework have exceeded our expectations. Some of the projects are now briefly described to further illustrate the process.

Examples

Continuous Flow Manufacturing:

AFG Industries, Incorporated (AFG) is the second largest flat glass manufacturer in North America and is headquartered in Kingsport, Tennessee. AFG has six production plants in the USA and two in Canada. Production is continuous flow in nature, and plants operate 24 hours per day, seven days per week, and 365 days per year. Our partnership with AFG illustrates the progression of projects. Our first graduate student team helped develop a strategic plan that was implemented by senior management. This in

turn led to a second project to design a detailed quality process, including ISO 9000 certification. During this project the need to establish a methodology for evaluating the cost of quality and non-conformance was surfaced. This led to a special topic course for one of our graduate students who also was employed by AFG. The resulting cost of quality project was successfully implemented by AFG management and resulted in substantial measurable bottom line savings. A journal article based upon the cost of quality and non-conformance model developed through this applied research was also one of the favorable outcomes of this partnership.

Discrete Manufacturing:

Siemens Energy and Automation (SEA), Inc. is a division of Siemens Corporation world-wide producers and distributors of electrical and electronic components and systems. The Siemens division in Johnson City, Tennessee, manufactures discrete electronics subsystems used to automate production for the pharmaceutical, food, fine chemical, oil, gas and automotive industries. Since Siemens headquarters are in Munich, Germany, students experience different national cultures (German and American) operating in a global environment.

Initial projects started in 1993 with an effort to capture the strategic quality plan and the ISO 9000 certification process. This early work resulted in a case that has proven successful in our Scheduling for Quality and Project Management class. Since 1993 several Masters in Technology theses have been completed and numerous students have benefited from internships.

Our partnership with Siemens in Johnson City led to a relationship with a similar Siemens manufacturing facility in Karlsruhe, Germany, and an exchange program with the Fachhochschule Karlsruhe. One of our students completed internships in both Siemens plants. This experience could provide the background for a case in education, discussing some of the challenges and opportunities students face when studying in interdisciplinary, international programs.

Currently, we are completing the second phase of a project investigating

change management in this highly competitive, global arena. A cross-functional graduate team comprised of two MBA and two Masters in Technology students is studying best practices to suggest an improved way to manage projects transitioning from design to production. These efforts will provide excellent case material for courses in Project Management and Continuous Quality Improvement.

Telecommunications:

Sprint is a well-known player in the telecommunications industry that is facing new forms of competition. The Sprint-ETSU partnership has followed the framework shown in Figure 1 and has resulted in several benefits for students, faculty, and the company. The purpose of the partnership is to provide students practical real-world experience while simultaneously helping to enhance Sprint's competitiveness and operational effectiveness. In the words of a Sprint executive, "The partnership has sustained success because the students gain significant practical experience that helped convert the classroom theory into practice; and, the partnership has been a "win-win" because Sprint continues to gain from the outside perspectives provided by students and professors. During the past six years, successes and opportunities from the partnership have included not only the graduate students' projects but also summer internships for ETSU students, consulting opportunities, doctoral projects for graduate students, publications, and conference presentations." Since 1994 we have completed the eight projects listed below.

- Rapid Assessment of the Baldrige Customer Focus & Satisfaction Quality Criteria
- Process Improvement Cost of Quality
- Competitive Advantage in a Changing Business Environment
- Marketing Rapid Assessment for Sprint Mid-Atlantic's Western Region
- Benchmarking study of Sprint's Human Resources (HR) Department
- Review of Sprint's Chairman's Quality Award Assessment Process HR Application
- Performance Effectiveness Review

of Sprint's Human Resources Measures

- Research and Review as to how to Improve Sprint's Employee Attitude Results in the Changing Telecommunications Industry

In addition, we have had four graduate internships and two professor consultations. Two case studies, four conference presentations, and two journal articles have resulted. We are currently working on two projects applying the National Baldrige Quality Award Criteria to identify improvement opportunities and enhance competitiveness.

Health Care:

East Tennessee State University has an important health care mission and has established strong ties to hospitals and medical professionals throughout our region. Although our primary ties are through our colleges of medicine, nursing, and public and allied health, several interdisciplinary student projects have been quite successful. Two examples are discussed briefly below.

Watauga Mental Health Center is a private not-for-profit corporation providing a continuum of quality mental health and chemical dependency programs. Watauga employs approximately 300 professionals and staff personnel. Both inpatient (at Woodridge Hospital) and outpatient services are provided. More than 55,000 lives are covered by the services that Watauga provides. Working with the Watauga professional staff, one of our graduate student teams was able to successfully apply process analysis and reengineering principles to improve health care delivery service. Benefits resulting from this project included more timely, and efficient delivery of services while maintaining quality of care as measured by external benchmarks. Results were published in a conference proceedings and formed the basis for a case introducing process analysis to a graduate class in leading empowered problem solving teams.

Johnson City Medical Center is a mid-sized, regional, tertiary care facility licensed for over 400 beds. Annual admissions average over 14,000 resulting in 100,000 inpatient days and more than 115,000 annual outpatient visits. The hospital is a private, not-for-profit, teach-

ing, health care institution assisting area residents in attaining their highest possible level of health. A cross-functional graduate student team worked with the hospital staff to develop an improved strategic quality orientation stressing a customer/patient focus. Using a rapid assessment methodology developed by one of the authors of this paper, the student team was able to identify several improvement opportunities that were subsequently implemented by the hospital's management team. This in turn led to further applied research, a journal article, and the basis for a case that can be used to teach the rapid assessment methodology to our graduate class in leading continuous improvement.

Hopefully, the above examples illustrate that the framework shown in Figure 1 can be applied to establish a broad spectrum of university-business-industry-professional community partnerships. These partnerships and the real world projects that result, provide substantial benefits to all involved. Based upon this experience, lessons learned are briefly summarized to serve as guideposts on a path that others may choose to follow.

Lessons Learned

The framework provided in Figure 1 has proven helpful in building long-term, win-win relationships that help overcome client reluctance to support case research. This section briefly summarizes some of the lessons learned in applying this framework during the past seven years.

Lesson 1: Develop a shared vision.

Although faculty members establish the long-term relationship with clients, it is important to have the students participate with the client in developing a shared vision for the project. This helps to achieve student "buy-in" to the project scope. Project expectations are more likely to be met when students document their understanding in a letter of agreement with the client during the first two weeks of the semester.

Lesson 2: Define client champions and project focal points.

Students must have access to client data and information to successfully complete the project on time. Client champions provide the required internal support to gain access to the required infor-

mation and to arrange for meetings with appropriate employees. A fringe benefit is that the client champion often becomes an advocate for the case research and helps gain client approval for subsequent publications.

Lesson 3: Conduct regular review meetings.

Project review meetings ensure that students realize the desired learning outcomes and that the client organization benefits from the outside perspective provided by the students and professors. Reviews also help to provide mid-course corrections. As a minimum three client-student-faculty meetings are required. The first meeting early in the semester should be designed to achieve consensus on project scope. Project scope is then documented in the letter of agreement. A second review meeting at mid term ensures that the project is on track, that students have appropriate access to the necessary people and information, and that the client is satisfied with progress to date. A final review is held at the end of the semester. Students make both the mid term and final presentations and faculty members act as coaches. Project results are documented in a final report that is reviewed by the faculty for grading purposes, and is then shared with the client.

Lesson 4: Achieve consensus on project findings and recommendations.

Students should be encouraged to achieve consensus on project findings and recommendations with the client's team members. It is best to avoid surprises. During the final presentation, senior management should be involved in the consensus process. Feedback from senior management helps ensure case validity, helps ensure that recommendations will be implemented by the organization, and helps gain support for future case publication.

Lesson 5: Ensure that everyone benefits.

Strive for a win-win approach throughout. Clients benefit because a current real-world problem is solved and a long-term relationship is established with the university. This helps clients recruit and retain high quality graduates and strengthens the clients' ties with the community. Students gain real world

experience and faculty improve their real-world knowledge, enhance their teaching methods, and make additional research contributions.

The SEATEC Project:

The South East Advanced Technology Education Consortium (SEATEC) believes that case-based learning and other components of problem-based learning are the key to training tomorrow's workforce. After many discussions with presidents and vice-presidents of industry in Tennessee, SEATEC found the workforce's desires to be the same no matter which area of telecommunications of engineering they represented. In order to be viable in today's workforce, employees must be able to work in team, possess leadership skills, possess oral and written communications skills, think both critically and independently, and solve problems without step-by-step guidance from management. Based on the 25 case studies already developed by SEATEC faculty through a previous National Science Foundation grant, each SEATEC team developed 1-2 case study models that were comprised of a focus on technology education, critical thinking skills, collaborative and active learning activities, and written and oral presentation components – all of which are presented according to the tenants of problem-based learning.

Overview of the SEATEC Project and its Goals

SEATEC is a collaboration of five two-year colleges in Tennessee. The colleges are Chattanooga State Technical Community College, Jackson State Community College, Nashville State Technical Institute, Pellissippi State Technical Community College, and the State Technical Institute at Memphis. Each of these two-year college teams is enhanced by a four-year university partner, a high school technical preparation program partner, and several business partners. Its work is made possible by a three-year grant from the National Science Foundation's Advanced Technology Education Program.

The long-term vision for the SEATEC consortium of two-year colleges is to provide leadership for the reform of technological education through case-based instructional delivery. SEATEC is building a foundation for this vision by develop-

ing a fundamental understanding of case-based instruction in technological education. Synthesis of the best thinking and practice of experts in the field along with the established structure of the SEATEC interdisciplinary teams and industry partners will lead to the development of real-world model cases. Through development and field testing of these model cases, the impact on students is currently being analyzed and studied. As the implementation of case studies matures through regional and national field testing, the SEATEC model for developing and using case studies in technological education will influence students and teachers on an ever widening scale. An ongoing program of dissemination will inform a national constituency of educators about the development and implementation of a case-based approach to technological education.

The SEATEC vision for the short-term leads to a long-term potential that can help reform technological education through the introduction of fundamentally sound model materials and methods. At conclusion, this project will have in place a body of research-based knowledge about the development and implementation of case studies in technology and the resulting improvements in student learning. Samples and models of materials and case-based implementation techniques will provide a foundation for reform in the development and delivery of successful case-based tools for instruction.

The SEATEC consortium promotes exemplary improvement in technical education through the design of case studies to be implemented in new curricula, instructional materials, and opportunities for faculty and teacher development. The SEATEC Consortium Case Study Development Project is also promoting and developing the use of multidisciplinary teams, which includes collaborating with business and industry. Business and industry partnering provides the means for better communication between higher education and private business for the development of the needs of business and the student by providing real-world application-based learning.

Project Goals

SEATEC is accomplishing its mission of bringing case-based, problem-based learning to technology programs at the

two-year college level by focusing on four goals. Goal 1 is to provide national leadership for the development and implementation of case-based instruction for technological education, Goal 2 is to provide opportunities for continuous and appropriate professional development of participating faculty, Goal 3 is to assess the effectiveness of the case study approach to teaching technology-related material in the classroom, and Goal 4 is to disseminate information nationally related to the SEATEC activities, materials, and results, including outcomes of the use of case studies in field-test settings.

Progress and Accomplishments

To date, SEATEC has made much progress toward accomplishing its goals. We have hosted two national conferences which briefed approximately 225 faculty and school administrators in the use of case-based learning in the classroom and gave participants the opportunity to hear panel discussions from leading national experts in the field of case-based and problem-based learning. SEATEC faculty have presented sessions and delivered workshops at numerous national and international conferences in the past two years and will continue to be a conference presence in year three of the grant. A biannual newsletter is mailed out nationally in April and September each year and is also available on the SEATEC website at www.nsti.tec.tn.us/seatec. We have produced a video on using case studies in the classroom which explains the process and the components of case-based learning. We have recently completed our first issue of *The Journal of SMET Education* which SEATEC co-founded and co-produces with the Drs. P. K. Raju and Chetan Sankar of Auburn University. This is the first journal focused on using case studies in the technologies. A Professional Development Team has been formed by SEATEC faculty which is presenting workshop on the case study method of learning to faculty across the United States and is also developing additional training materials and activities. SEATEC management is currently working with faculty at the Learning Technology Center (LTC) at Vanderbilt University to develop a process and tools for

evaluating case studies based upon field tests, case study content reviews and case study pedagogical reviews; an assessment of progress on the development of the case study models; and an assessment of the effectiveness of the case study approach to teaching technology material in SEATEC classrooms. A national advisory committee has been established to advise and consult with the management team of SEATEC in order to monitor the progress of the goals and objectives of the SEATEC Case Study Model Development Project. The members are: Professor James Camerius (Northern Michigan University), Dr. Robert Hornaday (The University of North Carolina at Charlotte), Dr. Elizabeth Mathias (Hagerstown Community College and the Scans 2000 Center at John's Hopkins University), Dr. P. K. Raju (Auburn University and the Laboratory for Innovative Teaching in Engineering Education), and Dr. Karl Smith (The University of Minnesota).

Business and Industry Partnering

The industry partners currently participating with the SEATEC project include: Touchstone Industries, Purodenso, Oak Ridge National Laboratories, Lockheed Martin, MCI Worldcom, Nortel, Heatcraft, Brach and Brock Confectioneries, Wise, Janey and Associates, and Time Warner Cable. These industry partners represent leaders in the communications field, automotive parts manufacturing, and The Federal Department of Energy. These agencies are given information concerning the SEATEC project and its goals and objectives through both team meetings and business meetings at the participating two-year community colleges. Through these meetings business and industry partners are advised that technicians trained through institutions utilizing curriculum with case studies incorporated into their curriculum will enter the workforce with traditional academic knowledge and real work force experience learned from utilizing industry-based case studies both inside and outside the classroom. The enticement for industry partners has been the possibility to hire graduates who had extensive troubleshooting practice, enhanced critical thinking skills, and the

ability to work collaboratively with other team members.

As an industry partner, they are able to help shape the education of graduates by providing site visits to their companies, internships to faculty and students, information and graphics to be used in case studies about their companies, guests speakers for classes and conferences, feedback on case studies written by a college team, resources to be used in teaching case studies developed by SEATEC, and curricular recommendations.

Faculty Internships

An NSF grant, Tennessee Exemplary Faculty for Advanced Technology Education (TEFATE) used summer faculty internships in industry to provide faculty with the ability to re-enter the classroom with work-based experiences to use to motivate and energize their students. Establishing, implementing, and assessing faculty internships in the TEFATE project yielded many lessons. TEFATE faculty served in various internships at sites including Nortel, Oak Ridge National Laboratories, Smith and Nephew, Lockheed Martin and MCI and performed a variety of tasks for the host industries including training, establishing Intranets, installing cabling, conducting marketing studies, network administration, and designing networks. Through these internships, we were able to identify the challenges faced in conducting an internship program, as well as techniques that were successful in developing and managing internship activities.

The philosophy driving faculty internships, regardless of the type of business or activity, is based in the belief that the best curricula are developed in an environment where the faculty have

- participated directly in that business,
- utilized the business's cutting-edge technology, and
- applied this knowledge with the highest possible academic standards.

We believe that these experiences for faculty will result in increasing energy and motivation in students taught by these faculty; our beliefs were supported by students' evaluations of these faculty and their courses.

TEFATE's [Guidebook for Developing Faculty Internships](#) reflects the guidelines for conducting faculty internships in busi-

ness and industry that emerged from the 24 internships that were carried out during the two-year TEFATE project. This document is currently available at the SEATEC website.

Website

Additional information about the South East Advanced Technological Education Consortium and its programs and case studies may be obtained directly from the SEATEC website at www.nsti.tec.tn.us/seatec. Please visit this site and subscribe to our mailing list to get the most current updates on our project.

LIMITATIONS, CONCLUSIONS AND IMPLICATIONS

Two objectives were addressed in this paper. First, results of a survey designed to test the level of development and application of cases in non-business courses such as Sciences, Mathematics, Engineering, Health, and Technology were presented. Secondly, the experience of two successful programs was analyzed to identify ways for overcoming some of the challenges found in the analysis of responses to the survey. To aid in this process, a framework for establishing win-win partnerships with business, industry and the professional community was suggested. Lessons learned in applying the framework (shown in Figure 1) are also briefly discussed.

Limitations

With regard to the survey, the sample is very small and therefore findings cannot be easily generalized, especially with regard to the challenges for case development and teaching. The analysis method could be improved to clearly identify participants in interdisciplinary areas as well as those with proven experience in case writing.

Conclusions

Findings support the growing popularity of case method of teaching and learning outside the Business School domain. However the faculty in these non-business disciplines appear to experience more challenges in case writing as well as in Instructors' Manual development. The need to develop these skills are

critical since past studies (1) have shown that excellence in case application is enhanced with the faculty ability to work with the data. In addition to the above, faculty (33 percent) who wrote in their survey expressed interest in learning to develop their own cases. Faculty in Business/Economics, English and Communication reported challenges in teaching with cases. Explanatory data identified the complexities of the environment and topics as reasons for this challenge. Although most of the survey participants identified themselves as faculty at the university level, there are enough data to support application of case method at the technical, community two-year colleges, and even high schools. Employers seek, desire and support the skills developed through the case method. In spite of the fact that many participants found it difficult to develop cases, they still support the concept that the case method is a very effective teaching and learning tool.

Copies of the survey instrument can be obtained from the first author.

Implications and Future Studies

Results of the survey and summary of special programs call for expansion and continuous improvement among case research organizations. Tracks for Case workshops should be expanded to include education, communication, technology, engineering and other non-business related areas. There is a need for schools to encourage and support faculty development in Case development and teaching skills.

Further studies are needed to determine the impact and specific needs of case developers and teachers. Funding opportunities for programs such as SEATEC, LITEE and Partnerships at ETSU should be studied and possibly replicated to broaden opportunity for faculty development. Current study should be expanded to include more participants and diverse disciplines. Meanwhile, a study of existing case clearing houses should be made to determine the availability, if any of cases in non-business disciplines.

¹ Published case research consists of the case itself and a separate Instructor's Manual or Teaching note.

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ABOUT THE AUTHORS

Andy Czuchry – Professor of Management, College of Business; Professor of Technology, College of Applied Science and Technology; and Chairholder of the AFG Industries Chair of Excellence in Business and Technology, at

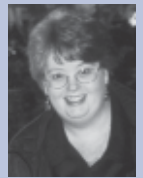


East Tennessee State University in Johnson City. Andy received his Ph.D. in Engineering, as well as his B.S.E.E. and M.S.A.E. from the University of Connecticut. He has helped develop additional graduate programs at ETSU in Innovative Entrepreneurship, Project Management, Continuous Improvement, and Computer Integrated Manufacturing. Prior to joining the faculty of ETSU, Andy was President of IRISS, a joint venture between Raytheon and General Dynamics, and has more than twenty years of experience as a professional manager in the electronics industry. He has been a member of the Panel of Judges for the statewide Tennessee Quality Award program since 1992 and has served as a member of the Global Competitiveness Council since 1995. Andy has also served as a resource for business, industry and the professional community to facilitate implementation of team building, new product development, project management, and continuous improvement programs. His record includes a number of publications in his field.

Tony Cicirello is a retired Naval Officer certified in the operation and maintenance of Nuclear Propulsion Systems, Communication, Radar, Navigation, Sonar, and Computer Systems. He is an experienced educator with 10 years experience in Higher Education in Business and Computer Information Systems. Currently he teaches computer networking and holds certifications as a Novell Instructor (CNI) and network engineer (CNE). He is a skilled presenter in the areas of problem analysis, critical thinking, evaluation, innovation in education methods, non-traditional education, business data communications. He is experienced in network design, operation and maintenance.



Claudia House is currently the Co-lead Principal Investigator of the SEATEC grant and is an Assistant Professor in the English Department at Nashville State Technical Institute. She has been teaching for 12 years and has experience at both the secondary and post secondary levels. She is a certified DACUM facilitator and has worked with industry on numerous occasions in both training and curriculum development capacities. She has presented numerous conference and workshop sessions, both nationally and internationally, in the areas of case study usage and development, problem-based learning, collaborative and active learning, faculty internships and critical thinking. She holds both a BA and an MA from Middle Tennessee State University.



Chi Anyansi Archibong received her Ph.D. and MBA from the University of Kansas. She is the author of four research and business casebooks, over 76 journal and proceedings articles, and eleven grant reports. She has appeared as an invited speaker in several national and international conferences. She has served as the President of the North American Case Research Association (NACRA), a 450 member international organization. She was the President and founder of the South East Case Research Association (SECRA) and the program chair for several international and national professional organizations. She is currently listed in the 2000 notable American Women, in the 1995 Who is Who World Wide, 1996 Sterling Who is Who, and 1995 Harvard Directory of Who is Who in International Management Research. She is a 1995 Nissan Fellow, a Samuel Walton Fellow for Free Enterprise Education, a National Director for SIFE Global, and the faculty director for the University of Michigan - Center for International Business.



**EXHIBIT 1
FINDINGS
PARTICIPANTS BACKGROUND**

Faculty Discipline	Number of Faculty	Level of Teaching
Business/Economics	11	U,O
Math	9	U,C,O
Technology	11	U,C,O
Science	5	U,O
Education	16	U
Engineering	13	U,O
English	3	C
Health	2	U
Communications	4	C,O

U = University
 C = Community College
 *O = Other
 * Most of the other area for management training technology, engineering and business/economics are top 3 in the area.
 ** 52 percent taught in/at university level.

**EXHIBIT 2
DISCIPLINE, NUMBER OF CASES WRITTEN AND
YEARS OF TEACHING WITH CASES**

Discipline	Average Number of Cases	Average Number of Years	Type of Case
Business/Economics	4	6	D
Math	2	3	I,S
Technology	3	3	A
Science	0	2	D
Education	4	5	A,S
Engineering	5	6	A,D
English	2	1	S
Health	2	4	D,A
Communications	2	1	D,A

Decision Focus Case = D; Illustrative = I
 Application = A; Scenario = S

**EXHIBIT 3
INSTRUCTORS' NOTE (IN)
CASE WRITING AND TEACHING CHALLENGES***

Participants	Case Writing Challenge	IN Challenge	Teaching Challenge
Business/Economics	4	2	1
Math	2	1	3
Technology	2	1	3
Science	2	1	3
Education	3	2	2
Engineering	2	2	2
English	1	1	1
Health	1	2	2
Communications	1	2	1

*Average level of challenge

KEY:
 1 = Very Strong Challenge
 2 = Strong Challenge
 3 = Slight Challenge
 4 = No Challenge

Instructor's Note and/or Teacher's Manual are the second portion of the case research documented to help the instructor using the case in a classroom setting.

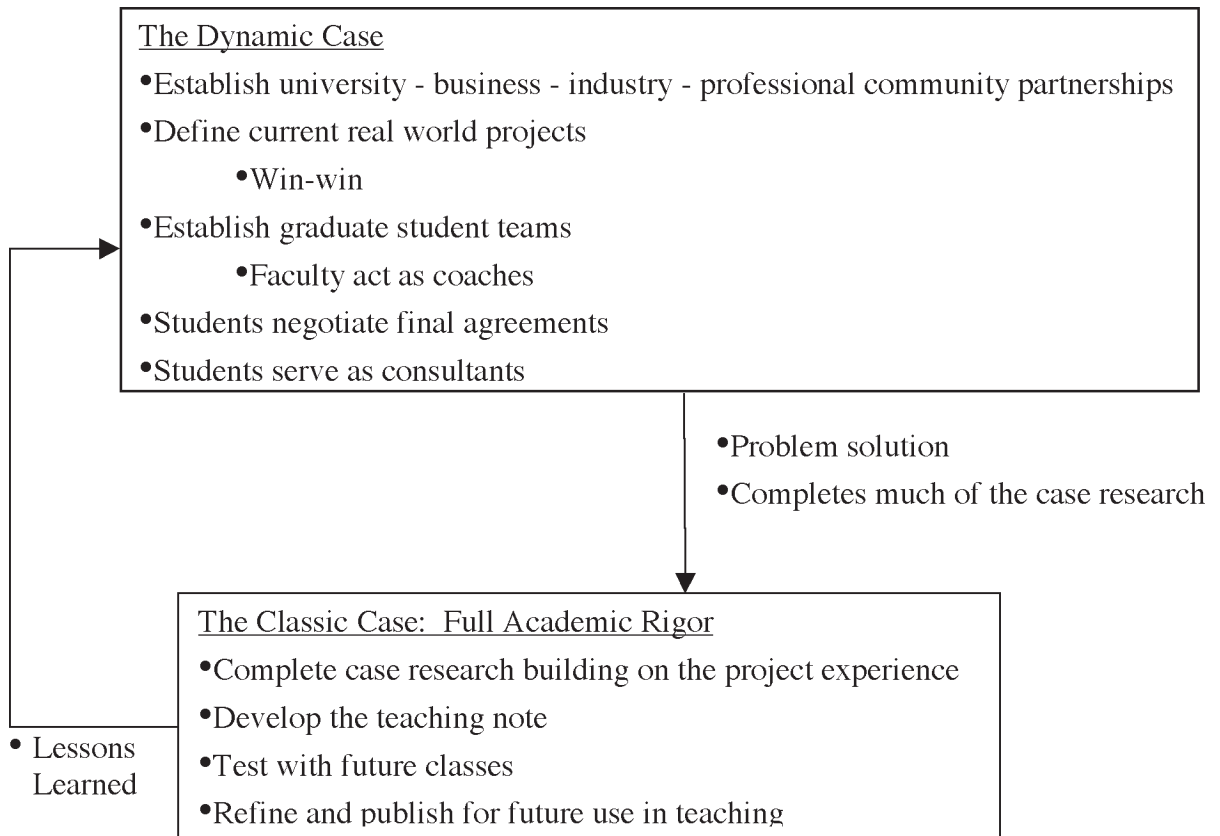


FIGURE 1. Overcoming Client Reluctance To Support Case Research: A Framework For Implementation