

ENHANCING INTERDISCIPLINARY ENGINEERING AND MARKETING SKILLS

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INTRODUCTION

Students of today's universities are moving into a work force where a long-term relationship with only one company is not the primary objective as it has been for past generations. Today's graduate is more likely to have several employers as well as several position changes. In most professions, moving on to a new company is an essential part of moving upward and self-employment and entrepreneurial career moves are also more common.

Along with the job mobility that students must be prepared for, a critical dynamic in business and manufacturing is the ability to get products to market quickly. The importance of this trend is reflected in a quote from Merle Leslie¹ of Anderson Corporation, a leading window manufacturer: "If we could save seven months on our time to market, we could drop millions of dollars a year to the bottom line." Often referred to as simultaneous engineering, this approach brings people within a company from different departments or divisions together in "product teams" to concurrently market, develop and design products and product improvements.

As a recent *Fortune*² article put it -- "In the new game people float from project to project, from team to team. Job definitions become blurred, titles become almost meaningless. What matters is what you know, how well you apply it to the business... and how much you get paid." Simultaneous engineering means company employees are valued increasingly for their ability to provide a wider range of functions.

At the same time, much of the specialized work is being outsourced or subcontracted. Thus, many of today's graduates will be self-employed or in small consulting companies that offer their services. As subcontractors and consultants, the technical person needs to be able to market their services and expertise while marketing consultants will need to be able to adapt and embrace the technical aspects of new products quickly and comfortably.

Faculty in marketing and bio-resource engineering at the University of Maine came together to better equip their students to deal with this need for team working skills and

diverse knowledge and experience. Two separate courses with nothing in common were modified to provide an interdisciplinary teamwork experience for students. Instructors added to each course a component where the marketing and engineering students work together on development of a product marketing plan.

The students are part of an interdisciplinary team to gain the perspective of another discipline, to work in a team atmosphere that is relatively unstructured and to experience the synergy that comes from bringing diverse viewpoints to a central theme. With the new interdisciplinary team marketing study, marketing students develop a marketing plan for a product, process or service that is being designed, prototyped and tested by engineering students. They get to experience, first hand, how designs evolve and change, and how they must deal with product development as they look at marketing possibilities. The engineering students, on the other hand, see their project from the perspective of marketers.

BACKGROUND

The Two Courses

The purpose of the Bio-Resource Capstone Design course is to give the senior student a supervised design experience which will require the student to select and design components and systems. Students are expected to utilize concepts and skills attained in virtually all of the courses contained in their curricula during the process of designing a solution and presenting their solution. As many projects as possible are chosen from industrial connections that give the student the constraints of time deadlines, environmental and regulatory constraints and budgetary limitations. The student is evaluated upon the complexity and quality of the final solution as well as ability to communicate designs.

The Marketing Research course encompasses the study of analytic procedures (e.g. quantitative and qualitative research methods) needed by marketing management to reduce decision-making uncertainties. The course is designed to emphasize a hands-on approach to marketing research. The course includes problem formulation, exploratory research, research design, basic observational and sampling requirements, data analysis, interpretation and sampling. The course objective is to learn about marketing research at a variety of levels, from mastery of basic concepts and terminology, to application of marketing research techniques through projects and computer assignments. Emphasis is placed on written and oral communication and the development of skills involved in formal and informal participation. Introductory courses in marketing and basic statistics are required of the student enrolling in marketing research. The course is generally taken by students at the senior level.

Development of the Collaboration

The initial idea for the marketing-engineering faculty collaboration came from

conversations of a bio-resource engineering faculty member with an engineering project manager³ from John Deere Company a few years ago. He related an experience of a new engine design team at John Deere Company where design engineers were placed on a design team with marketing, sales and manufacturing staff. From the knowledge of what was taking place in industry, faculty from bio-resource engineering and marketing decided they wanted to create a similar team experience for students. The first attempt at a joint project came in the Fall of 1995 and is continuing at this time with two semesters of experience behind completed.

OBJECTIVES OF THE COLLABORATIVE PROJECT

The learning objectives for all the students involved are

- 1) develop teamwork skills
- 2) deal with and understand people from a different background and experience
- 3) develop "ownership" of the design by marketers and of the marketing of the product by engineers
- 4) deal with the ambiguity inherent in developing and marketing a new product or service including the need to devise a systematic approach to the process.

Students are usually exposed to others from different disciplines in courses during their first two collegiate years, but as students matriculate into their respective programs interaction with students (in the classroom) outside their particular curriculum becomes limited. Juniors and seniors spend most of their time developing expertise in their own discipline, so that they typically become more isolated from other disciplines in their last undergraduate years. They do not generally have the opportunity to use their newly developed expertise in an interdisciplinary forum. A purpose of this collaboration is to evaluate student perception of other students and their programs of study and to see whether this project changes their perceptions. It is also important for the students as they will be dealing with diversity in the workplace.

METHODOLOGY

The interdisciplinary teams use the engineering students' design project as the product for the marketing students' feasibility study. The engineering students provide technical information to the marketers, and the marketing students provide the engineer with ideas to improve the marketability of their design and with marketing strategies for the finished product. The information provided to the engineers includes definition of the target market and initial specifications of the marketing mix.

The first year, the marketing students were randomly assigned into groups of five persons for the marketing component of each team. The engineering students were broken down according to project design teams. Because most engineering students choose an individual design project, there was one engineering student randomly assigned to each marketing group. The second year of the project, group assignments were more

structured for the purpose of research information, but the research is ongoing at this time and beyond the scope of this discussion.

Teamwork activities were dealt with differently in the first year than in the second year. There were no joint class meetings for the marketing and engineering students during the first year. The marketing students received various handouts about working in groups, team building and documenting meetings. These subjects were covered in a lecture format by the marketing professor. The marketing professor also met with the engineering students, provided a lecture on basic marketing concepts and informed them of their team assignments. Meanwhile, the engineering students in the first year took part in team-building exercises as part of their senior seminar class. These exercises were performed in class and as such were teams of engineering and technology students.

In the second year, four scheduled joint sessions of engineering and marketing students were held. These sessions were primarily designed to facilitate team interaction and conduct team building activities. Activities in these sessions consisted of handouts and assignments covering group dynamics, team building and recording meetings. In one of these classes the teams were given an exercise on defining and outlining their plan of action to fulfill the requirements for their feasibility study. The joint class meetings were held in an interactive workshop format where student teams could consult with both engineering and marketing professors. In both years, engineering and marketing faculty informally interacted with the students involved to see how the engineering-marketing teams were progressing and to see if there were any major issues that needed to be addressed.

The marketing students were required to keep a meeting journal to record the group's progress toward completing the project. There were three purposes to the journal: 1) to encourage more frequent group meetings, 2) to provide a focus for each meeting and 3) to create a shared terminology dictionary of words frequently used in each discipline but not shared across disciplines. Additionally, the marketing students created a written report and oral presentation of their feasibility study that was the culmination of the joint project.

RESULTS AND DISCUSSIONS

Concerning the development of teamwork skills by students, the growth in team skills was better during the second year. The first year, due to course structure, team building exercises were held in isolation of the team project work. This did not yield consistent response from engineering students concerning the joint project. Some engineering students observed that the engineering class team building exercises carried over into the engineering-marketing team meeting. However, there was evidence to the contrary of serious breakdown in group functioning that was not willingly shared with instructors. In the first year, the engineers did not participate in the oral presentations or the written report. The lack of participation of the engineering students in the marketing study this

first year was likely a repercussion of poor team dynamics.

Conducting team building exercises jointly with the engineering and marketing students together in their project teams was a key difference in the second year. This time serious problems in group dynamics were addressed by the students earlier in the process, and the solutions were generally more functional and did not lead to any isolation of members from the group. Students generally reported satisfaction with the outcome of the experience, and generally enjoyed interacting with each other. Most engineers spoke during the oral presentation of their team and collaborated on the written reports as well indicating that the teams formed stronger working relationships for the most part in the second year.

The second objective of understanding people from different backgrounds was also more successfully achieved in the second year although in both years there was some appreciation of the benefits of a different viewpoint. The students really seemed to grow and to value the opportunity to interact with someone outside their own discipline. They seemed to learn a great deal not only about another discipline's perspective, but about the limitations of their own perspective. The contrasts highlighted through ongoing communication with someone who did not speak their professional "language" seems in many cases to have helped students clarify their own assumptions, terminology, and theoretical perspectives and to see how these could be broadened by appeal to another perspective. This process was at times frustrating and potentially annoying for some of the students, and one of the ongoing tasks for this course is to find ways to alleviate the frustration and help the students to appreciate one another's talents and contributions earlier in the process, rather than at the end or even, potentially, sometime later in their careers.

In the earliest stages of the process, the first year, the engineering students were hesitant to allow others to observe and comment on their designs. However, after they had participated in the teamwork, there were some marked changes made to their projects. Describing their design concepts to their marketing group turned out to be helpful to the engineers in the development of their ideas and projects. Sometimes the insight was just a better understanding of their own ideas, but also most of them had not previously thought of their design in terms of its acceptability in the marketplace. For some the teamwork experience changed the whole emphasis that they had previously had for their project, while for some they realized errors in their project plan or design that they needed to redirect or redesign.

The sense of ownership was greatly enhanced by inclusion of class time for interdisciplinary meetings in the second year, but this is still a problematic area for this project. Part of the problem is a difference in the awarding of grades between the two classes involved in the joint collaboration. The marketing students have been graded on their participation and outcomes, with a significant proportion of their semester grade attributable to their performance on this project. This has not been the case with the

engineering students thus far. It was originally thought that the fact that the engineers were designing the project would be enough of an incentive for them to welcome some marketing input as well, but some engineering students view the marketing work as more of a drain on their time and not contributing much benefit. Therefore, in order to encourage greater ownership of the marketing side on the part of the engineers, future iterations of the project will include a portion of the engineers' grade that will be determined by their participation in the joint project.

The most discomfiting aspect of this project for the students is still the ambiguity of the way the project is designed. In the first year, marketing students were given more direction about what the final product of their efforts (the feasibility study) should look like. In the second year, they were not given much direction at all, and were forced to work with the engineers to define the scope of the project and to try to determine what information would be helpful to the engineers. Both the marketing students and the engineers experienced a great deal of stress over their attempts to define the scope of the project. However, the ambiguity of the process models reality much better than an extremely well-defined project would. In the future, one area to improve will be the support offered to students working through the definition process, both in terms of structuring the *process* more and in terms of providing feedback on their plans and outlines once they are formulated.

SUMMARY

The project has evolved away from instructor-centered tools such as crossover lectures and defined requirements to more student-centered tools like joint workshops and planning tools. The benefits to students make it apparent that the collaborative project of creating interdisciplinary teams is a valuable experience for them although course work methodology is developing and still in flux. Many of the difficulties experienced within the engineering-marketing student teams and with the instructors of the two disciplines working together reflect similar difficulties experienced in industry. As the instructors problem-solve amongst themselves and with their students, both groups will develop skills for working with others, broaden their perspectives and expedite the process of getting products to market faster and more effectively. The students will be better prepared for their future, and the instructors will continue to improve the opportunities and experiences of their students.

REFERENCES

1. Advertisement for Computervisions Electronic Product Definition Software in *Machine Design*. 1996. 28(21):43.
2. Fisher, Anne. 1997. "Six Ways to Supercharge Your Career," *Fortune*, January 13, pp. 46-48.
3. Ruff, Jim. 1990. John Deere Company. Personal communications.