

## **AC 2009-1732: MARKET SIMULATION PROGRAMMING AS A CULMINATING EXPERIENCE FOR STUDENTS INTERESTED IN ENTREPRENEURSHIP AND PURSUING AN M.S. IN ENGINEERING TECHNOLOGY**

### **W. Andrew Clark, East Tennessee State University**

W. ANDREW CLARK is an Associate Professor of Entrepreneurship at East Tennessee State University. His areas of interest and research pertain to commercialization of products in entrepreneurial and intrapreneurial organizations, innovation and nutritional biochemistry. He received his Ph.D. in Nutrition from North Carolina State University and spent 18 years in various management positions within Eastman Chemical Company.

### **Craig A. Turner, East Tennessee State University**

CRAIG A. TURNER is an Associate Professor of Strategic Management at East Tennessee State University. His areas of interest and research pertain to the effects of risk on decision-making and contextual determinants of entrepreneurial success and failure. He received his Ph.D. in Strategic Management from the University of Tennessee at Knoxville in 1999. His previous experience included 11 years at various positions involving financial and risk management in the citrus processing industry.

## Utilizing Market Simulation Programming as a Culminating Experience for Students Interested in Entrepreneurship and Pursuing a Master of Science in Engineering Technology.

### **Abstract:**

Many of our students enrolled in our Master of Science in Technology program have expressed an interest in learning about entrepreneurship and the development and management of a technology driven company. Students interested in entrepreneurship can pursue a 12 credit concentration that includes classes in developing a cohesive marketing and technology strategy, comparing and contrasting technology strategies for companies within the same market niche, developing an entrepreneurial business plan and coursework in either small business management or entrepreneurial finance. One critical component of this concentration is the utilization of the Marketplace™ Venture Capital simulation game to provide students with real world management experience in running a technology driven company. Teams of students playing roles as CEO, Marketing Manager, Manufacturing Manager, Financial Manager and R and D Manager develop the technology and marketing strategies for their companies as they compete against each other in a global environment. After four quarters of operation, students are required to prepare and deliver a 15 minute presentation to venture capitalists detailing their marketing and technology strategies, performance to date and expectations in the market for the remaining two quarters in the game simulation. They are competing against the other teams for the venture capitalist's money and must not only have a good presentation but also demonstrate conceptual understanding of what the financial and market data means. The roles of the venture capitalists are played by retired professionals in the community that have run businesses with revenues exceeding \$50 M/year, have started new technology based ventures or have managed researchers in a commercial environment. We instruct the venture capitalists to play the role as tough managers who require data and not fluff before they part with their precious venture capital financing. VC and Technology business managers must negotiate on the purchase price for shares of their company with lesser performing companies giving up a greater share of their company in the negotiation. Students utilize techniques presented in the first two classes in their curriculum (**Investigations in Technology** and **Strategic Management of Technology and Innovation**) to develop their marketing and technology strategies. The students appreciate the fact that they are able to take risks and make mistakes in a simulation environment where financial disasters are made with fake money. After utilizing this simulation program for three years, we have found that non-traditional students who have been working in an engineering field typically perform better than the traditional graduate students who are entering their graduate program immediately after receiving their bachelor's degree. Our experience is that all engineering technology students (regardless of when they enter the program) are weak in their comfort and understanding of financial data and that this is a weakness that we need to correct in both the undergraduate and graduate programs.

### **Introduction:**

Students enrolled in our Master of Science degree in technology come from two distinct populations; about one-third are entering graduate school immediately after graduating

from their bachelor's degree program while the other two-thirds are non-traditional graduate students who are working on their master's degree while performing full-time employment in a technical field, many working in National Laboratories. Both student populations understand that in addition to understanding the technical concepts and practices of their chosen field they also need to have an appreciation for management practices applicable to technical careers and the capability to understand financial statements from an on-going business enterprise. In order to fulfill this desire, in our program we are encouraging most students to enroll in our graduate class, "Strategic Management of Technology and Innovation" where they will learn how to develop a marketing and technology strategy and participate in starting up and running a technology based company through the use of a marketing simulation program entitled *The Web Marketplace* offered by Innovative Learning Solutions, Inc., Knoxville, TN. In addition to the simulation program, students attend lectures regarding strategy development (both technology and marketing) supplemented with readings from the text: *Strategic Management of Technological Innovation*, M.A. Schilling, McGraw-Hill Irwin.

### **Relevant literature and software selection:**

Corbett<sup>1</sup> in his recent article on experiential learning referenced Kolb's Model of Experiential Learning and stated that "Experiential learning theory (ELT) tells us that the acquisition and transformation experience is central to the learning process. ELT is an integrative perspective that combines the constructs of previous knowledge, perception, cognition, and experience. As such, it provides us the opportunity to uncover why some individuals acquire and transform information in different manners, how they combine it with existing knowledge stocks, and why these behaviors result in different opportunity recognition and exploitation abilities." Li et al<sup>2</sup> used Innovative Learning Solutions, Inc, *The Web Marketplace*, as an integral part of their MBA Marketing Curriculum and observed that "the current generation of business students, growing up in a social environment that is progressively interactive and communication intensive, expects a more stimulating educational experience to maintain interest, concentration level, and motivation.". Their experience with the marketing simulation program parallels our experience in that the students, regardless of their age, love the dynamics of taking a company from the creation of a global industry inception through a growth phase while managing numerous aspects of the business (product development, marketing strategies, advertising and promotion, sales and research and development) and in competing against other student teams. Cadotte<sup>3</sup>, the creator of *The Web Marketplace*, stated that technology-based business simulations offer students the opportunity to practice important business skills including:

- a) Strategic Planning and Thinking.
- b) Strategy Management
- c) Leadership, Teamwork and Interpersonal skills
- d) Budgeting and Cash-Flow Management
- e) Understanding and Delivery of Customer Value

Our decision to use *The Web Marketplace* as part of our course was three-fold. First, Innovative Learning Solutions, Inc., provides training in the use of the software in a classroom setting at their corporate location and you utilize the experiential process by "learning by doing" in a classroom setting with other trainees. Secondly, their simulation

forces the students to appreciate a cross-functional understanding of how communication between the various processes within the company (marketing, finance, research and development, manufacturing, etc.) is critical to running a successful technology-based business and finally, the software received a favorable review in a recent issue of the Journal of the Academy of Marketing Science by Shapiro and McCougan<sup>4</sup>.

### **Class Initiation and Team Selection:**

During the sixteen week semester, students receive lectures for the first four weeks of the semester pertaining to the industry dynamics of technological innovation. Since our class is primarily delivered to nontraditional students, we hold class once per week (3 hours) starting the class after 4:00 PM (typically 7:00 to 10:00 PM). We have delivered this class to a remote location served by ITV for the second class generation and have offered (third class generation) through a portal where students can participate from their home computer rather than coming to a central campus location. The capability of offering the course to home computers rather than classrooms is critical to serving today's non-traditional graduate student who is currently in a full-time position, allows us to expand our reach to service more students in our region and is more cost effective than a central remote location. The lectures for the first four weeks of the semester provides the students the basis to understand how market forces help shape how their product will be adopted in the marketplace, the technology S-curve adoption pattern, the importance of protecting your intellectual property and understanding the dynamics of standards battle and the concept of dominant design. During this first month of the semester, the students have a chance to get to know each other and understand the strengths and weaknesses of the other students in the class. It is at this point that we form student teams that will eventually compete against each other in the market simulation. In order to form teams that are based on student competencies rather than established friendships, we have each student describe their background and in what corporate responsibility they feel they have the greatest competency (Financial, Marketing, Management, Research and Development, Manufacturing, Sales and Advertising). Students who are interested in serving as a company CEO place their name into contention for leading a team. It is interesting that in the three times that we have taught this class, the number of students wanting to head up the management team very closely matches the number of positions open (total team number). We find that teams of five to six students provide each student with the opportunity to focus on one aspect of the company (just like in real life) and bring their opinions and expertise to the team meetings where company decisions are made. Team selections are then made using a "kick-ball" selection criterion, with the newly named CEO's rotating turns and selecting team members based on their self-described expertise. This method of team selection still allows the CEO's to pick some students that they know they already can work with but also provides them with an opportunity to practice their management skills when the team does not work as efficiently as they originally planned.

### **Learning Objectives:**

The majority of our students entering our Master of Science in Technology degree program have undergraduate degrees in Engineering Technology, Computer Science, Digital Media, Construction, Surveying or Interior Design. Even though there is a

diverse mix of undergraduate disciplines an underlying similarity is the students' lack of business practices and concepts. We have designed our core classes to provide our students with a familiarity with these concepts in addition to developing sound research methods. Upon completion of this course students will

- Understand the value of strategic planning and thinking
- Develop an understanding of the dynamics of competition, including the creation of impediments to new entry<sup>5</sup>, and establishment of constrained rivalry as sources of sustainable competitive advantage.
- Utilize competitor analysis skills to determine opportunities for creating a competitive advantage
- Value the need for communication between corporate functions to create synergies
- Bring about a better understanding of decision making under uncertain conditions
- How competitive positioning differs and strategies must shift during transitions of the industry life cycle
- Understand the need to effectively work as a team and to delegate responsibilities
- Determine buyer purchase criteria and the need to create and deliver customer value
- Have a basic understanding of financial statements and cash flows
- Prepare an effective presentation to influence capital sources to invest in your company

#### **The First Three Simulated Quarters of Business:**

The market simulation program is designed such that students ease into the program with increasing decision making complexity being added each subsequent quarter. In the first quarter the students are required to organize their business (naming the company, assigning organizational responsibilities and establishing team norms), establish a strategic direction (analyze provided market information, develop corporate and functional strategies and consider the available capital (\$2M initial starting capital for each team)), and finally make tactical decisions related to manufacturing (fixed plant capacity), product design (design two brands for market segments) and open up sales channels. As an instructor of the class, you find that as you enter quarter two you move rapidly from a traditional professor/student relationship to a consultant/client relationship where you direct students to find opportunities through evaluation and analysis of competitor and market data. In quarter two, the student companies enter a test market where they are required to set selling prices, create advertising campaigns and develop sales channels (hire salesmen and consider new sales outlets). The teams also schedule production of their products (computers (desktop, laptop, high-end engineering)), check pro forma financial statements and consider the purchase of market research on customers and competitors. In quarter three, teams must conduct a strategic analysis of the results from the test market. They evaluate the customer reaction to the brands, prices and advertising that they had created in quarter two, check their financial performance and production operations and evaluate their competitors strategic direction, tactics and the market response to their marketing and product selection strategies. The teams after careful analysis of the data need to react to the market response to their strategy through adjusting their marketing strategy, brand designs and prices, advertising campaign, sales force and manufacturing production plan. When the teams have entered their decisions into the simulation program for the third quarter, the data is submitted and the simulation computer run is made and students receive their results through the web-based system. It is on this data that the student teams prepare a 10 to 14 minute presentation to give to venture capitalist panel

that will be present at the next class period. A standard format for the presentation is not given to the students but we discuss in class some of the components that might be included in a presentation describing your company's history and prospectus for future sales, research and development plans and market expansion plans.

### **The Venture Capital Forum:**

The VC forum is the highlight of the semester. Each team knows that they have 10 to 14 minutes to provide information that will eventually influence VC participants to invest capital into their company. Each team has the opportunity to gain an additional \$4M of capital from the venture capitalists. After the presentation is completed we give the venture capitalists five minutes for follow up questions. We have taken several approaches to selecting individuals to play the role of venture capitalist and given our rural Appalachian we have a limited pool to select from when compared to more urban or high technology areas. Our venture capitalist pool comes from retired business/technical managers from an international chemical company, retired executives that have moved into the area, angel investors and managers from regional technology based business located in our community or in our university technology based business incubator. Since we have only run this course for three cycles, we do not have a good feel at this time regarding what background and experience the optimum venture capitalist would have for this exercise.

Only the team making the presentation is in the room with the VC's and all other teams are held in a ready room where they cannot hear or see the other team's presentation. Many student teams have become immersed in the VC forum and have dressed in suits, printed up business cards, provided business portfolios, coffee mugs with their company logo and other paraphernalia in an attempt to impress the venture capitalists. After all of the teams have made their presentations, the venture capitalists schedule meetings with the teams that they want to invest in and sit down for negotiations. The venture capitalists are instructed to try to negotiate the lowest purchase price they can obtain from the teams they want to invest in and obviously each team wants to negotiate the highest purchase price they can get. There is a direct correlation between the quality of the presentation and the price the venture capitalist is willing to pay for stock in each company and as an observer you can see the VC's lining up to talk to those teams who gave presentations that clearly define their current position and their path forward.

This past semester, we told the venture capitalists that they would be evaluated for how much value they could create from their investments. As a result, we noted that the VC's worked harder to drive down the prices that they negotiated for stock from each company. Our plans are to continue the competition between the VC participants and what we heard from the student teams is that the negotiations were difficult, with the VC's not willing to yield very much from their initial offer. We had one student team that decided for forgo VC investment and chose to borrow money from the simulation bank.

### **Quarters Four Through Six:**

In quarter four each team has the opportunity to invest in research and development in an attempt to create a competitive advantage in the marketplace. In addition, teams can begin negotiations with other teams to discuss cross licensing opportunities that would be implemented in quarter five. The teams have the inflow of the capital that they have received from the VC investors and they need to decide how they want to partition the capital between expanding the sales force and sales office locations, evaluating their manufacturing position and product design and reviewing how the market is responding to their advertising and marketing

campaign. It is during this quarter that the developing computer industry enters the high growth phase of the technology adoption cycle. Differences between companies become dramatic as the size of the market worldwide expands and those companies that are well positioned in manufacturing and inventory control, have sales offices and an adequate sales force, are knowledgeable in what their competitors are offering and how they are positioned begin to take leadership positions. Quarters five and six are positioning periods with teams enacting their marketing, licensing, manufacturing and advertising strategies while controlling their cash flow.

### **Final Student Output:**

After the sixth quarter is completed, we ask each individual student to write a paper describing their experience with the simulation focusing on their role in the team, how the team made decisions, what they learned from the exercise and what they would have done differently if they could have a do over. These papers provide valuable feedback for the course and most students feel that the use of the simulation program is a highpoint of their graduate experience. Included are some comments that are typical from the students when they write their final paper and we feel that their inclusion will give the reader an overall feeling regarding their participation in the marketing simulation program.

- “Overall this simulation strategy really opened my eyes to starting a new business but more importantly the need to select good team mates. I enjoyed working with each member of the team. We for the most part were able to work very well together. Even when times got tough, we were still able to work through them and laugh about our mistakes in the end. I wish we could have worked on it longer, maybe go into quarters 7, 8 and 9”
- “This game was incredibly educational and thought provoking. One can only learn so much by reading a PowerPoint™ slide or solving a math problem in a book. This virtual Marketplace game taught me some skills I never thought I would have. Before the game I had no business know-how. Now I know a little more about how to explore business data and make sense of it.”
- “This class was very educational and the experience was real. Meeting with the venture capitalists and negotiating with individual venture capitalists on the terms and conditions of the investment was a good learning experience for the executive team. I had fun playing the simulation game while learning strategic planning and management.”
- “I have to say as an observer of human nature that during the game I noticed that the young people were (for the most part) the losers. Why? I have my opinions just like everyone but the answer is of course priorities. They had their own to deal with and ours was to win the game. We were willing to put the time in, think about the problems, solve them and we won!”

### **Conclusions:**

The use of this simulation program has been a great learning experience for both the students and instructors and we will continue to use this in our strategic management class. In the three times that we have run the simulation, the team that has spent the most time on-line with the data have been the winners of the exercise, creating the most value. All of our VC participants want to have an opportunity to compete with the simulation at some time in the future to show what capabilities they have in managing a technology based business in a new market niche.

We are willing to share our experience with anyone who is interesting in using the simulation in their program

**References:**

- <sup>1</sup>Corbett, A.C. 2005. *Experiential Learning Within the Process of Opportunity Identification and Exploitation*. Entrepreneurship: Theory and Practice. 29(4):473-492.
- <sup>2</sup>Li, T., B.A. Greenberg and J.A.F. Nicholls. 2007. *Teaching Experiential Learning: Adoption of an Innovative Course in an MBA Marketing Curriculum*. J. Marketing Education. 29(1):25-33.
- <sup>3</sup>Cadotte, E.R. 1995. *Business Simulations – The Next Step in Management Training*. The Magazine of the Graduate Management Admission Council.
- <sup>4</sup>Shapiro, S.J. and C. McGougan. 2003. *Software Review: The Marketplace Game Innovative Learning Solutions Inc., [www.marketplace-simulation.com](http://www.marketplace-simulation.com)*. 31:92 – 95.
- <sup>5</sup>Dean, T.J., C.A. Turner and C.E. Bamford. 1997. *Impediments to Imitation and Rates of New Firm Failure*. Presented at the 1997 Academy of Management Meeting (Entrepreneurship Division). Academy of Management Best Paper Proceedings. Boston, MA. 103 – 107.