

INTEGRATING STRATEGIC MARKETING AND ENGINEERING: AN MBA COURSE ON CONCURRENT PRODUCT DEVELOPMENT

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Abstract

In this paper we propose a course on "concurrent product development ." The course premise is to integrate strategic marketing (thinking) and strategic engineering (thinking) through an interdisciplinary focus. This would prepare marketing students to be more effective in high technology environments.

THE BUSINESS EDUCATIONAL CHALLENGE

Recently graduate business education has seen substantial criticism. [c.f. Deutschman 1991] [Stan-ton 1988] [Behrman & Levin 1984]. Some argue that business instruction has become irrelevant to busi-ness practice. As a result, calls have been made for major overhaul of curricula, change in faculty focus, content of courses, approach to learning and revamp-ing of schools' incentive and reward structures. Recently, the American Assembly For Collegiate Schools of Business (AACSB) revised its accredita-tion guidelines to facilitate response to this chal-lenge.

Based on the authors' experiences, it appears that "curriculum innovation" might best be achieved through a bottom up process where individual faculty (or small groups of faculty) would create innovative courses. It is in this spirit that this paper on an inter-disciplinary course on "concurrent product develop-ment" is conceived.

COURSE BUSINESS CONTEXT: TWO KEY TRENDS IN THE 1990'S

The following is an effort to establish a relevant context for this proposed course. To accomplish this two important trends facing managers in the 1990's will be outlined briefly.

More Technology

First, world-wide, enterprises are creating new technology at an increasing rate. In some segments of industry, technology is changing how business is

conducted. It is changing the nature of competition. It is changing the product introduction process by shortening the time firms have to bring products to market. It is shortening product life cycles. More firms are introducing new products with greater technology content more often than ever before. Management of these changes is getting increased attention from practitioners as well as academics [c.f. Mckenna 1991] [Spencer & Triant 1989] [Gupta et. al. 1987]. The product design and development process must be enhanced.

More And Better Marketing Involvement

A second trend is the emerging validation of the "marketing concept" [c.f. Kotler 1984] [Levitt 1960] [Webster 1988]. For decades the "marketing con-cept" has been hailed as an effective business philosophy [c.f. Houston 1986] [Peters & Waterman 1985], but only recently has a prescription on how to implement the concept been made [Kohili & Jaworski 1990]. Also in 1990 came the first solid empirical research validating the concept's positive impact on business performance [Narver & Slater 1990].

Managerial Integration is Lacking

One would expect then, that managers would move swiftly to align their R&D, engineering and manufac-turing organizations with marketing, or, that market-ing would expend fresh efforts to become more involved in R&D and engineering. One would also expect that business schools would capitalize on this opportunity and initiate dialogues with engineering colleges and vice-versa. This appears not to be happening¹. Although business context and market

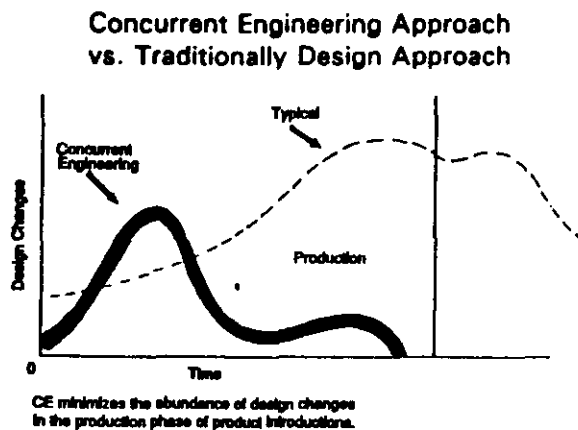
¹ A review of 46 articles on concurrent and simulta-neous engineering revealed only fleeting attention to marketing. A series of 27 indepth interviews with engineering managers in the high technology field reflected only incidental marketing and customer inputs into the product development process.

ing are high on the list in engineering schools (Dixon 1991), the reality is that marketing is almost invisible in the debate related to concurrent design and simultaneous engineering. And, concurrent engineering issues appear not yet to have reached the marketing literature.

Concurrent Development

Concurrent and simultaneous engineering are currently among the most popular topics within the engineering management discipline. Essentially what concurrent engineering facilitates is that it shifts a major portion of product design changes to the left (earlier) in the design process. A conceptual graph of this is shown in Figure 1.

FIGURE 1



In spite of these advances, there is one serious problem. Without marketing concurrent engineering tends to be an incestuous activity. It is a process through which one tends to generate the same old products faster, better, or at lower cost; but one often fails to integrate important customer value criteria into the new products. What is needed is an expanded concept labeled "concurrent product development", a process that integrates strategic marketing (thinking) and strategic engineering (thinking) throughout all phases of product development. This process should de-emphasize the sequential approach of conventional development models and promote the development, commercialization of products as an integrated, cross-functional process, rather than two independent parallel (engineering & marketing) series of stage-like events.

MARKETPLACE REALITIES

The two trends outlined above pose substantial

challenges to both technology (engineering) oriented and market oriented organizations. The technology oriented organization must incorporate increased market, customer and marketing considerations into its innovation and development process. Traditional marketing oriented organizations may face significant challenges in encouraging increased technological innovation in company culture and strategy. A recent study conducted by McKinsey (Nevens et. al. 1990) concludes that the process of bringing products with higher technology content to market is increasingly becoming an important success criteria. Another much larger and more recent study of 311 CEO's, presidents and general managers ranked "time-to-market", second only to design quality as the most important factors for success in high-tech markets [Jorgensen 1991]. This implies that incremental increases in resource allocation to development and commercialization may be well worth it. A better integrated process of strategic marketing (thinking) and strategic engineering (thinking) assures that the right product "value" is delivered.

MARKETING EDUCATION AND PRODUCT DEVELOPMENT

In spite of the intuitive appeal of integrating technology and marketing few business schools have incorporated the technology-marketing combination well. There are at least three reasons for this:

First, the marketing discipline has not yet conceptualized well what technology is, how it can be made operational in an organizational sense, and how individual elements of the technology [Capon & Glazer 1987] relate to each other and to key marketing concepts.

Second, business schools have traditionally integrated product development issues into courses such as "principles of marketing" and "marketing strategy".

Third, marketing and technology managements (engineering) have traditionally, from fundamental educational training in business schools and engineering colleges through to the practical management and organization, perceived their respective roles as being mutually exclusive. These causes explain partially the presence of major barriers to enhancing product development education which directly influences product design, development and commercialization practice.

THE PROPOSED COURSE

In light of the important trends outlined above, calls for integration, and the inherent weaknesses in organizing product design and development education, we propose a "new" interdisciplinary course on product development. This course is a hybrid of a traditional product development concepts and an engineering design management concepts. In Figure 2 we outline briefly some of the potential topics to be covered in such a course. It is important to note that we try to emphasize the combined strengths of the conventional market oriented thinking with strategic engineering thinking. The course should start with a context session on strategic marketing engineering. This could include traditional marketing topics such as appraising needs and requirements from the market, opportunity analysis and product management issues, but it should also include discussions on the role of science, technology and engineering as they relate to (sustainable) competitive issues. This is to make students think about technology scope and development parameters which may reach beyond the scope of their existing marketing thinking.

FIGURE 2

COURSE MODULE	POSSIBLE MARKETING CONCEPTS	POSSIBLE ENGINEERING CONCEPTS	EXAMPLES OF POSSIBLE ANALOGOUS APPROACHES
INTRODUCTION Course objectives Course motivation Need for integration Need for planning	Strategic Market Context Market Opportunity Nature of markets Target markets The "product concept"	Strategic Engineering Context The Role of Technology Scientific/Technological - Benchmarking Application Engineering Feasibility	Portfolio Models Matrix Models
CONCEPT GENERATION How to generate ideas, assess ideas, transform ideas to market needs, translate market needs to product needs and to convert this to competitive product attributes.	Preliminary Requirements Target Pricing-Rate of return Benchmarking: - Competitive - Technology Product/Market Analysis	Involved current technology Improved Specifications Technical Feasibility Technical context Technical competency matrix	Task Areas New product Vision Teams Sign-Offs Benchmarking Rapid design Performance Scan HIT Analysis Morphological Analysis Gap Analysis Innovation Tools Lateral Search Reasoning Analysis Two-Tier-Model Improved Response Structuring
DESIGN DEVELOPMENT To design the "best" product, meet cost effectiveness and faster than the competition	Concept Testing Cost Modeling Key Success Factors Reviews Product Attributes	Design Theory Principles Design Review Management Design Tools - CAD/CAM/CAE Solid Modeling Design For Manufacturability Design For Assembly Assembly Modeling Assembly Modeling Process Simulation Cost Estimating	CAO/CAM Simulations Attribution Analysis Concept Analysis Trade-Off Analysis MOS (Performance) Matrix Access Analysis Materials Tools Structure Models Product Comparison In-Depth Information Sensitivity Testing
PROTOTYPING To build and test the product's market relevance and technical performance	Alpha Tests Beta Tests	Vendor Specifications Vendor (Supplier) Reactions Material Models Serviceability Rapid Process Prototyping Computational Prototyping	Test Marketing Market Testing STH's
COMMERCIALIZATION To prepare the product for introduction to the marketplace	Opportunity Costing Launch Planning Price "packaging"	Design for Manufacturability Pilot Production	
MANUFACTURING & MARKET LAUNCH To prepare for "mass" production and actual shipment to customers	Credibility building Market Pricing Product Launch Market Share building	Volume Production	Simulations Value Pricing Timeline Share-hold Analysis
ONGOING IMPROVEMENT To establish a "learning" culture which fosters continuous improvement and customer care	Customer Satisfaction Pricing Tactics Program Assessment Performance Audit New Targets	Enhancements Management of New Features Upgrades Learning: - New Materials - New Processes - New Technologies	Measurement Program Performance Multi-functional Teams Group Issues Performance Issues

To the left in Figure 2 we show some of the major modules or course sections while in the middle two columns we indicate marketing and engineering concepts such as benchmarking, cost and price constraints, input from customers, and market research; in addition to science, technology and engineering related topics. In the right-hand column we suggest analytical frameworks and/or methods which may be appropriate to use at each phase of the development process. The course sequence is meant to follow the flow of a product development program. Organizing the course in this way has several advantages.

First, students will appreciate how important it is for marketing to get scientific know-how early in the process. This knowledge can be used to obtain refined market intelligence and product conceptualization which are of value to R&D, designers and manufacturing engineers.

Second, by incorporating marketing-technology parameters early, project goals and priorities are likely to become more congruous among marketing and technical teams.

Third, early incorporation of engineering data and process technology parameters is likely to give the students an appreciation for the importance of clear technical guidance from engineering to marketing.

Fourth, by appreciating this early and enhanced definition of technology and market prospects students will understand how likely this is to influence an organization's allocation of resources for marketing, engineering development and manufacturing. Consequently, this prevents under-funding and delays in time-to-market.

Fifth, in line with contemporary thoughts on simultaneous engineering, the course should facilitate discussion on integration of process technology considerations before product design and development are initiated. The clear advantage of this is that manufacturing and engineering may furnish constraints and/or initiate manufacturing engineering studies early in the project.

Sixth, when product R&D is initiated, a complete base of market and scientific know-how will exist. This comprehensive understanding is likely to maintain top management commitment to the project. It will keep development teams focused on creating value to customers and on adhering to time tables.

MODUS OPERANDI

Many will argue that it is very difficult to implement such a course because it requires the instructor to have knowledge about engineering as well as marketing. This difficulty can be easily overcome by making it possible for business and engineering professors to plan and team such a course together. Perhaps by dividing in half the contribution from each professor and by teaching one course section in the engineering school and one in the business school bureaucratic road-blocks can be overcome. In any case, given present business school culture in this country, assertive efforts from individual faculty are probably required.

This type of course lends itself very well to have invited outside experts speakers on some of the more technological topics such as CAD/CAM. It is also possible to use case studies dealing with manufacturing, quality, technology as well as product management and marketing. This gives the course the appropriate concurrent interdisciplinary.

Finally, a good mix of engineering and marketing oriented students in each class section would facilitate refreshing confrontation between technical and commercial points-of-view. This may facilitate shared use of terminology and empathy for each discipline's point of view.

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