

Strategic Management Issues with Engineering Management Distance Learning

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Abstract

This paper identifies and discusses real-world strategic issues in making distance learning a “Win-Win-Win” for the primary customer(s), the general public, and the educational institution. The University of Tennessee’s Graduate Engineering Management Program is used as a case study. Concepts and issues are discussed generically to promote transfer of key concepts and lessons learned to other distance learning and engineering management programs. Key areas discussed are strategic vision, strategies for “how-to-get-there,” customer focus, market analysis, economic issues, and the process for continuous improvement.

Introduction

What strategic management approach should be used and what should be considered by a university that is either offering or considering offering graduate engineering education management through distance learning? For this paper the strategic management approach includes formulating what is referred to as strategic vision and the strategies for obtaining that vision. These concepts are discussed in general and for a graduate engineering management distance learning program. Market opportunity for distance learning is addressed, since this is perhaps one of the primary reasons for having distance learning. And as one might expect, the economic aspects are also of primary consideration when strategically planning a distance learning program.

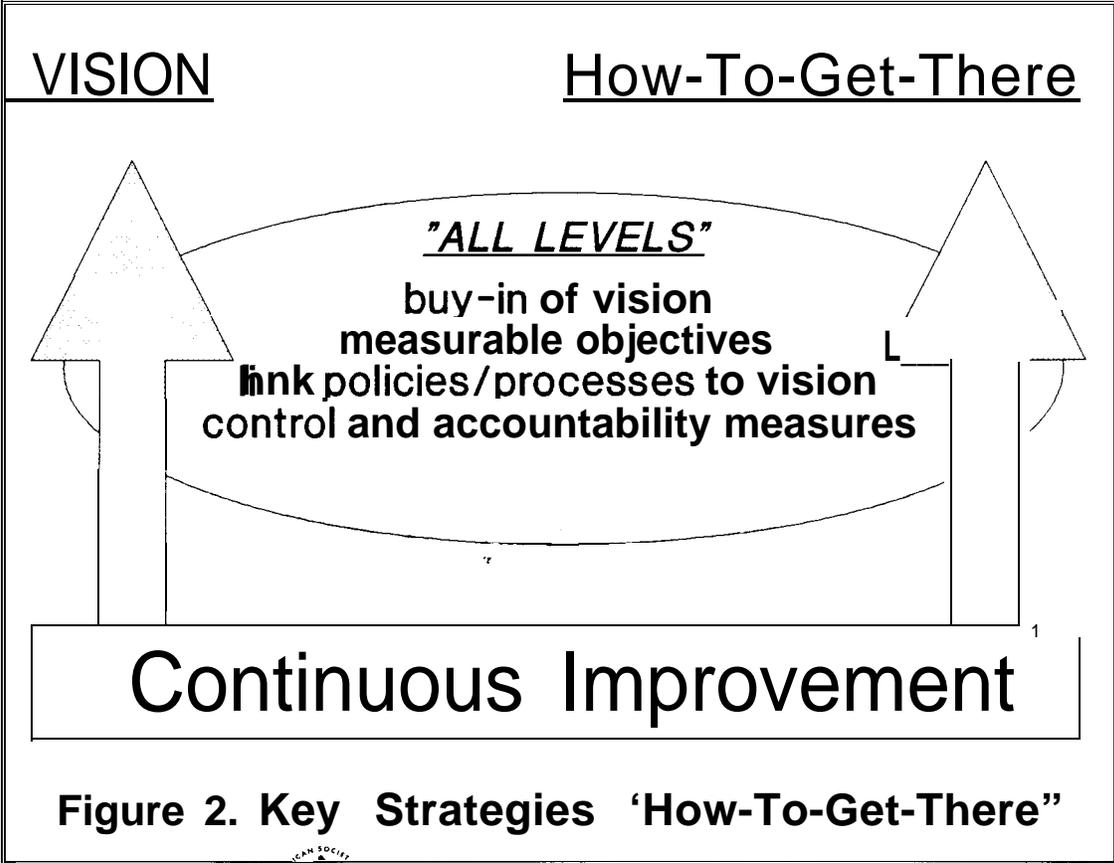
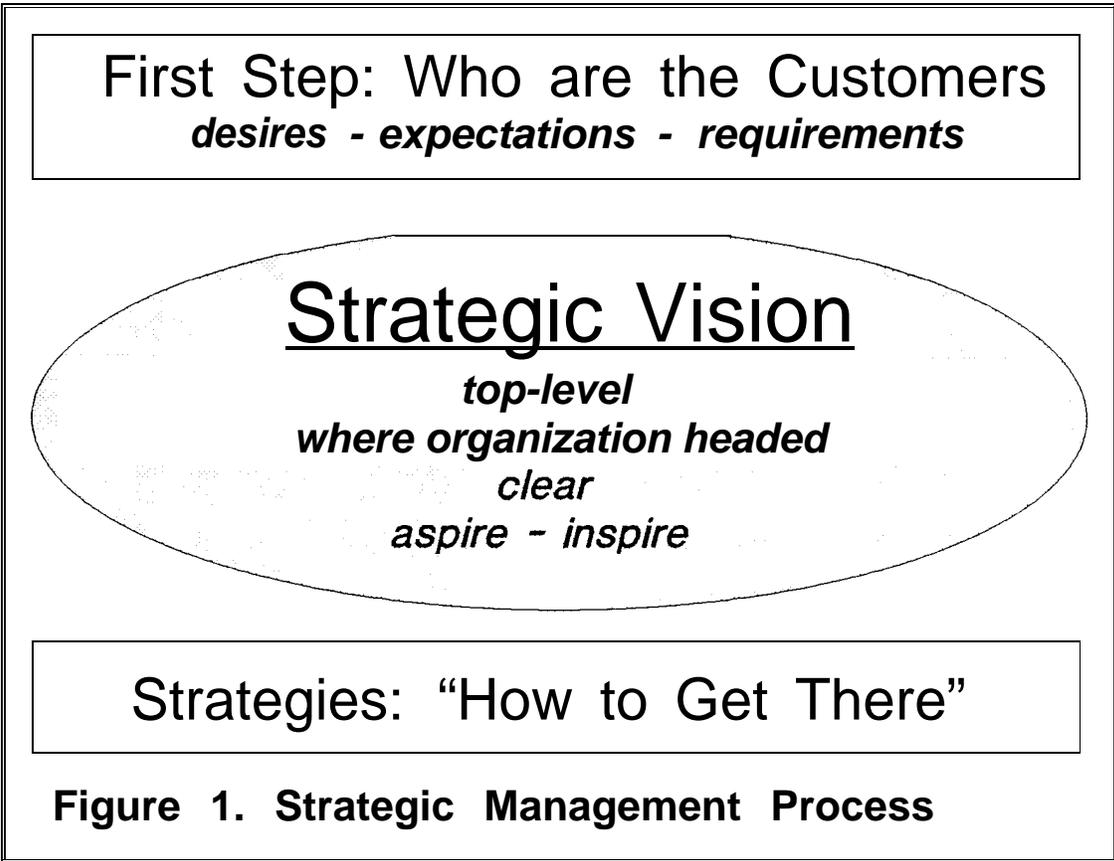
Strategic Vision and How to Get There: In General

What is the business of the organization? -- what are we trying to do? -- where is our organization headed? -- what are we trying to become? These are considered the foremost direction-setting questions for senior organization leaders, administrators, managers and stakeholders. In fact, these can be considered the primary questions of concern in considering organizational growth, competitiveness and survivability.

If successful, strategic vision infuses the organization with a sense of purpose and with long-term direction. Strategic vision in effect, becomes the hub; for “identity” setting of the organization, for both internal and external communication, for setting of goals and objectives, for resource prioritization, for individual and team motivation, for fiscal responsibility and accountability, and to measure overall effectiveness.

The process of strategic management can be looked at in two steps; “strategic vision” and “how to get there.” Figures 1 and 2 show this breakdown of strategic management and keys-to-success in implementing the steps.





Strategic vision starts with a clear top-level vision and picture of where the organization is headed in the future -- say over the next 5-10 years. Ideally, this can be stated in a way that all participants of the organization can directly and personally relate to as stakeholders. Ideally this statement should inspire the organization to aspire to focus on meeting the vision.

The first step in developing a strategic vision is to understand and define the business of the organization. This may not be a simple task. Who are we to serve? Who is the customer -- or are there many customers or groups of customers?

Perhaps the answer to who the customer is should start by identifying who maintains the organization's existence? -- where "does or will" the organization get its financial resources? - and - what "are or will be" the implications and expectations from the customer(s) or groups? Identifying and understanding these external customers should form an initial basis for understanding the purpose of the organization. This should be a primary consideration in strategic vision formulation and development of strategies to achieve the vision or mission statement.

In addition, each person of an organization has customers internal to the organization that they serve. Identifying this tie of internal customer service to external customer needs, requirements and expectations and to the overall strategic vision can form a basis for accountability and improvement. This latter point is reflected into the strategies for "how to get there."

Perhaps the first key strategy for "how to get there" is having as an objective to foster understanding and support of the vision by all fictional personnel. This is done through a combination of leadership, principles of team building and motivation. Another key strategy is to strive to have the operational policies and procedures of the organization tied/linked from the strategic vision. This starts with having measurable performance objectives or targets and showing where all operating policies, procedures and processes are linked from all levels of the organization to the internal and external customers and to the vision from top-level leadership.

It may be difficult and time consuming to get a clear picture and understanding of how each person fits into the overall strategy. It may be difficult and time consuming to get a clear picture and understanding of how the operating policies, procedures and processes relate to the internal and external customers and strategic vision. However, the better this baseline ties to the vision and is communicated and understood, the better is the opportunity for control and accountability measures to become a positive long-term influence on meeting the vision.

These strategies provide a baseline for better understanding of the costs for each part of the process. This leads to another strategy for "how get there." This key-to-success is to emphasize and promote continuous improvement in all aspects of the organization, including its operating environment and culture. As can be seen from Figure 2, the strategy of continuous improvement also means to keep looking for needed change in the overall vision. Perhaps the initial vision statement was in the right direction, but the wording could be improved for clarity and focus or emphasis. Perhaps competition, market opportunity or customer expectations offer a need for change. Consider fostering a culture where quality change is what is looked for and that change be **planned as evolutionary**. These are characteristics of continuous improvement.

When organizations do not provide a culture for continuous improvement that emanates at all levels, then change comes through resistance, conflict and **revolutionary** actions. Government organizations, organizations that are **funded** by the government, and monopolies may not have adequate culture, economic incentives and accountability measures for promoting continuous improvement. However, most organizations have strong competition, with changing customer and market needs and opportunities made available through the use of evolving technologies. Thus organizations having developed a culture for continuous improvement have the inherent advantage for long-term financial existence and survivability.

**Strategic Vision and How To Get There:
Graduate Engineering Management Distance Learning Program**

Let us consider how the concepts discussed above could be tailored for an institution that either has or is considering offering a graduate engineering management distance learning program? Who is the customer? What is the vision and what strategies will be used?

The university's customers can perhaps best be identified by identifying the sources of the university's revenue. The starting point for determining customer service priorities and emphasis can then be assessed by identifying the requirements and expectations that come from these customers.

There are many sources of revenue for academic institutions (Figure 3). With these sources of revenue, in some cases, comes a somewhat vague but broad range of responsibilities and expectations for customer service. In most universities, an important source of revenue for education comes from student fees. Students' desires and expectations include a quality education, and learning experience that assists them in meeting their professional growth objectives. Some students desire the opportunity to select coursework to best meet their education objectives. This implies that the educational program needs to have some flexibility to be responsive to individual customer needs. Some students, particularly on site students also desire financial assistance from the academic institution.

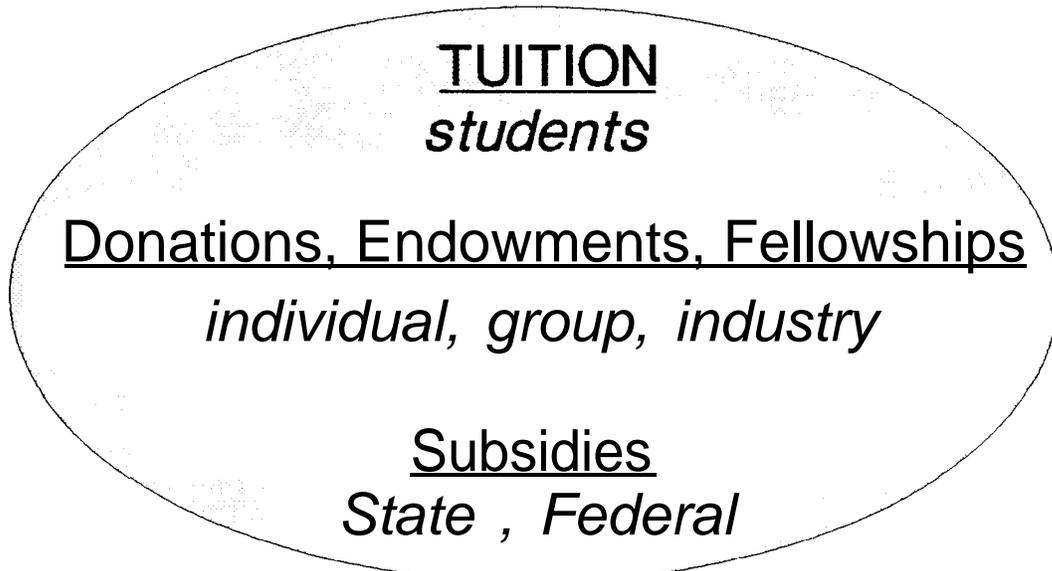


Figure 3. Sources of Funds: Customers

Many universities are subsidized through State and in some cases only through Federal funding. Government funding for universities comes with expectations to advance the education of students so they can better meet job growth opportunities and to advance science and technology developments. Thus, this gives the requirement for the university to support short and long-term growth and opportunity needs of individuals, industry and the overall community.

Another important source of funding comes from individual, group and industry donations, endowments, and fellowships. In these cases, the customers stipulate the vision, objectives and any special requirements for use of the funds. These could range from specifying a research or education area to be supported or support of a special group of student base. Most universities receive government support either through State appropriations or Federal grants.

Yet another important funding source is Federal, State and industry funding for basic and applied research. Since graduate school has a research element, this funding requires faculty as well as students to participate and keep current in their discipline.

Funding for these educational needs and opportunities are being focused to support a particular locale, state, or the country as a whole. Also, based on what is observed at many universities, particularly in the engineering disciplines, it appears that universities are also being funded to support education needs of the global market.

As with other industry, technology advances such as, the use of a combination of video tape studios and interactive classrooms have opened up new markets of distance learning. These technologies are allowing the classroom setting to be brought to the large student market that is outside the community of the university location. The main advantage to the customer is that this allows the engineering student to take advance courses and complete degree requirements without significant losses in financial and professional growth. With these technology advances and cost of delivery becoming more and more competitive, distance learning is being sought for by the potential working student and by industry. In fact, entrepreneurial academic institutions such as MEU and NTU are already capitalizing on these market opportunities to gain market share.

Engineering Management Case Study

Vision Statement

There will undoubtedly be a wide range of vision statements for an engineering management distance learning program. Getting agreement on a meaningful statement might be a challenge in coordination and true buy-in by the stakeholders.

One example of a typical vision statement might be:

“The University of Tennessee offers graduate engineering management education to meet the needs of the local industry and community, state and nation. This university offers degrees using both on-site and distance learning delivery mechanisms. ”

Now consider an example where the vision is embellished as:

“The University of Tennessee will provide the highest quality of engineering management education for a competitive price to our customers. Our program will target, reach out and meet the market opportunities and needs of local, state, nation and global communities. To this end, we will offer a degree program using both on-site and distance learning delivery mechanisms. Emphasis and care will be given to meet the career broadening needs and expectations of individual students from all engineering and scientific disciplines and meeting industrial needs for sustained competitiveness and growth. We will continually strive to improve ourselves and our education processes from the current baselines. ”

On the surface one might consider that the basic difference in the two statements is in opening up the market boundaries past the state borders. Identifying the market is important. However, the second statement provides “added clarification and focus” in other areas that could be used to bring administrators and faculty “together with a common vision. ”



Resistances and Continuous Improvement

Figure 4 identifies sources of resistance in developing a vision and developing and implementing strategies to achieve the vision. For example, everything else being equal, it is more difficult to be effective as a teacher through distance learning delivery mechanisms. Thus, the quality of education via distance learning education can become an issue. The institution's reputation "identity" for delivery of quality education can be harmed if the teaching effectiveness of its faculty goes down.

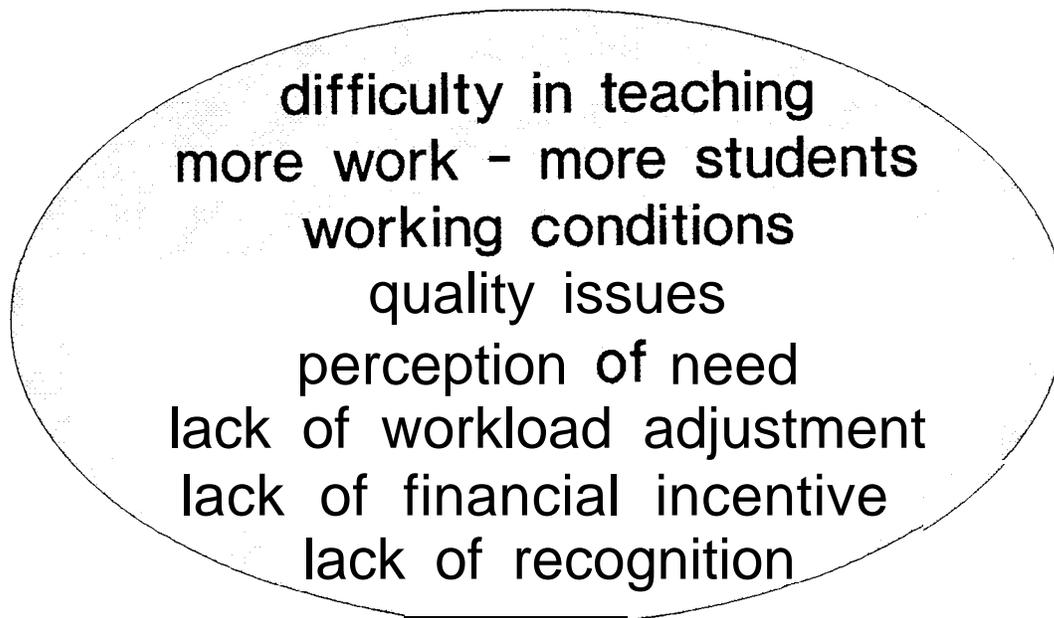


Figure 4. Sources of Resistance

Distance learning provides a larger student base. This becomes a potential benefit for faculty to serve more customers. Faculty have the added challenge of providing lectures that are being televised. With this, the institution may not have adequate policies and processes in place for recognition and growth, workload adjustment, or for financial incentive. In fact, the processes and culture may be in place that reduces belonging, esteem and self-actualization needs, and discourages using distance learning for job enrichment and individual growth. Thus, one can see the general tendency for faculty to resist embracing distance learning. Analyzing these inherent resistances points to the need for emphasis on keys-to-success of Figure 2 including getting the buy-in at all levels to the concept of continuous improvement.

Market Analysis and Strategy

With the available and emerging technologies, customer expectations and emerging competition among educational institutions, the market opportunity and potential for development and delivery of distance learning in engineering management education takes on "global" boundaries and is essentially "every" engineer and scientist in every industry and at every government level. Figure 5 shows four areas for consideration of customer service by the engineering management distance learning program. The first is the traditional area of providing an engineering management degree for the share of market desiring to career broaden with

primary emphasis in engineering management. Another market opportunity is for customers seeking graduate degrees in other engineering and scientific fields. Support of this market could range from serving customers desiring career broadening with a second **major** or minor concentration in management, supporting selected courses that may be required by the customer and academic functional area for the degree in the primary fictional area, or courses desired by students as electives. For example, a student and industry market may encourage master and doctoral students in physics or civil engineering to have an engineering management minor area of concentration. Some markets may expect the program to broaden into topics like: systems thinking for technology development, how to better project and manage cost, schedule and performance of a project, how to do strategic planning for the organization, and how to improve functional team building and interpersonal skills, motivation and entrepreneurship. Some markets may desire the degree to promote more broadened technical skills in areas such as statistical and economic analysis, systems **modelling** and design of experiments. In some cases the **functional** area degree may need overall specialty courses, such as, logistics, human factors, expert systems or reliability that are being served by the engineering management program.

ALL
Engineers - Scientists
Industry - Government Orgn's

Career Broadening
engineering management degree
major or minor emphasis area
selected courses or electives
post-graduate studies

Figure 5. Markets for Engineering Management Program

Many engineers and scientists professionally broaden into engineering management with limited support from academic programs. Independent of the academic background and degree of experience, this non-degree seeking market is available for growth opportunities. These opportunities exist for all levels of management. The last area can be considered part of continuous improvement, where engineering management courses could be offered for post graduate education for the journeyman to senior level engineering and scientific communities.

A university could limit the market by targeting only selected markets identified above. In addition, depending on the strategic vision of a particular institution, the program may be limited in other ways. In many cases the institution may not be emphasizing a global market,

when in fact, a large number of engineering students, particularly, full-time students, come from other countries. Many institutions whose primary source of funding is from a particular state serve a significant number of engineering students from outside the state. Rather than serve all industry and all students, many institutions serve only a few industry and student customer bases within a **specified** radius from the institution.

Universities may limit their customer market based on its strategic vision for degree of flexibility to support the market needs and expectations. Does the university understand support the growth needs and expectations in management for electrical design engineers? -- mechanical engineers? -- aerospace? -- chemical? -- environmental? -- civil? -- computer? -- manufacturing? -- industrial? -- operations research -- logistics -- systems? -- physicists? -- and mathematicians? Since in many institutions, the faculty capabilities and markets for engineering management has evolved from traditional industrial engineering academic disciplines, many institutions develop the program around that academic discipline and market. Many institutions who plan on serving other markets do not adequately understand and promote the flexibility required to meet the needs and expectations of these customer markets.

Thus, the market opportunity for distance learning engineering management education is limited only by the strategic vision of the institution and effectiveness of strategies identified and adopted for obtaining the vision. The first step in developing a market strategy is to obtain understanding and agreement on the market that the institution will serve. This will allow better identification of the market opportunity, competition, and aid to focus on other strategic implementation issues. The next step would be to develop measurable targets for near-term and long-term growth. This could come from a combination of projection of the market, competition, capabilities, **financial**, political and cultural aspects. The next level of strategy of how to obtain the objectives of market share which will not be discussed in this paper.

Economic Issues and Strategy

Suppose that one is considering whether to embark on a new business venture. The process can be broken down in many ways, but for this paper the process will be broken down into three models. The first way the venture could get started would be where one performs a short-and long-range strategic plan, including, an objective market and needs analysis, feasibility analysis including technology assessment, investment and operations cost analysis, impact areas and changes to the organization, and return-on-investment. In this model, if it appears feasible from a return-on-investment strategy or other factors relative to the organization vision, then, buy-in can easily occur for a positive decision. This might be referred to as the model of “objectivity with responsibility and accountability to the owners and stakeholders.”

The second way that this venture may be started is when the owner of the business or person with decision authority, has all the resources and authority to make the “go” decision. In this model, the authority may or may not have a concern over risks, including costs, over the true projections of market or return-on-investment or impacts to the organization. This model could be referred to as “subjective and non-accountable.”

The third approach to the decision process could be a mixed model approach. This is perhaps a starting point for looking at decisions for embarking on a distance learning program in general and then to consider offering a graduate degree in engineering management.

In taking the first approach, there are many internal and external factors that will play a part in the risk projections. These should, in theory, all relate back to the strategic vision. For example, what market and distance learning delivery mechanism(s) to use. Evolving



technology offers opportunity for visionaries in the education business. However, the technology can be a significant investment. If the institute's vision is to limit distance learning to video, it can target a selected student and industrial market. If it has both live classes and interactive classrooms, it has another investment and market opportunity. If it **downlinks** from satellite, another market becomes available. With the advanced multimedia opportunities on the internet, the world could easily be the market opportunity. Perhaps the technology is evolving where a student, anywhere in the world, going to any institution, can get primary degree program credit instead of "transfer credit" for taking Dr. so-and-so's course in such-and-such.

Thus, what distance learning delivery systems should be evaluated? Each of these visions and each of these delivery mechanisms will have different cost, benefits and impact projections. The risks in not meeting these projections is also a significant point that should not be overlooked in the decision process. Relative to strategic vision and economics, when the topic is discussed as to which capability should the university focus on, perhaps the starting point for vision should be to say "potentially yes" to all capabilities. Promote innovations for obtaining market share, innovations for keeping operating and support costs in check, and innovations for continuous improvement including technology changes to be cost effective and competitive.

This paper does not address each of the factors for economic consideration. The purpose for the example on technology and strategic vision is to promote self assessment on which process for strategy and economic analysis is being or is to be followed.

Highlights of The UT/UTSI Engineering Management Distance Learning Program

The program was **originally** called Engineering Administration and was managed from both the Knoxville and Nashville campuses and came into existence around 1970. The distance aspects consisted of **teletypewriter** and telephone links, traveling professors, and a few video tapes. After a federal court closed the UT Nashville campus and other departmental and campus conflicts were resolved, the primary responsibility for managing the program was at UTSI under the umbrella of the Industrial Engineering Department at UTK. It has existed this way for the last thirteen years with the program name of Engineering Management.

The only major upheaval in the content occurred when the University changed from the quarter to the semester system. Content still changes as the needs of the clients' are detected.

The distance aspect of the current program is mainly through video tape although interactive TV has been in use for the past four years. The interactive TV network is at UT campus locations through ground links. Some companies have shown an interest in satellite links to training centers. Students attend live classes connected by interactive TV at four UT sites. Video tapes go to more than thirty company locations. Approximately half of the students have access to or use the interactive sites. Even though it seems innocent enough, time zone lines are a **major impediment** to the use of interactive TV.

UT has interactive classes originating from six campuses that go to nine campuses across two time zones. Sharing this system with a dozen academic programs has become a scheduling nightmare.

Assessment of The UT/UTSI Program

A cursory review of the UT/UTSI engineering management program offers insight for improvement. The UT/UTSI engineering management distance learning program does not have a formal vision statement. Based on communications and actions from top-level administrators



from UT/UTK and UTSI, it appears that the program is a high priority. This vision has more-or-less been made through verbal communications and personnel and funding profiles not being significantly reduced relative to other programs. It has been communicated from top-levels and reasonably understood that distance learning education is the wave of the future and that engineering management can meet a customer need and market opportunity. However, this is about as far as the top-level vision and leadership has taken the strategy for “how to get there.” There have been no visible signs of supporting policies and cultural change including control and accountability measures that support the vision. In fact, it has been a struggle for control.

Thus, developing strategies, to help in success, like having measurable objectives, will be difficult to coordinate. For example, the top-level strategic vision is not clear to what extent the organization is to be headed in a direction to develop and meet market needs and opportunities. The vision does not give indication of desirability to accept risk by investigating and pushing the boundaries of expanding distance learning within the state, let alone to other states and countries. The strategic vision does not address the important point of quality of distance learning while meeting the market opportunity.

Neither the strategic vision nor associated strategies of operating policies, prioritization of resources and processes for implementation and accountability, provide a high level of inspiration and motivation for faculty participation and professional growth in distance learning. The actual vision and how-to strategies have to come from emerging leadership at lower levels. This can be considered part of empowerment and team building, but other critical parts of the organizations are not tied-in to top-level vision, and control and accountability mechanisms. This creates a natural environment for internal politics and resistances. Without adequate clear top-level vision and leadership, initiatives from lower level administrative and functional areas become more difficult in the development and coordinating process. This is due basically to the conflicts of individual visions, preferences, prejudices, and inherent resistances induced by the control and accountability mechanisms in place.

The UTSI lacks the needed commitment to increasing the “breadth” of the system. Only one studio is available to support 7 degree programs; engineering management, computer science, aviation systems, MBA from the University of Tennessee at Chattanooga, human resources development and audio and speech pathology from Knoxville.

The ownership of programs needs to be defined along with better procedures for the transfer of funds and who gets credit. Credit is important in that it is counted in the funding formula. In addition, the annual evaluation of faculty effort needs to be adjusted for teaching in distance learning. Also ownership of course material and copyright considerations are being addressed but are not yet resolved.

Summary/Conclusions

It should easily be seen that distance learning is the wave of the future. Technology advances will continue to offer quality education opportunities and economic advantages. Thus, the strategic vision should promote flexibility to take advantage of developing technologies, and staying on the bow wave of competitiveness in serving the needs and expectations of an expanding market base. The focus should be in formulating strategic vision for serving the customers (market) with engineering management through distance learning. In this, one should address the issues of where the need, capabilities and competition are headed.

Concepts of strategic management can be used to assess an engineering management distance learning program. Starting with focussing on strategic vision on where the program



should be headed to developing strategies on how to achieve the vision. As one might expect, The University of Tennessee program has not been formulated using these concepts. However, perhaps with better understanding of customer needs and expectations, emphasis on customer service and continuous improvement will evolve needed cultural and process change.

Suggested Bibliographic Readings in Strategic Management

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